

Fishing Gears

of the

Cambodian Mekong



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of the

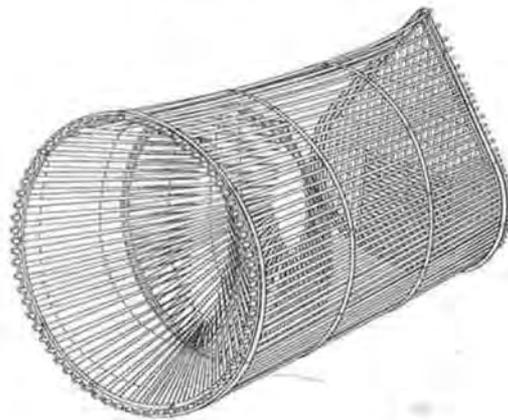
Cambodian Mekong

Compiled by:

Deap Loeung, Peter Degen and Nicolaas van Zalinge

Illustrations and Layout by:

Arijan Jansonius



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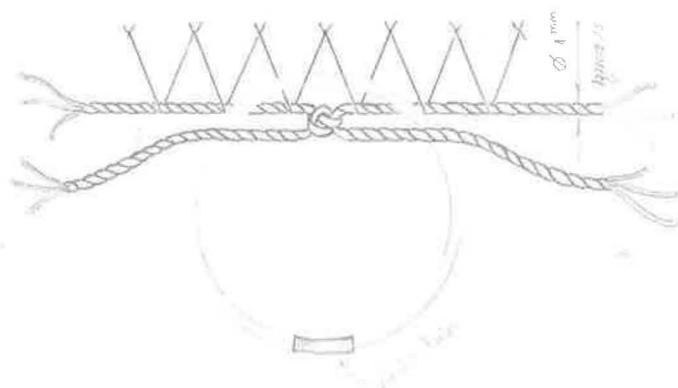
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Illustrations: Arijan Jansonius

Layout: Arijan Jansonius

E-mail: ajansonius@hotmail.com

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Foreword

The Department of Fisheries of Cambodia (DoF) is strongly committed to its mandate for management, conservation and development of fisheries, and maintaining the pivotal role of fish as food and a source of income for rural people. To maintain fisheries productivity, measures for conservation and management need to be implemented. Competition for water and seasonally-flooded land resources cause conflicts over access and usage; and increasing fishing pressure and conversion of critical habitats are causing reduced catches by fishers, all of which show the need for improved management regulations and practices.

This documentation of fishing gears used in the inland waters of Cambodia was long-awaited by fisheries policy makers, scholars, practitioners and extension workers in fisheries and environmental fields. This structured description of fishing gears constitutes a fundamental tool, which allows policy makers and fisheries managers at all levels to better understand the complexities of resource utilization. The fabrication and use of each fishing gear reflects the traditional knowledge of generations of fishers, as well as emerging trends as a result of changing environmental, socio-economic and/or market conditions.

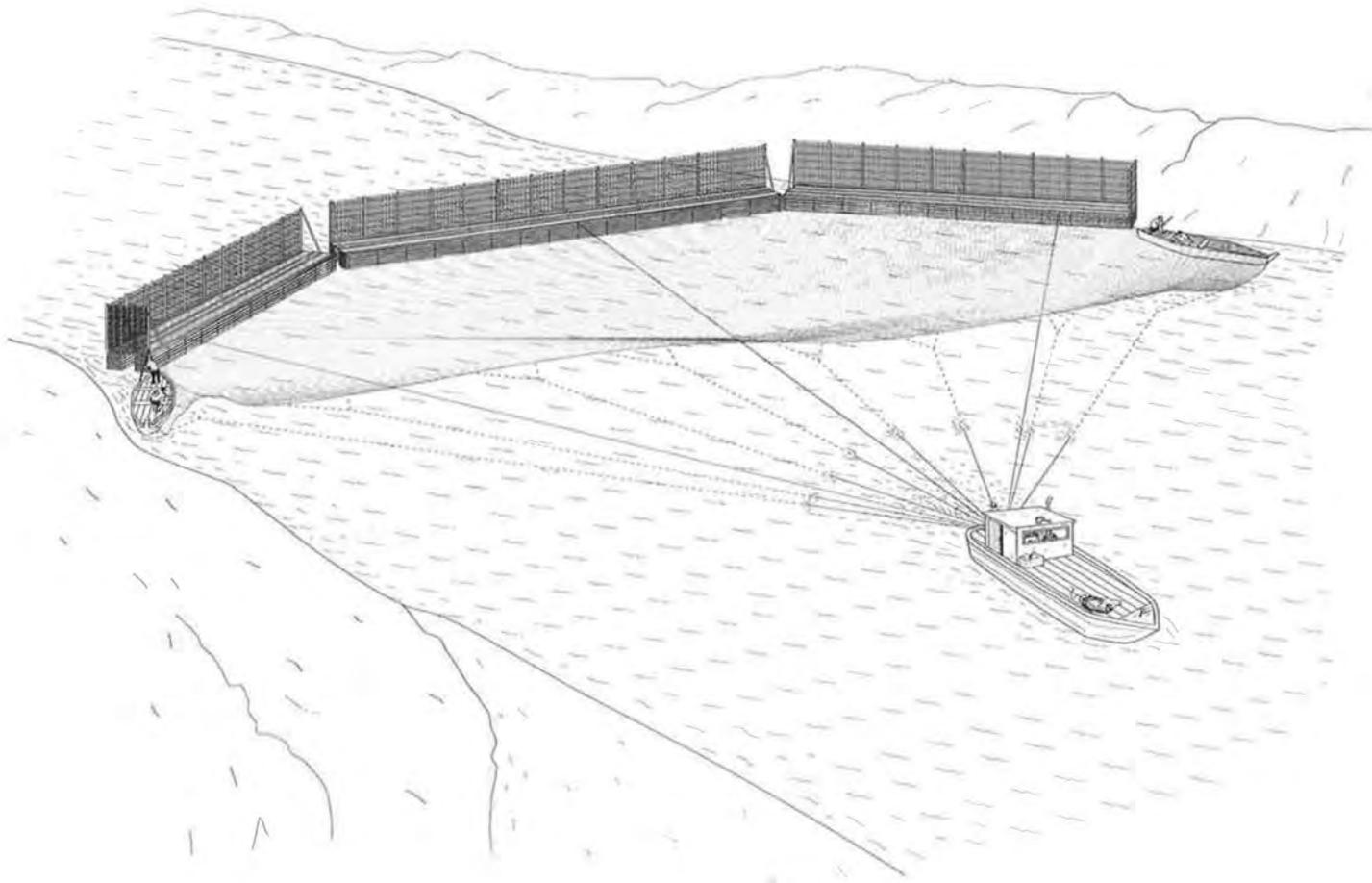


The present publication is an important result achieved through the dedication of counterparts and provincial technical support staff of the Department of Fisheries of Cambodia, collaborating with the project for the Management of the Freshwater Capture Fisheries of Cambodia of the MRC Fisheries Programme. The data collection and fieldwork took several fishing seasons and the analysis, reviewing and preparation of the book took more than one recession period.

The DoF and its Inland Fisheries Research and Development Institute (IFReDI) would like to express their gratitude to the Project for the Management of the Freshwater Capture Fisheries of the MRC Programme for Fisheries Management and Development Cooperation. We also want to give our thanks to all anonymous collaborators in the field, fishermen and women for freely sharing their knowledge often gathered over many generations. Without their kind collaboration this book would not have been possible. Special thanks go to the compilers of the book, the provincial supervisors and their collaborators and the artistic designer of the book. We acknowledge particularly the assistance of the Mekong River Commission Secretariat (MRCS) and the Danish International Development Assistance (DANIDA) to DoF and IFReDI.



Nao Thook
Director
Department of Fisheries of Cambodia



Acknowledgments

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The preparation of the book would not have been possible without the cooperation of many colleagues in the Cambodian Department of Fisheries and the MRC Fisheries Programme. In particular we thank Nao Thuok, Director of the Department of Fisheries, and Jorgen Jensen, the (former) Manager of the MRC Fisheries Programme, both of whom provided encouragement and guidance, and made resources available for this very considerable undertaking.

The information presented herein is largely based on the field work of Provincial Fisheries Officers. We thank them for their dedication and commitment over several years and often in arduous conditions. They are Troeung Rot (Battambang), Phem Sea (Pursat), Cheng Vibolrith (Siem Reap), Chuol Thach (Kampong Thom), Sam Chin Ho and Prak Leng Hour (Kampong Chhnang), Suon Chhun Heang (Phnom Penh), Suon Sothea (Kandal), Sao Kosal (Takeo), Aun Sinath (Prey Veng), Hing Sophannarith (Kampong Cham), Sean Kin (Kratie) and Chea Vannaren (Stung Treng).

We also wish to acknowledge all our colleagues in the project who provided assistance in many ways, including support with field work and feed back on the book as it was being developed. They are Sam Nuov, Lieng Sopha, Chea Tharith, Ngor Peng Bun, Hem Rady, Ouch Vutha, Chap Piseth, Lieng Saroeun, and Yin Dara.

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We are indebted to Arijan Jansonius for his excellent illustrations and for layout and presentation of the book. The quality of the book reflects the skill and dedication he brought to the task. Chris Barlow provided editorial support when preparing the document for printing.

Most importantly, we wish to express our appreciation to the fishers of Cambodia. Those with whom we worked freely shared their knowledge and expertise. We hope this book conveys to readers an understanding of the wealth of cultural and ecological knowledge that the fishing communities of Cambodia have developed over many generations. And we further hope that the book will assist in ensuring the sustainability of those fisheries resources for future generations of Cambodians.

Deap Loeung, Peter Degen and Nicolaas van Zalinge

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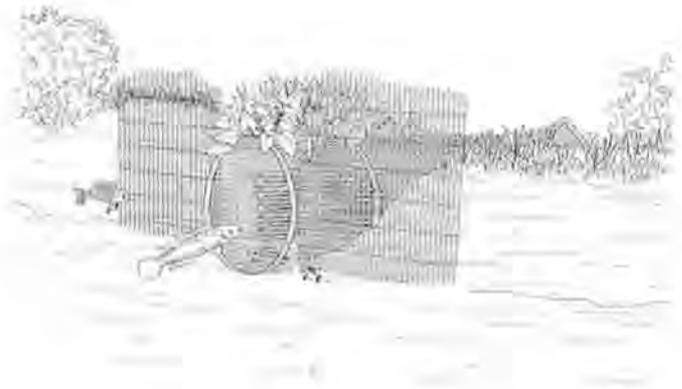
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Executive summary

This catalogue of the fishing gears of the Cambodian Mekong is the first of its kind produced in the region. It is an essential aid for managing and studying inland fisheries. In the catalogue about 150 gear types are accurately defined and described, and grouped into 16 major categories, based on their principle of capture. The names of the gears are given in Khmer and English. A short technical description of each gear and its operation is accompanied by technical drawings and photographs. A chart shows usage of the gear in four fishery regions; the Great Lake, the Tonle Sap, the Mekong and Bassac floodplains south and east of Phnom Penh, and the upper Mekong River. It also indicates at which stage of the flood cycle the gear is used. In addition the gender aspects of the use of the gear, its cost and legal status are dealt with.

Cambodia's inland capture fisheries, based on the Mekong River and its tributaries and floodplains, are among the most productive and species-rich in the world, and have been exploited for centuries. Of Cambodia's population of 12 million, 85% are rural dwellers, involved in farming and fishing on a family scale, so the country has exceptionally large and varied artisanal fisheries. Cambodians catch a wide variety of fish in many habitats during different seasons, with fishing activity most intense when fish are concentrated in receding waters after the annual floods. The wide range of conditions, species and fishers results in large variations in methods, from the most simple method of catching fish (by hand), through the use of such everyday gears as gillnets and traps, to the very complex operations based on large commercial fishing lots.

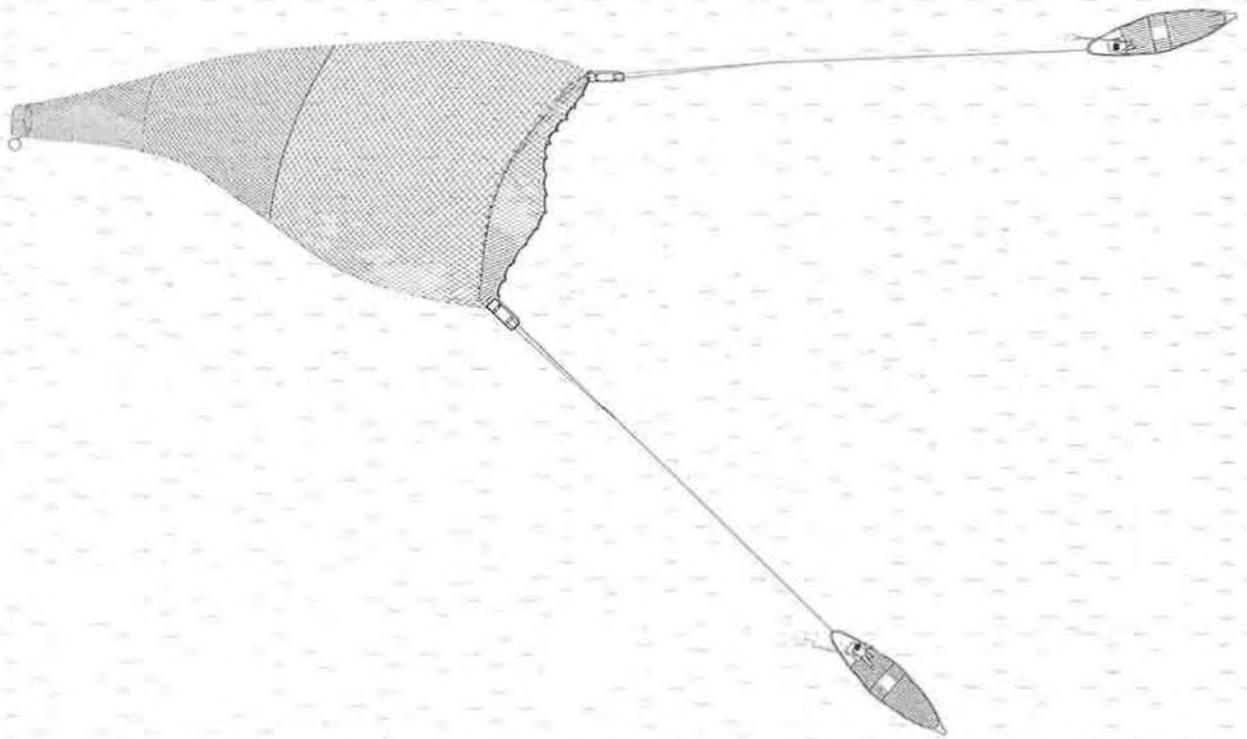
By accurately describing gears, the catalogue enables their use to be regulated to conserve the fishery. Moreover, the catalogue will assist those assessing or monitoring fisheries by providing accurate specifications of gear size and



characteristics needed in any research, for example for calculation of catch per unit effort (CPUE). Apart from the usefulness of this manual for management and study of fisheries, the gears which are depicted reflect the fascinating living culture of the Cambodian people, whose lives have for centuries been based on harvesting the Mekong's riches.

By carrying out the research for this catalogue, the capacity of the Department of Fisheries staff in understanding how fisheries work was strengthened. It provided a deeper understanding of the relationships between fish and their habitats, and the impact of human exploitation. The increased understanding of the use of the fishing gears facilitates more effective conservation of the resources, through, for instance, improvement of fishery law regulations of fishing gear usage as an instrument of fisheries management.

The information presented in this catalogue is incomplete. The quality and quantity of information generated varied from province to province and it was sometimes difficult to gather information on illegal gears as the researchers were in all cases government fisheries officers. Hence, there is scope for more work and it is hoped that future editions of this catalogue will include more types of gear and perhaps more appropriate categorisations of individual gears.



Introduction

Fisheries in Cambodia

Cambodia's inland capture fisheries, based on the Mekong River and its tributaries and floodplains, are among the most productive and species-rich in the world, and have been exploited for centuries. The Mekong System continues to provide its natural bounty of fish and other aquatic animals because it still contains large areas of natural habitat, and is relatively unmodified by dams or other industrial activities that would alter its hydrology or water quality. The system's high productivity is based on a complex floodplain system, which is nurtured by the annual wet monsoon which causes a single large flood lasting for several months between May and November. About 85-90 % of the discharge is generated during the wet season, and at Kratie (Cambodia) the Mekong's maximum discharge is about 50 times its minimum.

In Cambodia about 20,000 to 25,000 km² of land is flooded each year. The extent of flooding depends on the strength of the wet monsoon. The Tonle Sap - Great Lake floodplains in the heart of Cambodia contain the largest continuous areas of natural wetland habitats remaining in the Mekong system and the Great Lake is the largest permanent freshwater body in Southeast Asia. The lake is connected to the Mekong by the Tonle Sap (or Sap River) at Phnom Penh (see Figure 1). Due to higher water levels in the Mekong during most of the wet season the Tonle Sap flows toward the lake, thereby enlarging it 3- to 6-fold, from 2,700 km² to 9,000-16,000 km². In the dry season the Mekong's level falls so the flow of the Tonle Sap reverses and it flows back toward the Mekong.

The hundreds of fish species which inhabit the river system may be classed as either "black fish" or "white fish". Black fish spend most or all of their lives on the floodplain, where the waters are often stained black as a result of dissolution of humic materials from plants, whereas white fish spend most of their lives in the main river channels where waters are turbid ("white") as a result of transport of sediment from the highlands upstream. Many of the larger individuals of white fishes (including many species of catfish and river carps) spend the dry season in deep pools upstream of the main floodplain areas, for example in

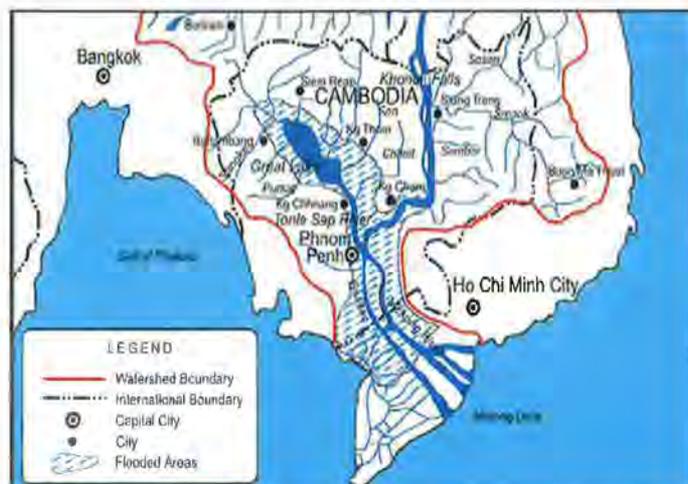


Figure 1. Map of southern Indochina showing the Mekong river, its delta and floodplains.

the Mekong and large tributaries in Kratie and Stung Treng provinces. At the start of the flood these adult fish spawn, so millions of fish eggs and fry are carried downstream by the currents and swept into the floodplain areas that are being inundated, where ideal conditions are created for rapid growth of young fish. Most fish larvae eat zooplankton, and newly flooded land provides the nutrients for rapid growth of the phytoplankton upon which the zooplankton feed. Black fish (such as snakeheads and climbing perch) survive in remnant pools and waterbodies, or aestivate on the floodplain and revive, feed and breed when floodwaters arrive.

Fish numbers and size increase rapidly on flooded areas, but when water levels begin to fall, fish are forced to migrate to deeper water; white fish move back to river channels and the Great Lake, and blackfish to floodplain waterbodies (lateral migration). Many white fishes then migrate down the Tonle Sap to the Mekong River, and then most move upstream and stay in deep pools for the dry season. These "longitudinal migrant" white fishes constitute about 63% of the total catch in the Tonle Sap area (Van Zalinge *et al.* 2000). Apart from the larger species of white fish, some smaller species mature and reproduce within their first year of life. Their abundance in catches is related to the level of the floods; i.e. a bigger flood results in higher catches. Among these "opportunists", the dominant species is the cyprinid, trey riel, *Henicorhynchus siamensis*

(Figure 2), an important food fish which is made into fish paste or prahoc, a famous Cambodian staple food.



Figure 2. *Riel* forms approximately 40% of the Dai catch. This species reproduces within one year of its birth.

Fish are highly vulnerable to capture while migrating. In particular, a variety of large- and middle-scale gears are used to intercept migrating fish, beginning when the floods start receding around October, but in all receding waters fishers can be observed catching the abundant fish which are concentrated in the reduced volume of water.

The impressive operations of the large-scale fisheries in the Great Lake and Tonle Sap comprise great fences, pens and arrow-shaped traps in the Lake, barrages in the Tonle Sap Delta in Kampong Chhnang and the "dais" or bagnets operating in the main channel of the Tonle Sap upstream of the Mekong. These large-scale gears operate within fishing lots, concessions leased from the Cambodian Government (Chevey and Le Poulain 1940, Van Zalinge *et al.* 2000). But the vast majority of the 1.2 million fishers in the Tonle Sap - Great Lake area are engaged in the so-called middle and small or family fisheries (Ahmed *et al.* 1998), using smaller gears such as gill nets and various traps.

Historical Notes

Since the Great Lake in Cambodia was formed some 5,000-6,000 years ago (Carbonnel and Guiscafre 1963, Tsukawaki 1997), it has provided an abundant supply of fish. The rise of the Khmer Angkor Empire was to a large extent based upon the availability of rich fish resources and rice grown on the land from which floodwaters were receding. Fish and fishing feature prominently in historical records, including for example the reliefs on the famous Bayon and Angkor Wat temples, which are strategically located near the

Great Lake in Siem Reap. Rice and fish are still the staple foods for the great majority of Cambodians, and many Cambodians still travel to the Great Lake and Tonle Sap during the wet season to trade rice for fish. Indeed, until recently, Khmer-speaking rice farmers in northeast Thailand also used to make the journey to the Great Lake, but now traders export the fish to Thailand.

The Cambodian richness in fish resources has long been recognised, and attempts to raise a resource rent led to the practice of issuing fishery leases, the creation of fishing lots, and the introduction of the first fishery laws of the country (Petillot 1911). Petillot also reported that in 1910 about 50,000 tonnes of fish products were exported from Cambodia as dried, salted, or live fish, as well as fish oil and paste. In the 1920s and 1930s Chinese traders were exporting some 25,000 tonnes of dried fish each year to Indonesia, roughly corresponding to 75,000 tonnes of fresh fish. Chevey and Le Poulain (1940) estimated total fish production in Cambodia to be 120,000 tonnes per year. Nowadays, large quantities are being exported to Thailand and Vietnam, mostly in fresh or dried or smoked form, or as fish paste or sauce.

Importance of the fishery and the state of exploitation

Although the productivity and richness of the Cambodian fish resources have been recognised for centuries, the fishery until recently has not been well-described nor have accurate statistics been collected. Historical statistics on the fish catch and its value are very poor, and there are few data on variations over time. Because most of the fish are caught by many small-scale fishers spread over large areas, it is difficult to accurately record and quantify catches. Many fish are not traded and many small markets exist, so market monitoring is also difficult. Studying consumption (i.e. fish eaten) provides relatively accurate estimates of yield, as the number of people is known and there is limited variation in their diet. Based mainly on consumption studies, it is estimated that at least 400,000 tonnes of fish are caught in the country (Van Zalinge *et al.* 2000), and a revised estimate suggests 700,000 tonnes is more likely (Sjorslev 2001, Hortle and Bush 2003). Fishing pressure is very high in places and increasing, because the population of Cambodia has increased 3-fold since 1940 and most people (85%) live in rural areas, where millions of people engage in full and part-time fishing. Although overall fish production is probably higher than ever, the catch rates of individual

fishers have decreased. Larger species are declining in catches, which are now becoming dominated by smaller short-lived and rapidly-reproducing species, which tend to be of lower value, so the average value per kg of the catch is declining.

The first-sale value of fish brought into landing sites and destined for markets or export is estimated at more than US\$200 million. This estimate excludes all fish which are not bought or sold for cash, including fish used for subsistence and barter. In a country where the average per capita income is less than US\$1 per day, fish is vital for food security, particularly for poor people. Access to productive fishing grounds is essential for the livelihoods of large segments of Cambodia's rural population. Thus, the freshwater capture fisheries play a very important role in the nation's efforts to reduce poverty (Degen *et al.* 2000).

The Gear Catalogue

Purpose and Objectives

The purpose of the catalogue is to support fisheries management and fisheries research.

The specific objectives for developing the fishing gear catalogue were:

1. to document the state of gear development in Cambodia, a country with exceptionally large and varied artisanal fisheries;
2. to systematically record the existing knowledge of the use of fishing gears in the freshwater capture fisheries in Cambodia;
3. to strengthen the capacity of the Department of Fisheries staff in understanding how fisheries work, as well as in design and implementation of research activities;
4. to facilitate a deeper understanding of the relationships between fish resources, their habitats and the impact of human exploitation, thereby facilitating more effective conservation of the resources.

In terms of management, at the time of preparation the Cambodian Fiat Law on Fisheries Management and Administration 1987 divided the country's fishing gear into three categories, namely small-, middle- and large-scale, based on the size of the gear and the potential revenues that a gear may yield. The law only permits 52 types of gear to be used in the freshwater fisheries and any other gears not

mentioned in the law are illegal. Consequently, many fishers are operating illegally. This catalogue thereby serves as an essential aid for managing inland fisheries, because it defines and describes gears accurately so that their use can be regulated to conserve the fishery, for example by prohibiting specific kinds of gear, or by allowing usage of specified types of gears in certain areas or at certain times.

As a result of the current poor coverage of gear types in the fisheries law, fisheries research that only covers legal gears will underestimate the size and value of the fishery, as surveyors will naturally experience difficulty obtaining information on catches by illegal gears. This catalogue supports any activity which aims to assess or monitor fisheries as it provides accurate specifications of gear size and characteristics, and allows (for example) calculation of catch per unit effort (CPUE), and it also provides a basis for standard measurement and specification of the gears encountered in any field research.

Apart from the usefulness of this manual for management and study of fisheries, the gears which are depicted reflect the fascinating living culture of the Cambodian people, whose lives have for centuries been based on harvesting the Mekong's riches. So it is expected that this fishing gear catalogue will be useful not only as a source of reference for fisheries managers and administrators, but also for environmental planners, biologists, historians, teachers and extension workers involved in natural resources research and management in the Mekong region and elsewhere.

Methodology and research process

The catalogue was compiled as part of the Capture Fisheries Component of the Mekong River Commission's Fisheries Programme, which is funded by Danida. National fisheries officers acted as supervisors and provincial fisheries officers acted as data collectors. They were trained in the basic concepts of fishing gears, specific terminology, technical drawing and reporting. A standard data collection form was developed. The questions aimed at encouraging creativity and motivation of the data collectors allowing them to develop ownership with the research topic. Information gathered referred mainly to a description of the gear, its size, materials of construction, costs, operation of the gear regarding crew, fishing grounds and seasonality, gender aspects

and complementary equipment. Photos were taken and additional technical drawings and operational sketches were made.

Each researcher was provided with a research kit comprising a small suitcase containing stationery, pens of different colours, millimetre paper, rulers, large and small measuring tapes, a calliper and a 35 mm camera. Data collection was undertaken in the most important freshwater fisheries provinces, namely Siem Reap, Battambang, Pursat, Kampong Thom, Kampong Chhnang, Kandal, Phnom Penh, Takeo, Prey Veng, Kampong Cham, Kratie and Stung Treng.

The data sheets were compiled in the project and monitored. The researcher's task was to document any gear encountered as accurately as possible, including precise measurements. Since gears are constructed or assembled by craftsmen, each gear is unique, so the measurements shown refer to only one example of the particular gear, with measurements varying slightly from fisher to fisher, constructor to constructor, year to year, and place to place.

The preparation of the catalogue was a learning process both for the compilers, as well as for their collaborators in the field. The catalogue no doubt contains mistakes and omissions, and it is hoped that future editions will contain more gears and perhaps improved classification, reflecting the experience gained in the compilation of gears presented in this volume, and the contributions from further research.

The concept

Fishers use a wide range of gears in many different ways, with the type of gear and the method of use depending upon many factors, including target species, habitat, time and hydrological conditions. For example, the simplest method to catch fish is by using only bare hands, and the most complex methods are large fishing operations with many different gears used in a coordinated manner.

Fishing gears are the link between the fishers and the fish. Their selection and the way they are used shows many aspects of the behaviour of the target species, the habitats they occupy, and their seasonal and geographical movements, because gear selection and use are based on fishers' knowledge, accumulated over many generations. The gears themselves also exemplify local technologies and show the decision-making processes of the fishers, which affect the design or management to cater for both the needs of the fishers and sustainable exploitation of the fisheries resources (Figure 3).

Customs and ceremonies for fish-related spirits are an integral part of local management practices. The use of a specific fishing gear is a fisher's choice that also reflects beliefs and taboos. In line with Buddhist precepts fishing is not allowed close to pagodas. Also special spirit places are off-limits for certain fishing activities. The belief in the existence of special spirits (*neak tha*) is of critical importance when it comes to measures for resource conservation. However, this

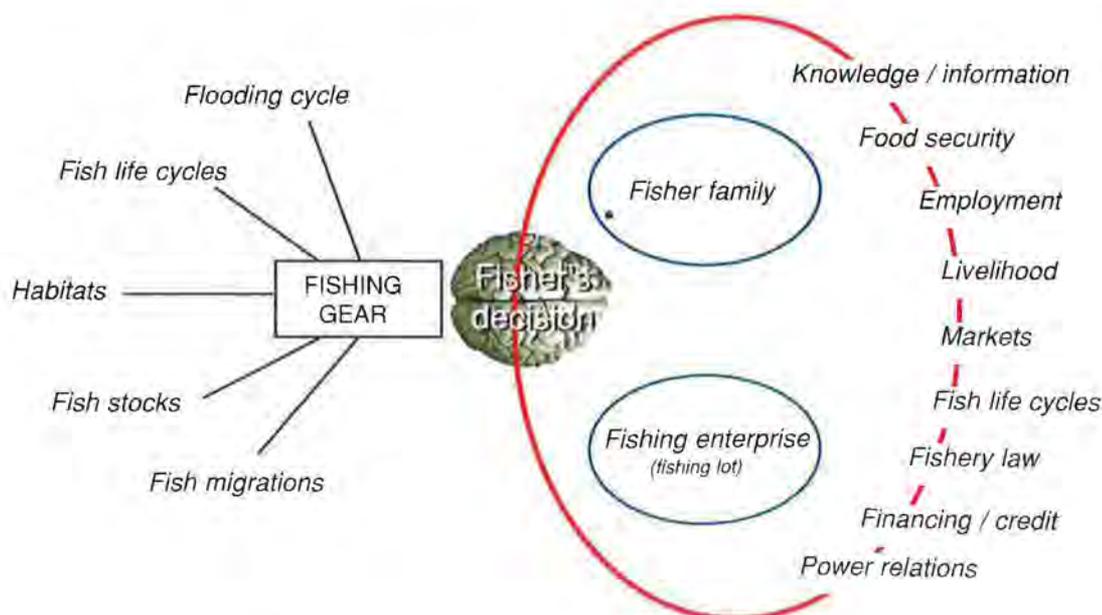


Figure 3. Fishing gear as a function of a fisher's decision

important aspect of fisheries management practices is beyond the scope of this book.

Classification of Gears

The classification of fishing gears follows largely the one established by Von Brandt (1959, 1972 and 1984). The main criterion for classification is the principle of capture, not the importance of the gear or its distribution in the country. For the establishment of subgroups, different criteria were used, following where possible locally-established categories, such as *lop*, *tru* or *saiyoeun* in the case of basket traps, which differ in orientation and shape, and in particular in the shape of the entry cone.

The 16 major groups of gears are as follows.

1. Capture by hand
2. Scoop devices
3. Wounding gear
4. Hook & Line
5. Traps
6. Gillnets / Entangle nets
7. Surrounding / Seine nets
8. Dragged gears
9. Pushed nets
10. Lift nets / Dip nets
11. Covering devices
12. Bagnets
13. Anaesthetic methods
14. Fishing by pumping
15. Attracting devices
16. Fish scaring methods

These primary groups of fishing gear are divided into 44 sub-categories which are further divided into 94 sub-sub-categories. In total more than 150 gears and variations have been identified. In addition there are some 50 synonyms mentioned in the catalogue.

The categorization of some gears is quite debatable. The compilers encourage such debate, and hope that coverage and accuracy of future revisions of the gear catalogue will lead to improved and more comprehensive classifications.

Presentation of gears in this catalogue

The presentation of the main fishing gears is structured as follows.

Name(s)

The names of the gears are given in the Khmer and English languages. Around 200 names of fishing gears have been recorded from the 12 provinces. As expected, sometimes the same gear was recorded under different names in different places or different gears had the same name in different provinces. Even in the same place one gear could have different names, depending if somebody referred to the target fish caught by the gear, or to the shape of its entrance cone, or the specific place or setting of the operation.

The Khmer gear names have been translated into English making use of international conventions of gear denominations and the Cambodian Fisheries Law (see Von Brandt 1959, 1972 and 1984, Nédélec and Prado 1990, Prado 1990, Department of Fisheries of Cambodia 1990, Claridge *et al.* 1997). In a number of cases, especially with the traps, Khmer names are used for specific forms or shapes (e.g. trap entry cones), for which no name in English could be found.

Description of gears and operations

The technical descriptions provided for each gear summarize the information gathered in all target provinces, considering similarities as well as regional differences and, sometimes, personal preferences of gear builders. The measurements recorded are taken from the particular gears observed in the field.

Drawings

Each technical drawing is one example of a specific gear encountered in the field. Usually, the most complete and exact drawing delivered from the data collectors was selected as an example and redrawn for publication. The drawings of bigger gears and more complex commercial fishing operations show less technical details and occasionally lean on documentation provided in Chevy and Le Poulain (1940) and Fily and D'Aubenton (1965). Drawings of operations were based on field sketches made by the data collectors.

Photos

The photos were mainly taken by the data collectors listed as collaborators and the compilers. Additional photos come from the photographic archive of the Mekong River Commission, and some digital stills are from the video documentary "Me-un teuk, me-un trey" (Where there is water there is fish) (produced by the Mekong River Commission in collaboration with the Department of Fisheries of Cambodia). However, some illegal gears could not be photographed.

Cost

The costs of the gears are reported in the Cambodian currency Riel. The estimates refer to the time period between 1998 and 2000. The average exchange rate at the time was about Riel 3,800 to US\$1.00. Often fishing gears are not purchased in the market, but fabricated by the individual fisher. In these cases the time used for collecting the raw materials from nature and treating them, and for constructing the gear, was assessed and calculated at the minimum labour cost (between Riel 2,500 and Riel 4,000 per day) in the place of construction.

Gender aspects

The compilation of information on fishing gears offers a good platform for studying the specific participation of women and men in the fishery sector. A variety of gears are used predominantly by women and/or by younger peer groups.

Chart of seasonal usage in major fishing zones

The "Time and Place of Usage" chart show the geographical and seasonal use of each gear. The wave in the graph represents the average annual flooding cycle with lowest water levels in April-May and highest in September-October. The four regions in the chart are:

1. "The Great Lake, its tributaries and surrounding floodplains" - the most important fishing area for the large fishing operations in the country covering the provinces of Battambang, Pursat, Siem Reap and Kampong Thom;
2. "The Tonle Sap and surrounding floodplains" - one of the biggest and most critical migration routes for white fish species, covering mainly Kampong Chhnang province, the part of Kandal on the Tonle Sap, and Phnom Penh;
3. "Mekong/Bassac floodplains" - the provinces of Takeo, Kandal, Prey Veng and Kampong Cham, where the floods recede later than in the floodplains north of Phnom Penh (i.e. the Tonle Sap basin).
4. "Upper Mekong & tributaries" - a more upland river situation, containing important breeding grounds for many white fish species and where only small floodplains exist in the provinces of Kratie and Stung Treng.

Target / main species caught

Many gears target particular species of fish. This is often reflected in the name of the gear. But most gears aim at catching a broader selection, such as pelagic (migratory) or demersal species. A few gears, such as

fence systems or trawls are relatively unselective. Usually only up to 10 of the most commonly caught species are listed, although many more may be caught by the gear.

The Khmer fish names given in Rainboth (1996) are used as the standard for spelling.

Legal aspects

The mention of particular fishing gears in the fisheries law is noted in this section. However, most of the freshwater fishing gears in Cambodia are not mentioned in the fisheries law. At the time of publication, the fisheries law was being revised.

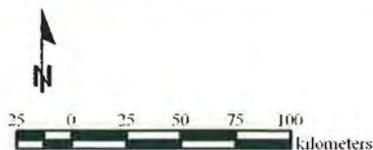
Maps of Cambodia

Major rivers and towns in Cambodia



Legend

- Provincial Center
- Capital City
- Country Boundary
- River
- Water Body
- Flooded Area



Disclaimer:

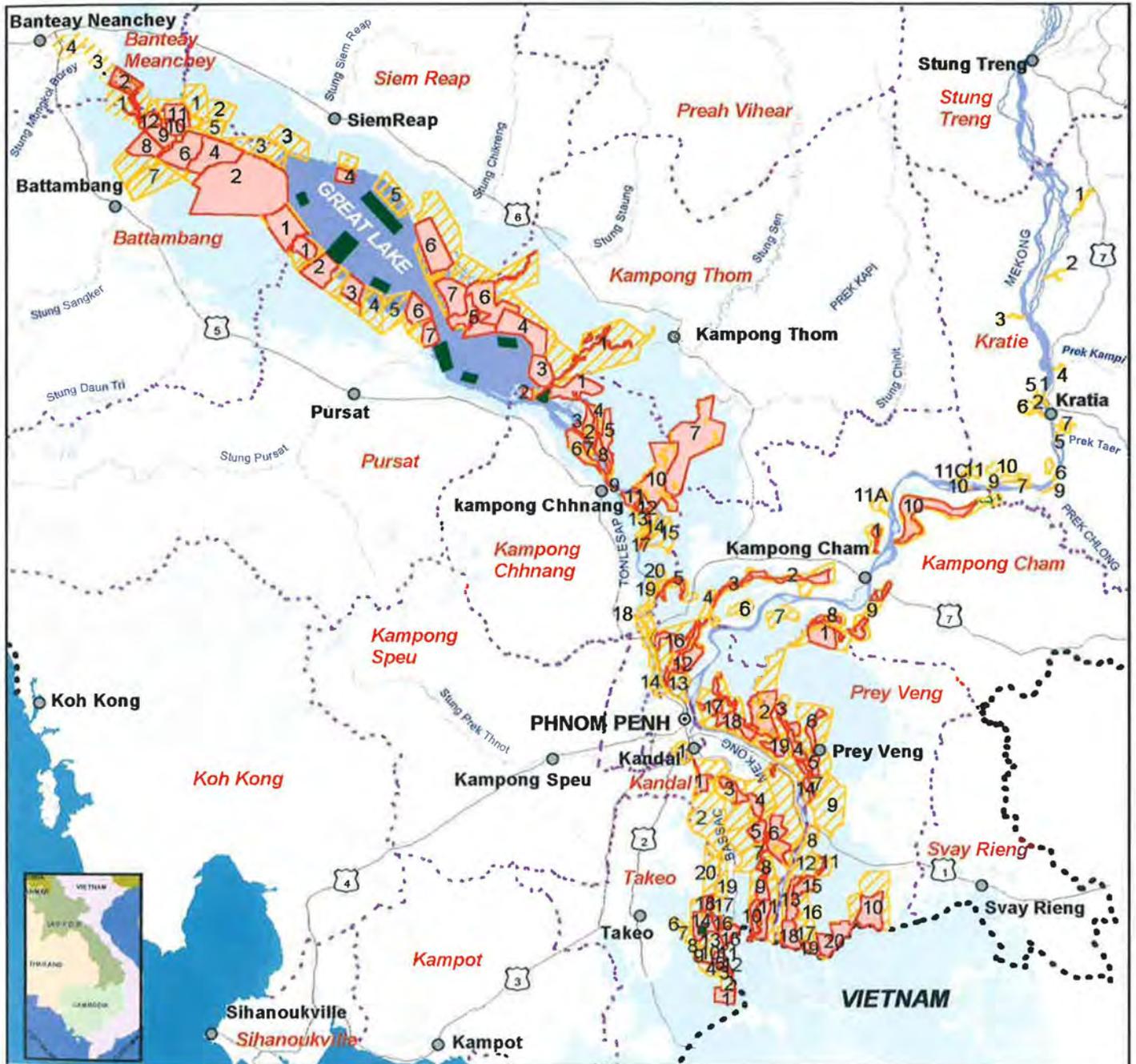
While every care is taken to ensure the accuracy of the data used on this map, the Mekong River Commission and the Governments of the Kingdom of Cambodia, the Lao People's Democratic Republic, the Kingdom of Thailand and the Socialist Republic of Viet Nam make no representations or warranties about this accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including direct or consequential damage) and costs which may be incurred as a result of the data being inaccurate or incomplete in any way and for any reason.

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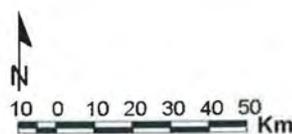


Source : Topographic map mainly at scale 1:50,000

Fishing Lots of Cambodia



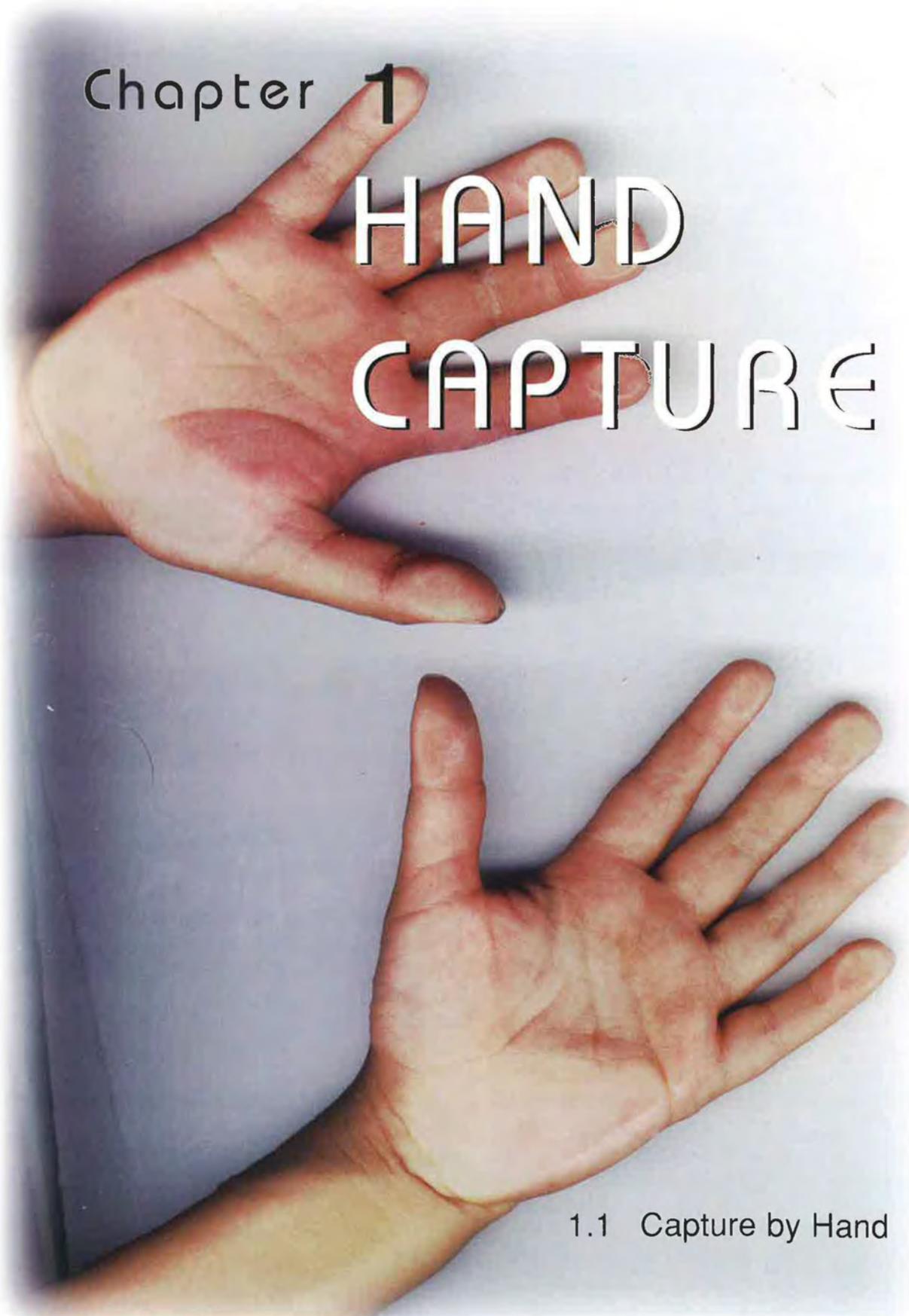
- Legend**
- Existing fishing lot areas
 - Released fishing lot area
 - Fish sanctuary
 - International boundary
 - Provincial boundary
 - Major river
 - Inundated area
 - Capital city
 - City



Prepared by Department of Fisheries,
Fishery Domain and Extension Office

Chapter 1

HAND CAPTURE



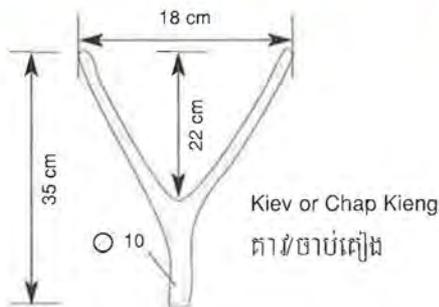
1.1 Capture by Hand

Capture by Hand

Chap Doy Dai



Hand collection of frogs



Collecting by hand

Direct capture by hand of fish and other aquatic animals is largely carried out by children in peer groups or sometimes as a family activity.

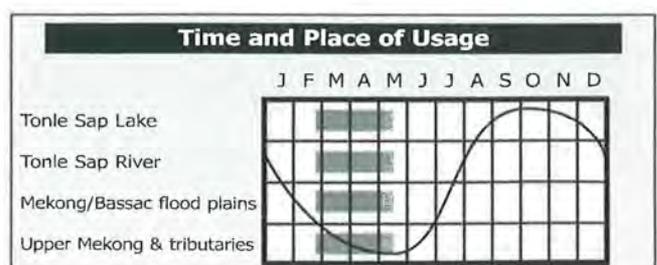
In the dry season children take spades to rice paddies to open cracks in the dried out soil to look for frogs that are then picked up by hand. In the wet season, when the paddies are being ploughed, children walk behind the oxen to collect any fish, frog or crab that is affected by the stirred up mud in the water and becomes visible at the surface. They also walk through the water of ditches, canals and small streams looking for banks where tall grasses or other vegetation overhang the water and provides shade especially during the hottest part of the day. Here they press the grasses or vegetation down hoping to trap and capture fish, which are mostly small snakehead / trey phtuok / trey raws (*Channa striata* spp.).

Family groups visit drying up ponds or small lakes, where no water remains, but the mud is still liquid. Here they wade through the mud feeling with their toes for fish and when they find them, they grab them by hand.

Mostly trey antong (*Monopterus albus*); trey chhlonh chhnoht (*Macrognathus siamensis*) and snakehead fish / trey phtuok / trey raws (*Channa striata* spp.) are collected.

In the method called *kiev* or *chap kieng*, a forked piece of wood is used to probe the banks of small rivers and streams for fish in the dry season (February to April). If a fish is disturbed and tries to escape, it is grabbed using both hands. This method was only reported from Pursat, but was probably more wide-spread in the past.

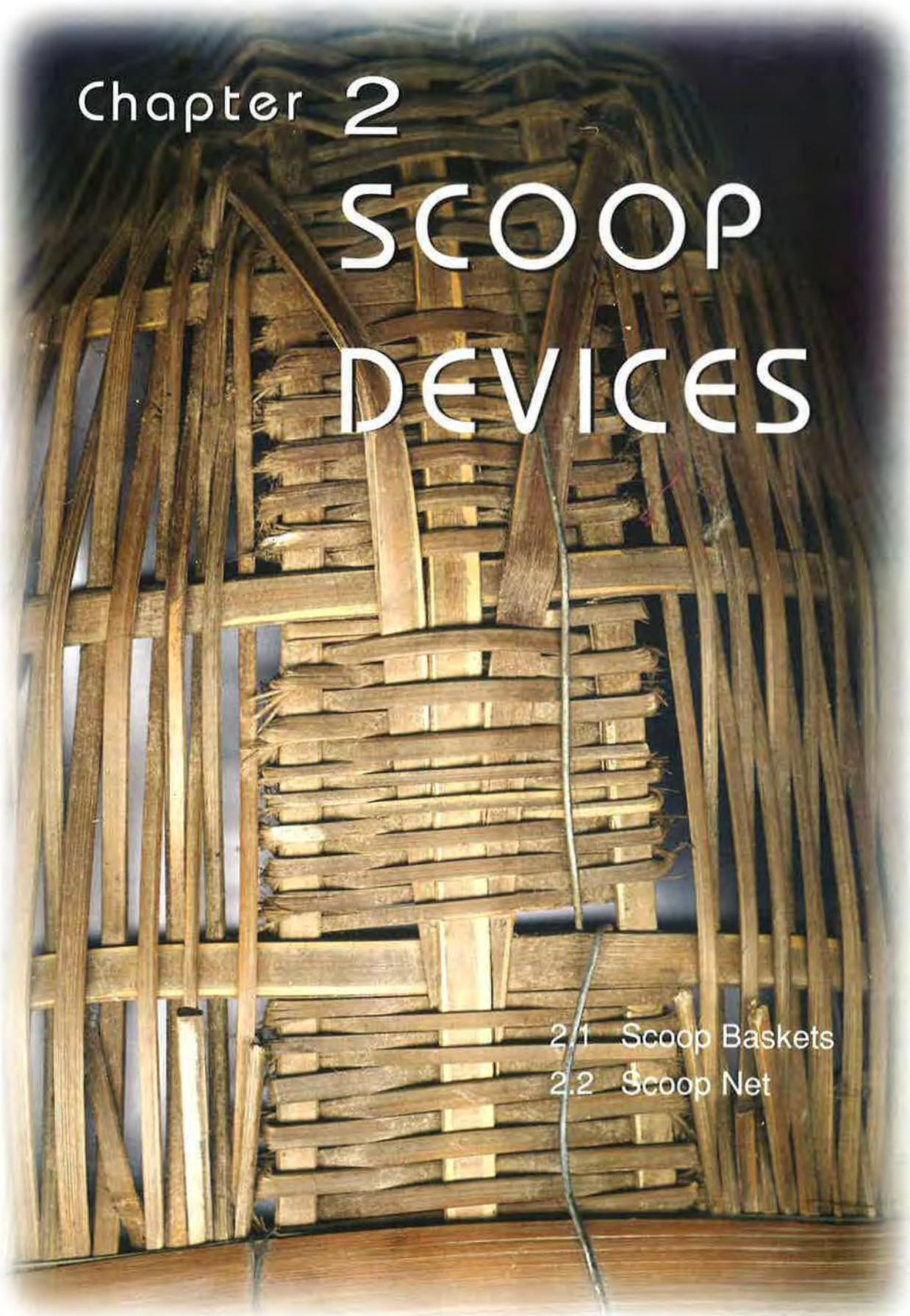
Fish capture by diving and direct capture by hand has been witnessed in a Takeo river. Here the target fish was trey kantrawb (*Pristolepis fasciata*).



Chapter 2

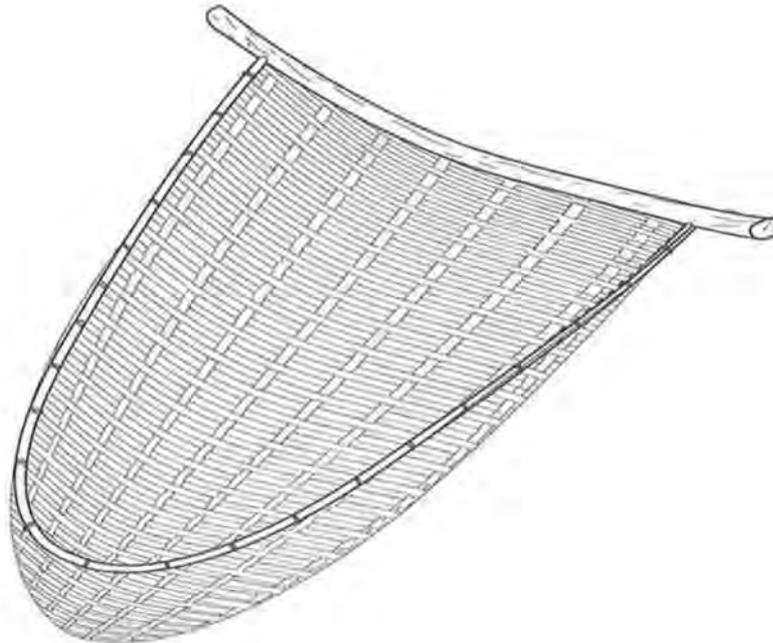
SCOOP DEVICES

- 2.1 Scoop Baskets
- 2.2 Scoop Net



Wedge-shaped Scoop Basket

Chhnieng Chunhchoat or Chhnieng Dai

**Description**

The *chhnieng chunhchoat* is a shovel-shaped basket made of rattan or bamboo wickerwork. It is between 50 and 70 cm long and between 50 and 60 cm wide. On one end it has a 25 to 30 cm deep 'capture pocket' and on the other the wickerwork is fixed to a wooden stick with handles of 5 to 10 cm at both ends.

Cost

R. 4.000 to 6.000

Operation

The *chhnieng chunhchoat* is one of the most elementary and common fishing gears in the country. It is used at any time of the year in suitable fishing grounds, such as rice fields, swamps, lakes and ponds in shallow water areas, or even in the mud or under floating water hyacinth. It is mainly used at the end of the dry season, for sifting through the drying out water bodies.

The fisher sieves through the water with quick semi-circle movements in the same direction, creating a sort of current hauling the fish into the basket. Between the movements a quick glance checks if something is caught. When used in muddy water, the fisher sets the scoop basket out as far as possible and

hauls it towards his / her body, sieving the mud. It is also pushed under water hyacinth and among other water plants where aquatic animals may be hiding.

Gender aspects

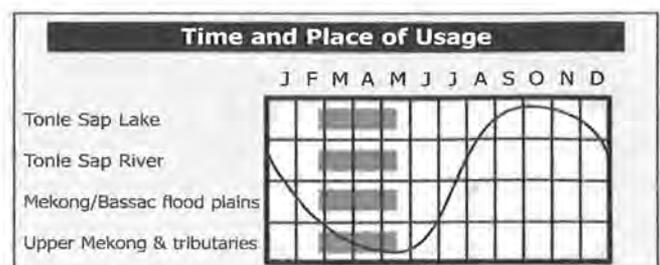
The *chhnieng chunhchoat* is commonly used by women and children.

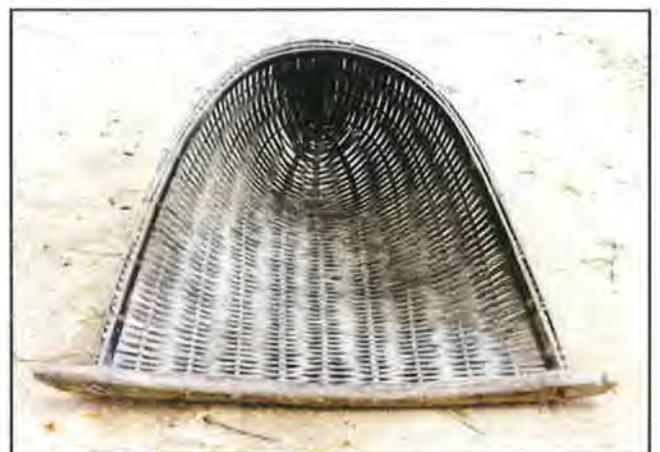
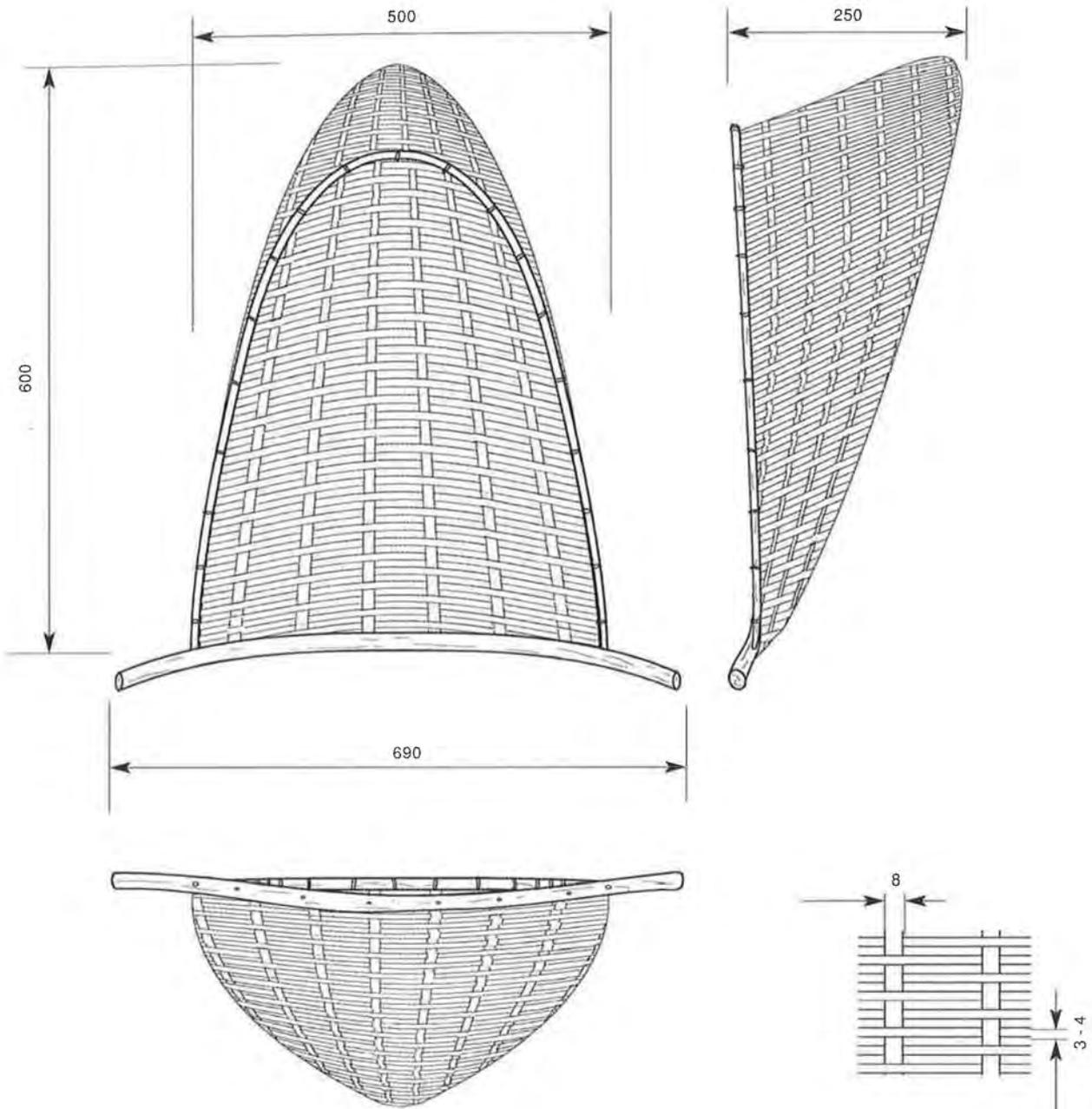
Target species

Small shrimps, crabs and small gourami fish such as *trey kawmphleanh* (*Trichogaster* spp.), *trey kroeum kdah* (*Trichopsis vittata*), *trey kroeum tunsai* (*Trichopsis pumila*), *trey kranh srai* (*Anabas testudineus*).

Legal aspects

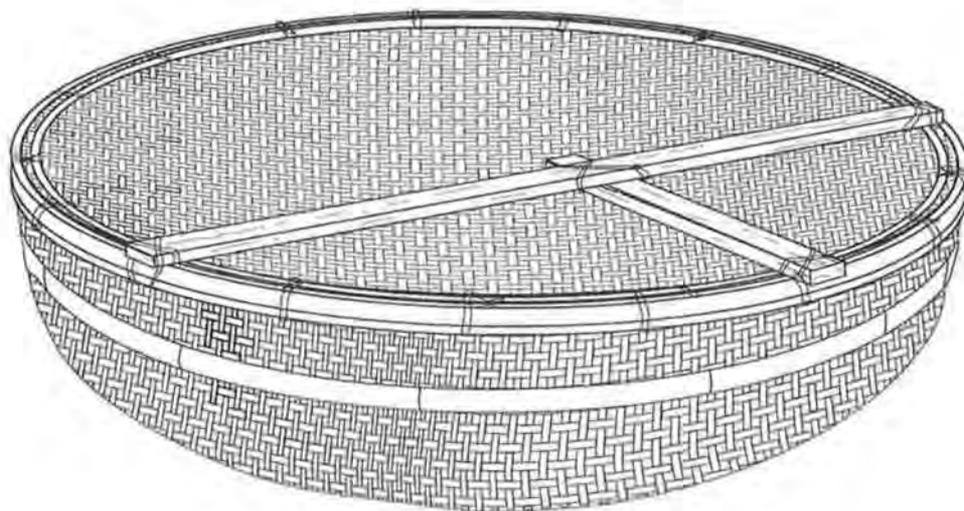
Small scale fishing gear (No. 028 KOR SOR KOR).





Big Round Scoop Basket

Konchhraeng Luong Trey or Anchutt



Description

The *konchhraeng luong Trey* is an open-weave round basket made out of bamboo strips or rattan measuring 1.2 to 1.5 m in diameter and up to 40 cm in depth. At one third of the width there is a wooden cross-bar that serves as a handle.

Cost

R. 5.000 to 30.000

Operation

This type of basket is used to catch minnows and carp-like fish, which are found in great numbers around floating houses in villages or close to larger fishing operations of the Great Lake and on the Tonle Sap river in calm water conditions. Generally, the basket is operated from a sampan and held in both hands a few centimeters below the water surface. Tapping with the hand in the water attracts the fish and / or with a few drops of fish oil, any kind of animal fat or fish oil mixed with eel blood poured above the submerged basket. As soon as there are a certain number of fishes congregated above the basket, it is pulled up and emptied into the sampan. The operation is quick and fishing may

continue for several hours.

Gender aspects

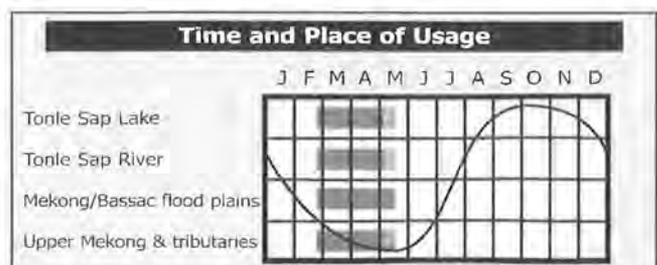
This gear is commonly used by women belonging to the ethnic Vietnamese minority in Cambodia. One or two persons operate this gear from a small boat, kept in a stable position by using an anchor.

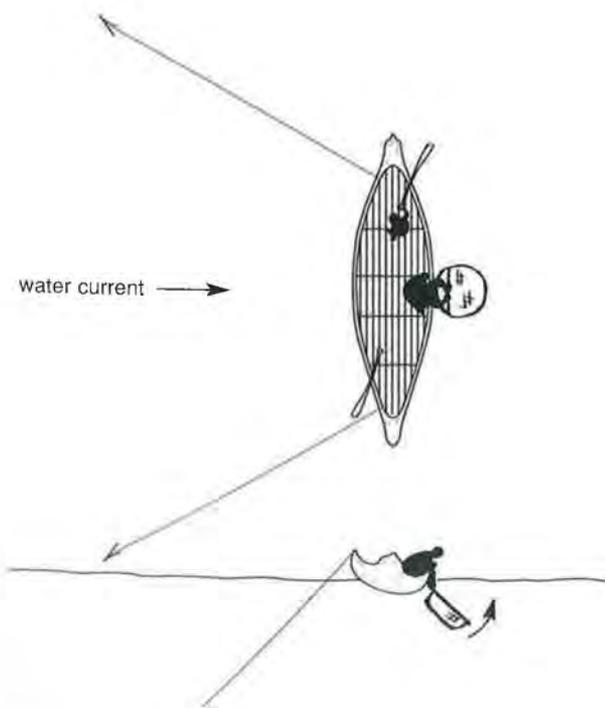
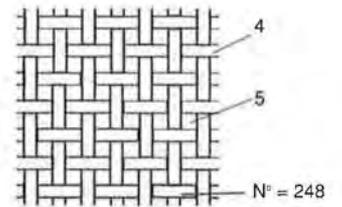
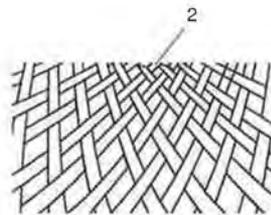
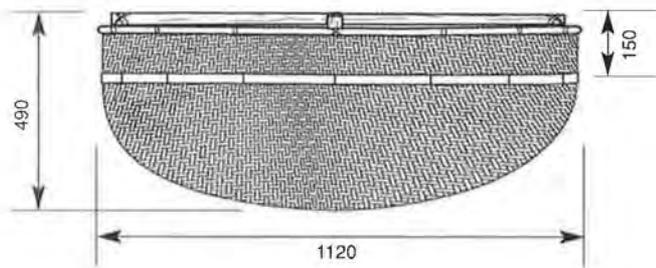
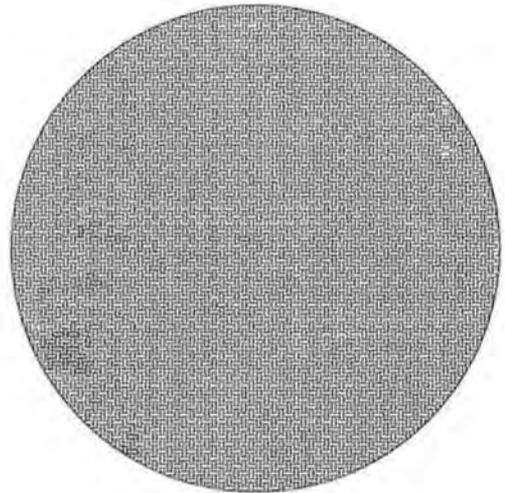
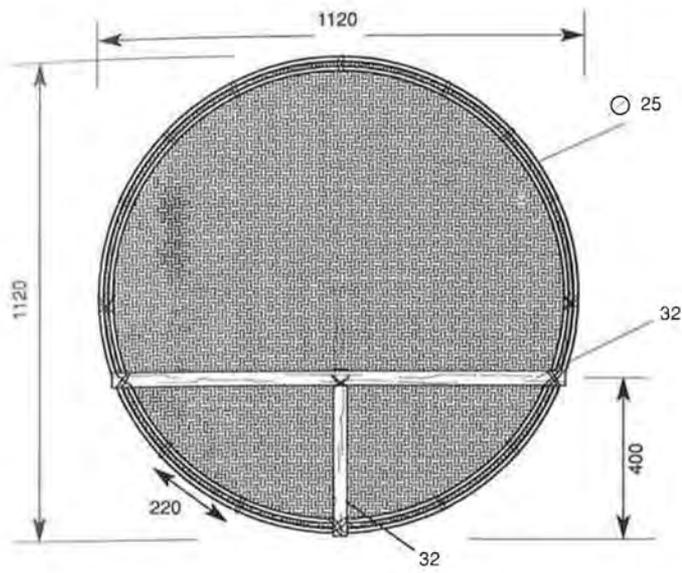
Target species

Fish catch species are *trey changva* (*Opsarius* spp.) and *trey sloek russey* (*Paralaubuca* spp. and *Oxygaster* spp.).

Legal aspects

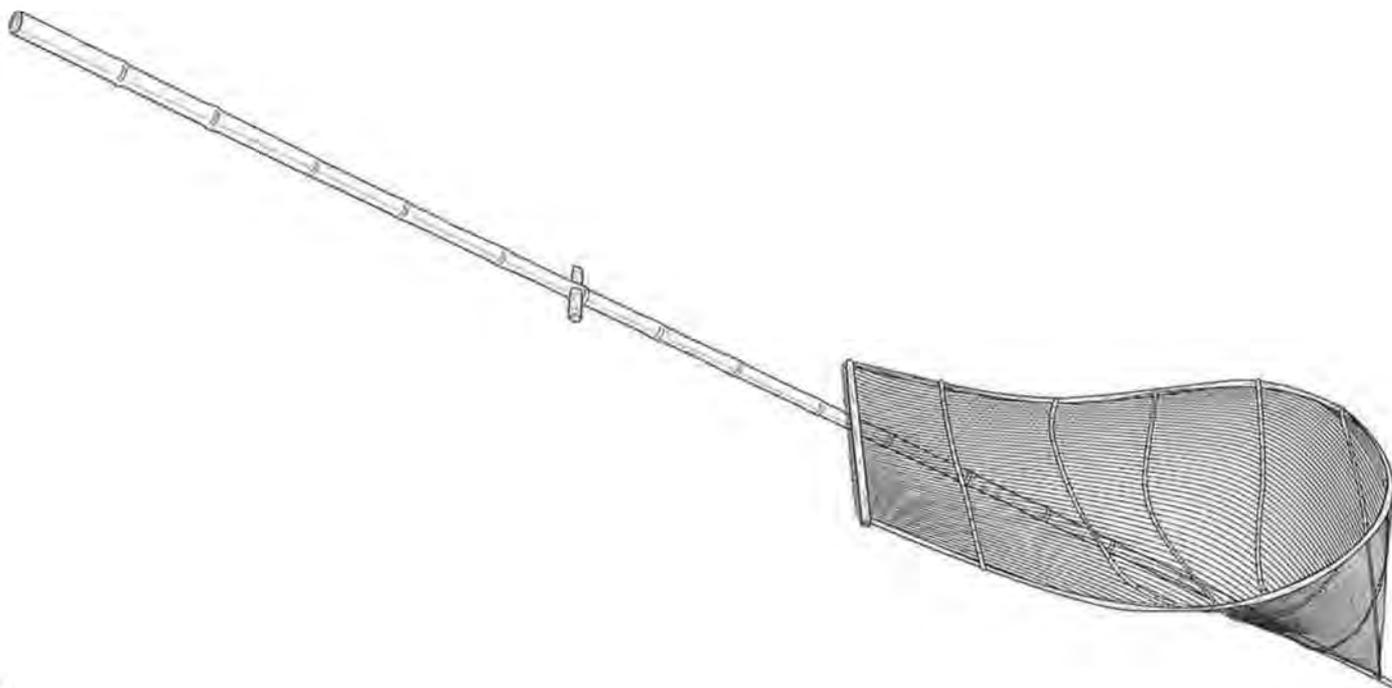
Small scale fishing gear (No. 028 KOR SOR KOR).





Long Handle Scoop Basket

Chhnieng Kong Trey Pthoung
or Chhnieng Chak Bondawy



Description

The *chhnieng kong Trey pthoung* looks like a big basket spoon with a long handle. As observed in Takeo province, the 6 m long bamboo pole carries on its thinner end a 2.30 m long, 1.42 m wide and 1.46 m high scoop basket made of finely worked bamboo sticks.

Cost

R. 30.000 to 40.000

Operation

The *chhnieng kong Trey pthoung* is used exclusively to scoop pelagic needlefish. This gear is used only for a short period of time during the cold season (November / December) when water becomes relatively clear in the rivers.

Once a suitable fishing spot is selected a basic operating platform is installed. In order to slow down the current and bar any drifting rubbish and water hyacinth, the fisher anchors a big tree branch in the river several meters upstream. The scoop device is positioned perpendicular to the current and the end of the bamboo handle is firmly stabilized on sort of a tripod on the operating platform. While the needlefish moves up-stream, the scoop basket is moved along

with the current (*bondawy*) just below the water surface, scooping up the surface bound fish.

Gender aspects

Both men and women are involved in the construction and operation of this gear.

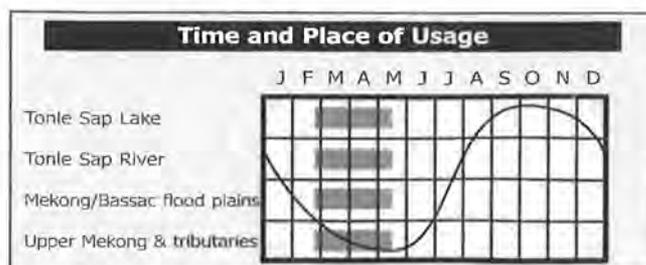
Target species

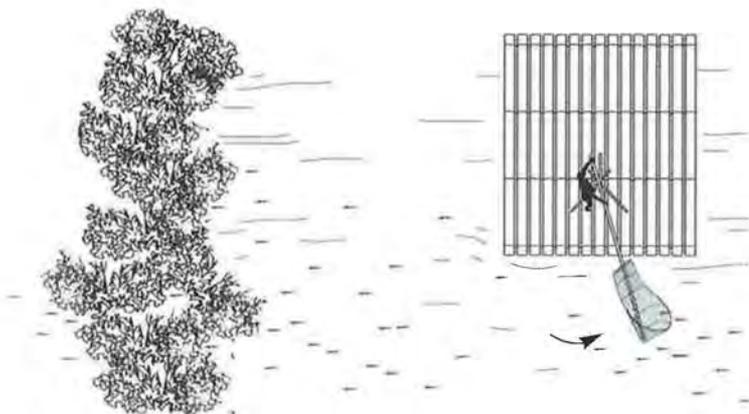
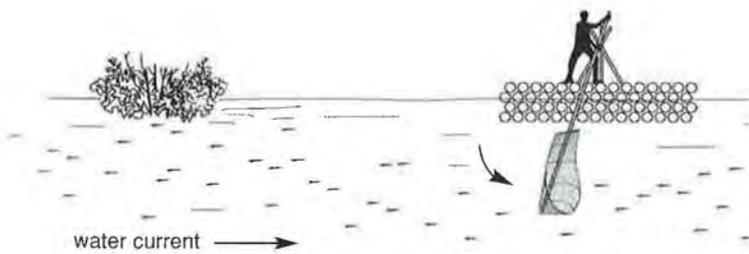
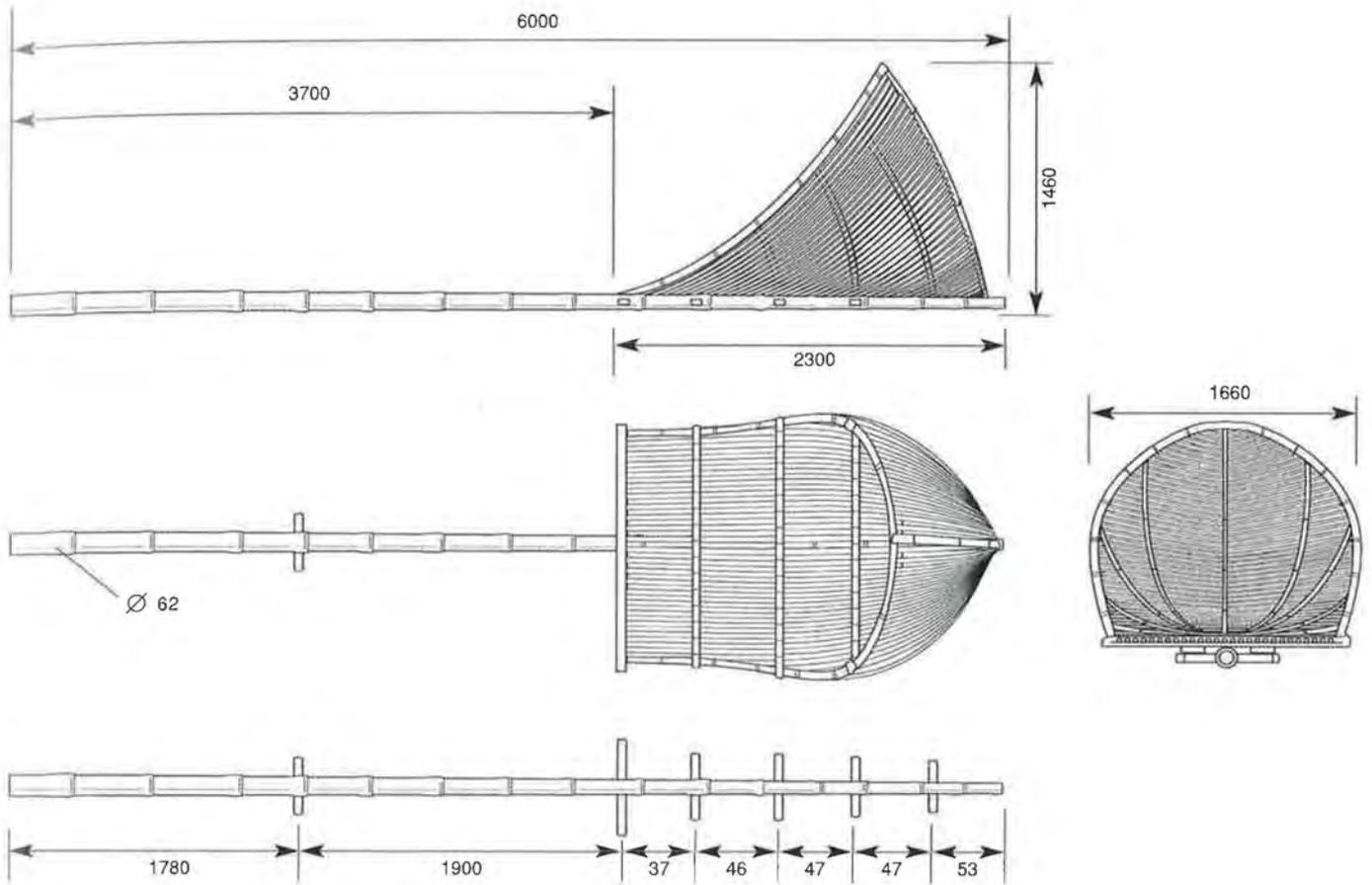
Needlefish (*trey pthoung*, *Xenentodon* spp., *Dermogenys pusilla*, *Hyporhamphus limbatus*).



Legal aspects

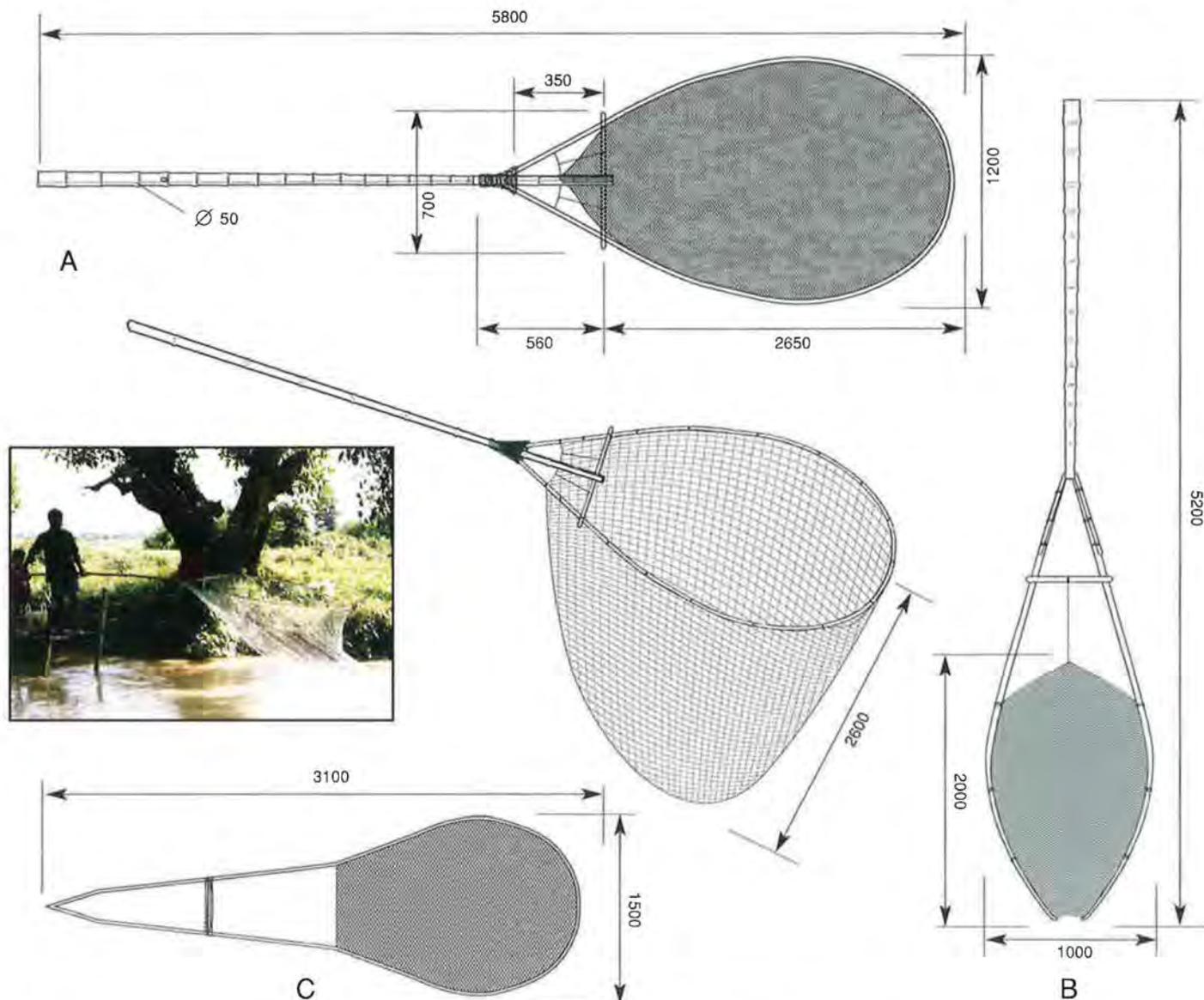
Not mentioned in the law..





Long Handle Circular Scoop Bag

Thnong Moul or Brom



Description

A round or oval bamboo frame suspending the bag net characterizes the *thnong moul* or *brom*. The size and shapes of the frames vary considerably, with a total length (wooden handle and net frame) of between 3.1 m and 5.8 m. The mesh size is between mosquito netting and up to 15 mm. A is the most common type, B and C are variations; C is found in Pursat.

Cost

R. 15.000 to 50.000

Operation

The *thnong moul* is used from the banks of rivers during the times of rising floods to catch up-stream migrating fish. Occasionally, small wooden piers are installed at the riverbank facilitating the operation of the scoop net.

Gender aspects

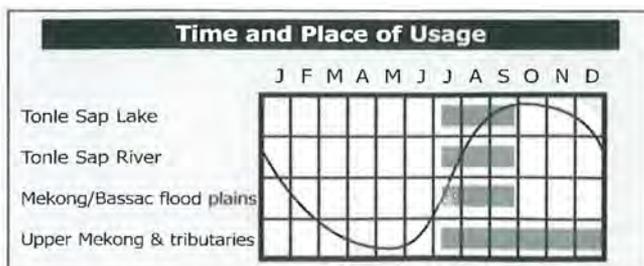
Occasionally women operate this gear; more frequently they assist in piloting the boat.

Target species

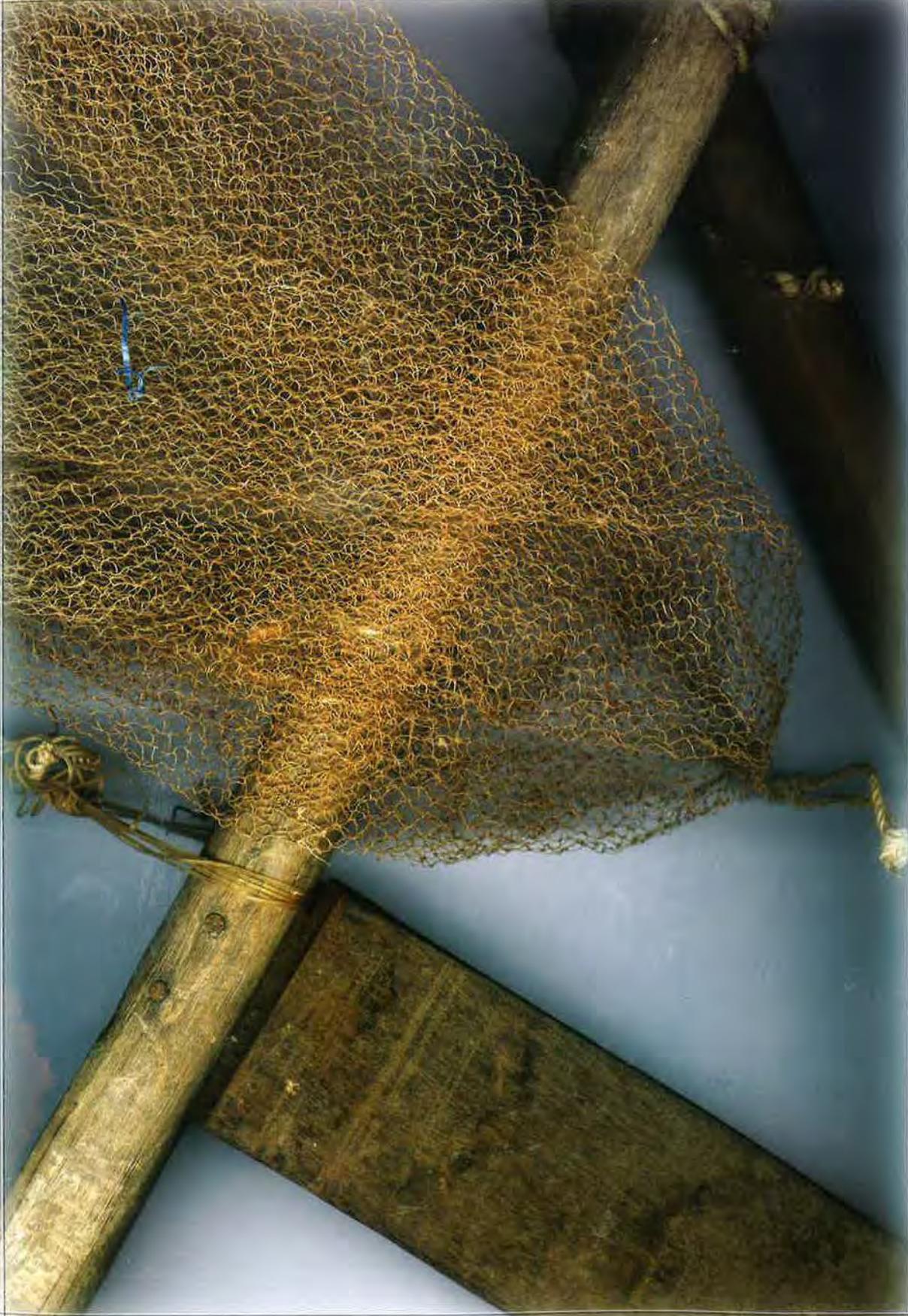
Trey riel (*Henicorhynchus* spp.) and trey slak russey (*Paralaubuca* spp.).

Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR).



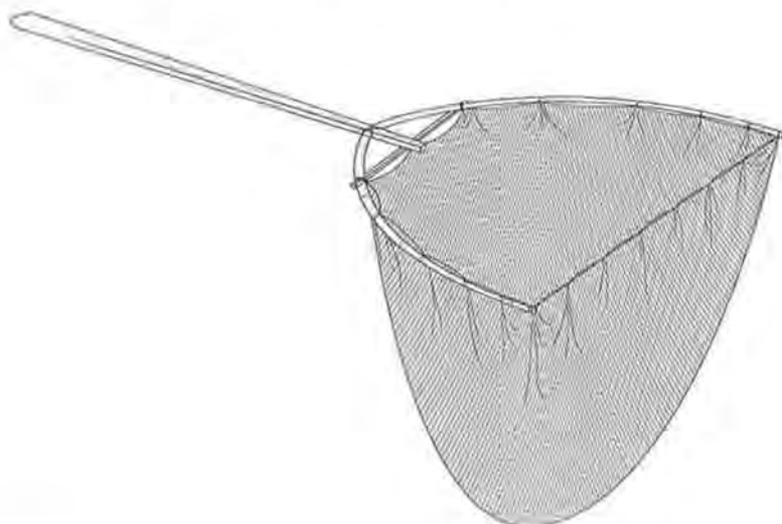
C L O S E - U P



Handle of a scoop net

Long Handle Triangle Scoop Net

Thnong Chhrung



Description

There is a broad variety of hand-operated scoop nets differing in size, materials used and shapes. They are characterised by a wooden handle linked to a half-circle or fork-shaped bamboo frame that supports a bag net. The length of the forks varies from 1.5 to more than 3 m; the length of the wooden handle is adjusted accordingly. The mesh size and bag depth depend on the target species and the ecological conditions in which it is operated.

Cost

R. 5.000 to 30.000

Operation

Scoop nets are commonly operated from a boat or from fixed platforms next to a water body. They may be used as autonomous fishing gears, particularly when large quantities of small fish or shrimp can be scooped out. This may be the case during peak migration times in floodplain rivers in January, when scoop nets can be held into the current capturing carp-like fish migrating downstream. Some smaller types of scoop nets are used when wading through shallow water or mud or walking on land and through rice fields in the case of frogs scoop nets. Frequently, the scoop nets are used in conjunction with complementary fish attracting or luring devices, such as brushwood, light (at night), shade (during the day) or bait. Very often, however, the smallest types of hand-operated scoop nets are only complementary implements with which to scoop the catch out of larger fishing gear such as stationary fishing gear, barrage bag nets and big traps. See also 2.2.2.

In Kratie, bigger groups of fishers were observed operating this gear at the outlet of a small river into the Mekong during the full moon period (see photo). The

catch consisted mostly of smaller species, but also juveniles of some bigger species.

Gender aspects

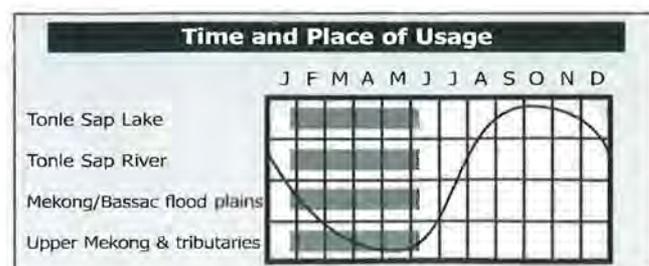
Women and children are commonly involved in fishing operations using scoop nets.

Target species

Many different fish species are targeted, mainly juveniles seeking protection and gathering in and around FADs. In the fishing operation in Kratie 28 fish species were recorded, the top ten being: trey riel (*Henicorhynchus* spp.), trey chunchhuk dai (*Gyrino-cheilus aymonieri*), trey bandaul amprov (*Clupeich-thys goniognathus*), trey kanh chrouk (*Botia* spp.), trey slak russey (*Paralabuca typus*), trey kraport / sandai (*Wallago* spp.), trey khaman (*Hampala dispar*), trey chrakeng (*Puntioplites proctozyron*), trey chhpin (*Barbonymus gonionotus*), and trey kralang (*Cirrhinus micropeltes*). Some fingerlings of bigger species were trey krom (*Osteochilus melanopleurus*), and trey chhok (*Chlocheilichthys enoplos*). Even some juvenile eels (*Anguilla marmorata*) were among the catch.

Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR).



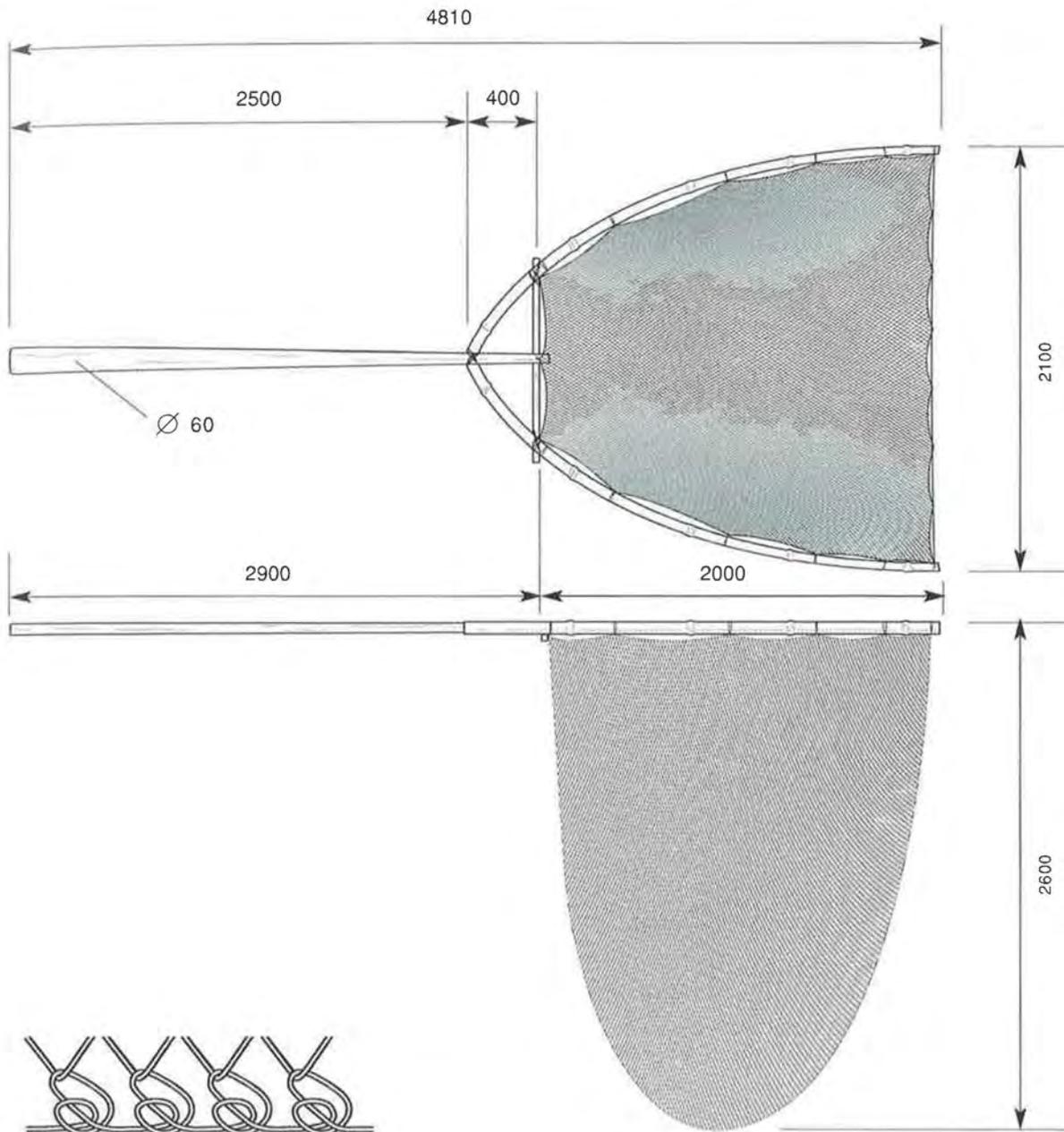
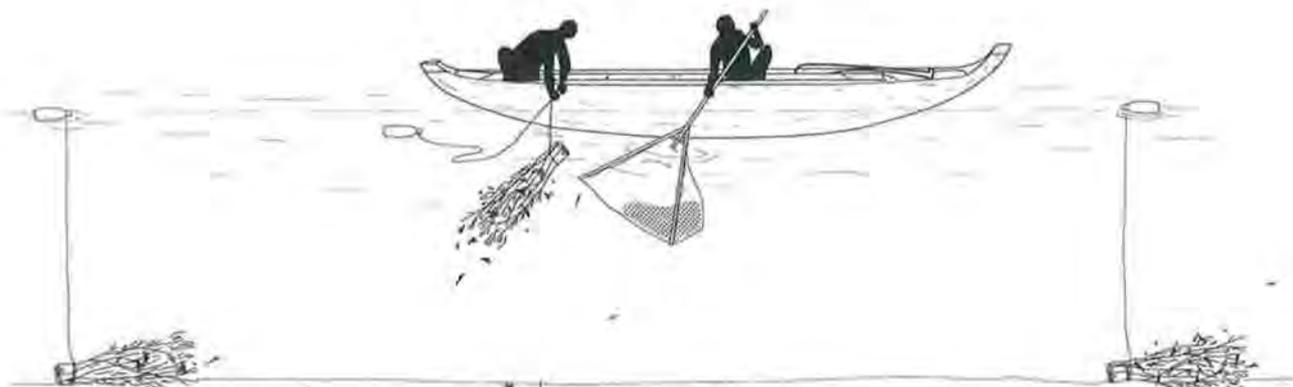


Figure representing the way the net is attached to the handle



Long Handle Shrimp Scoop Net

Thnorng Kampeh



Description

The *thnorng kampeh* is a big hand-held scoop net for shrimp. It is made out of two bamboo forks (between 1.2 and 2.1 m long) carrying the triangle opening of a bag net suspended between them and a wooden handle (srorlav wood) of 1.5 m length. The bag net is composed of three pieces of triangle-shaped netting (mesh size of 8 or 10 mm) forming a bag net. The edge of the netting is rigged to a nylon rope, which is fixed to the forks. The net rope is tightened between the fork points, which are 1.2 to 1.5 m apart. The end of the wooden handle is frequently carved into a paddle, which allows an individual fisher to operate the scoop net without the help of a boat pilot. Floats used to be made of the light wood of the *snou* tree (*Sesbania javanica*), but nowadays empty canisters or plastic bottles are used.

Cost

R. 5.000 to 15.000

Operation

The *thnorng kampeh* can be used as an independent fishing gear operated from a boat. The fisher quietly approaches floating or inundated vegetation, or a location next to brush parks or floating houses, all of which serve as fish attracting devices (FADs), and scoop along them capturing fish or shrimps. This

scoop net is also used as an essential instrument in the shrimp fishery with brush bundles (see *kansom kampeh*) widely used in the Great Lake Tonle Sap. When the brush bundles are gently lifted, the scoop net is pushed below the brush, catching the escaping shrimp and fish. If necessary the fisher shakes the brush bundle to retrieve all hiding fish. The catch is emptied into the boat.

Gender aspects

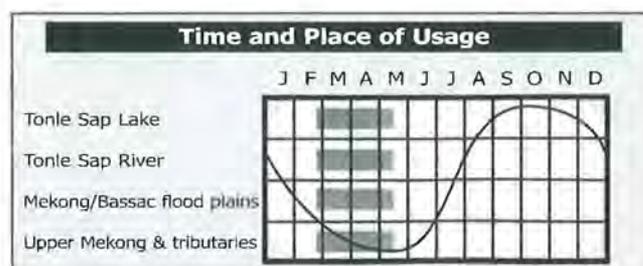
Both men and women construct and operate this gear.

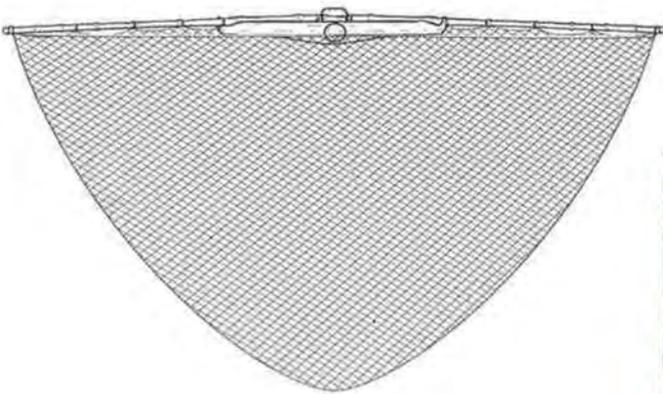
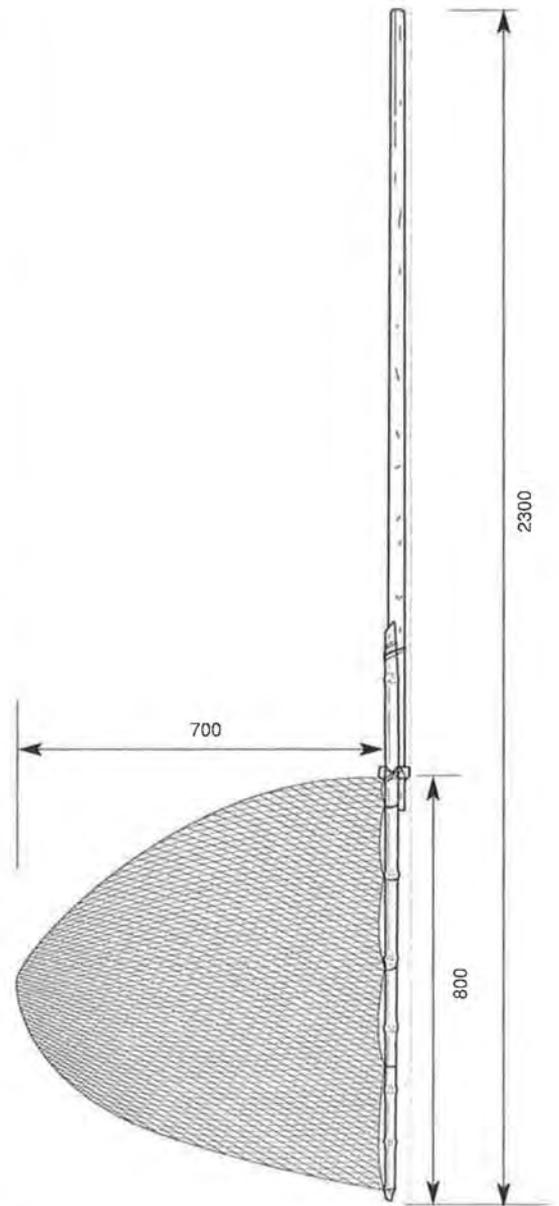
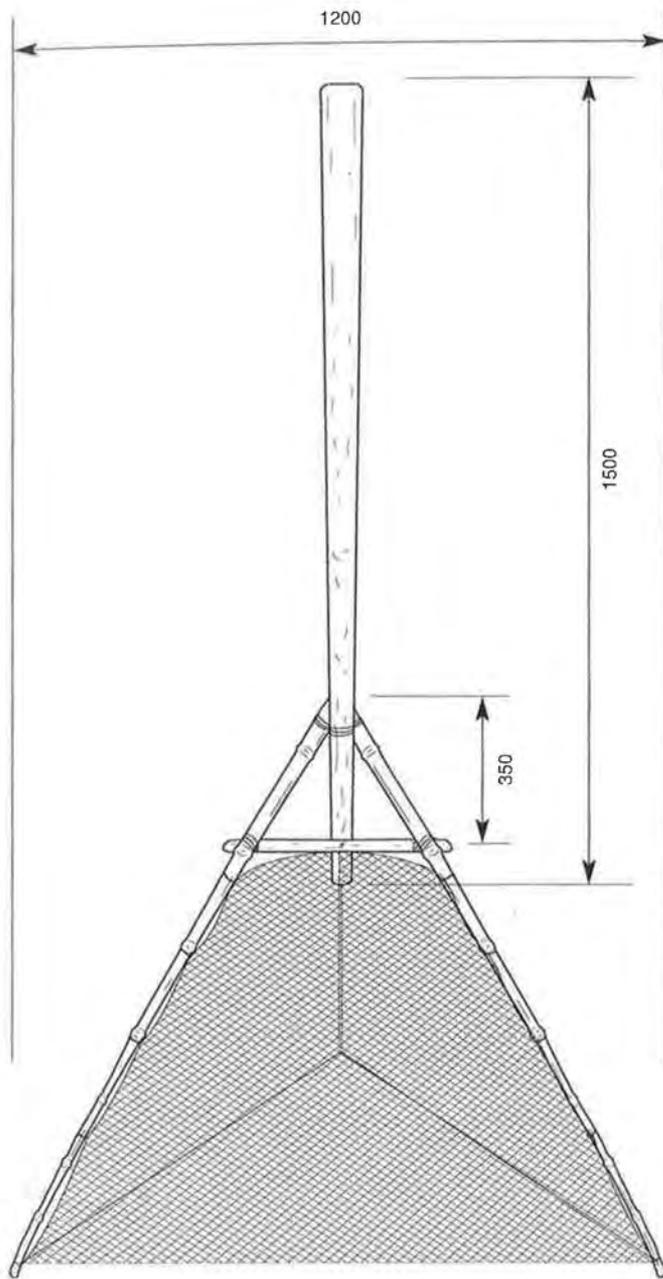
Target species

Carid shrimp, trey kranh (*Anabas testudineus*).

Legal aspects

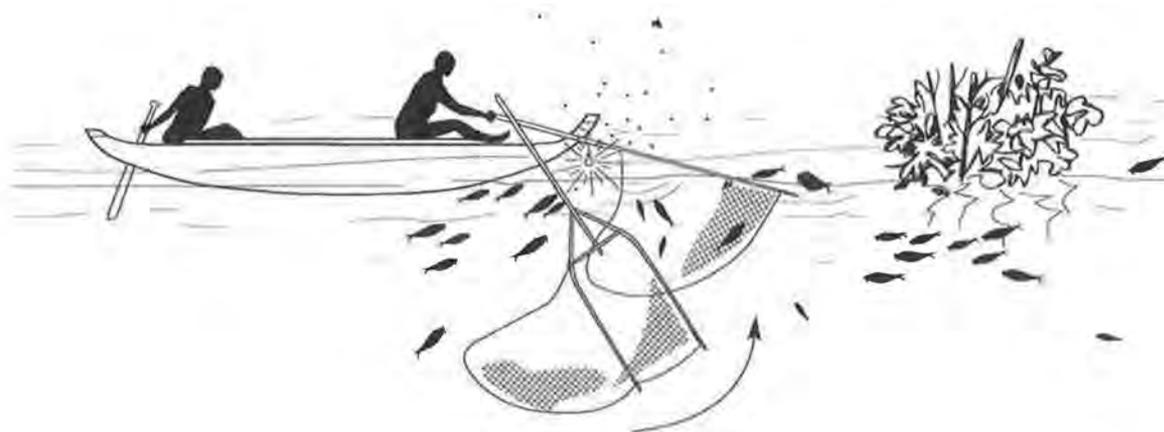
Small scale fishing gear (No. 028 KOR SOR KOR).





Handle Scoop Net

Veuk Trey Kamplieu

Trey kamplieu (*Kryptopterus* spp.)**Description**

The scoop gear *veuk Trey kamplieu* is made of a wooden frame comprising a 1.5 m long wooden handle and two 1.3 m long forks with an opening of 1.2 m. A bag net with 10 mm mesh size and a depth of 1.8 m is suspended between the slightly bent forks.

Cost

R. 14.000 (Takeo)

Operation

This big scoop net is generally operated at night and in conjunction with a light-attracting device. The minimum crew is two, a pilot and the gear net operator scooping the fish in front of the stern, where a petroleum lamp is hung outboard over the water surface. *Trey kamplieu* feeds on insects that are attracted by the light and eventually fall into the water. The use is similar to the V-shaped push net mounted on a boat (see 9.1.3).

Gender aspects

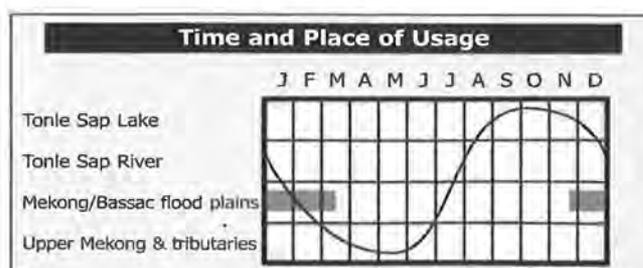
Mainly used by men.

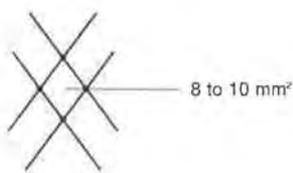
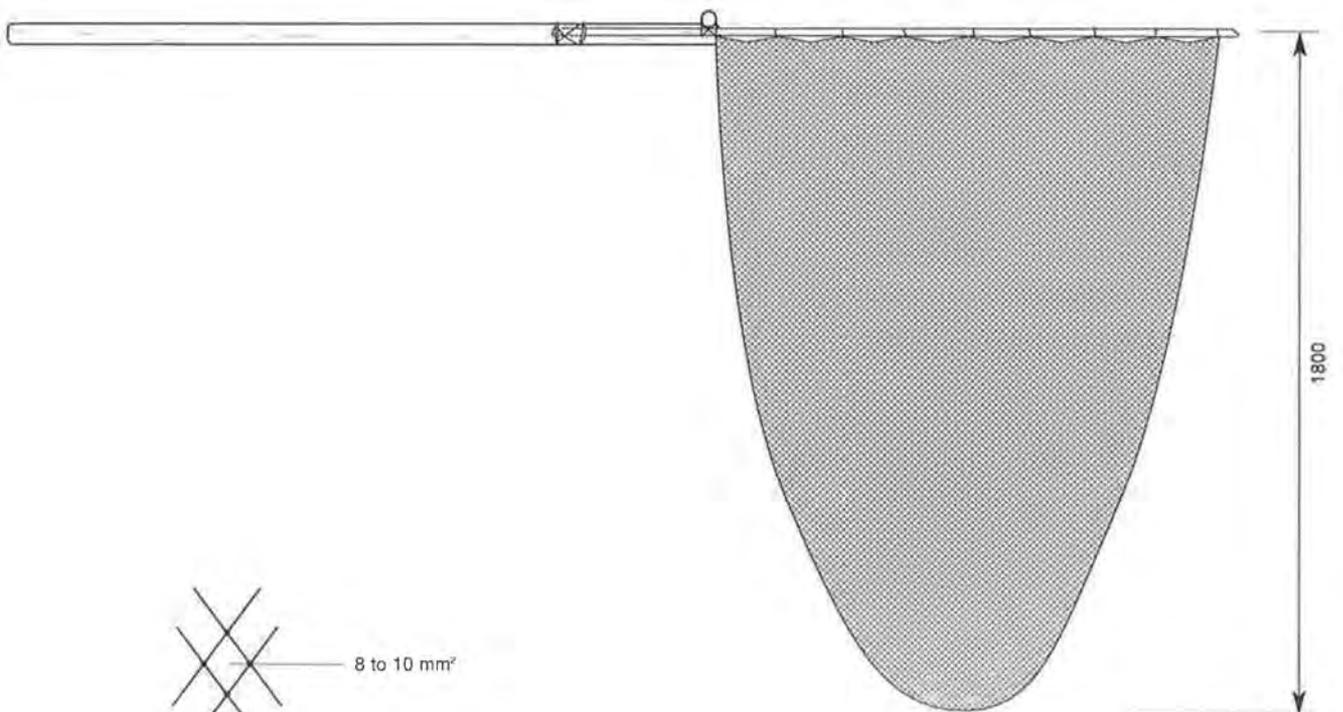
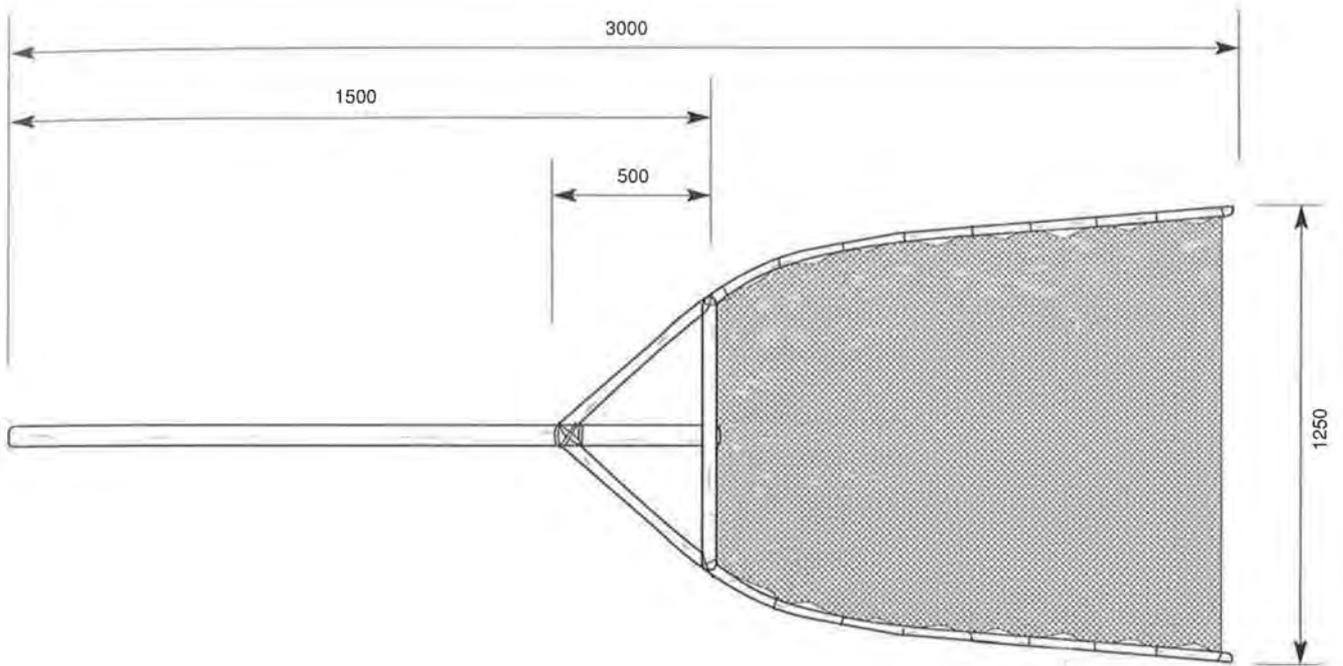
Target species

Trey kamplieu (*Kryptopterus* spp.).

Legal aspects

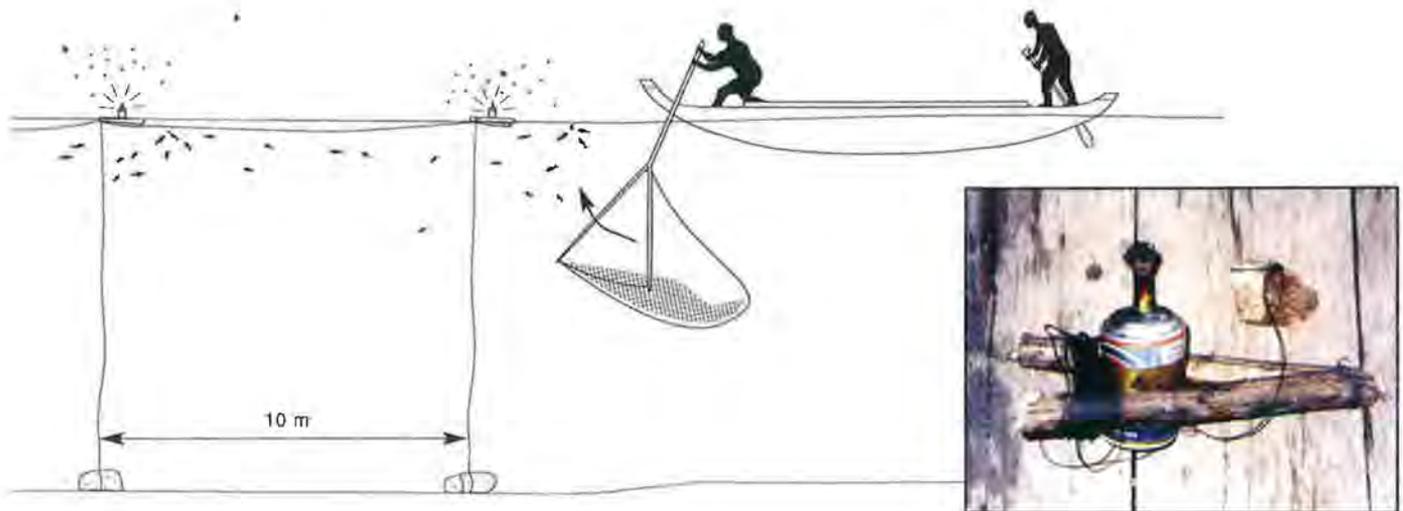
Any kind of luring tactic for concentrating fish is disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, C).





Scoop Net for Glassfish

Changkieng Trey Kanchanh Chrah



Description

The word *changkieng* means 'lamp', which is used in this context in conjunction with a big hand-manipulated scoop net. The petroleum lamp, being an essential part of the fishing equipment, is assembled with 50 to 60 empty cans attached to floater sticks made of *snou* wood (*Aeschynomena aspera*). The wick is made from hemp fibers.

The scoop device is similar to the *veuk Trey Kamplieu*. The two forks of the bamboo frame are 3 m wide at the outer ends carrying the triangle opening of the bag net, whose mesh size is 5 mm to 10 mm. The wooden handle is up to 3.5 m long.

Cost

Lamp: R. 1.000

Scoop net: R. 30.000

Operation

This type of night fishing operation is only found in the Great Lake Tonle Sap in the area around Choung Khneas, Siem Reap province, during the first half of the recession period. The weather conditions should be calm and the water surface smooth. Fishing yields are reported higher during the dark moon period. One fishing unit carries as many as 60 lamps, set out at a distance of 10 m from each other. While each floating lamp is anchored by a stone weight on the ground, the lamps are linked through a long line to each other. The light attracts two kinds of flies and moths, which concentrate around the light and eventually fall into the water if they come too near. If the wind is too strong there are no flying insects and, consequently,

there is no fish to catch. The fisher standing in the stern of the boat gently approaches the lamp area, pushing the scoop net under the lamp to scoop the feeding fish. During the 3 to 4 days of peak time around the dark moon this fishery can yield up to 200 kg of glassfish per net per night. The average yield per net per night is about 80 kg. The glassfish is dried and used as duck feed.

Gender aspects

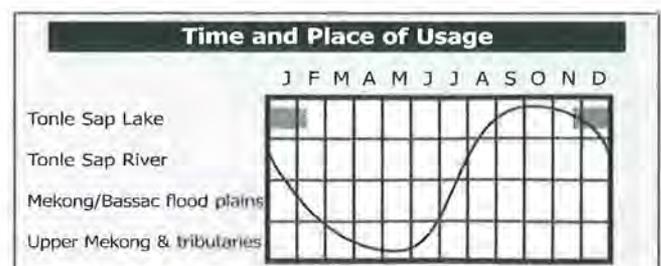
Women frequently participate in preparing the fishing devices and in the fishing operation. Processing of the fish is mainly done by women.

Target species

80 to 90% of the catch is *trey kanchanh chrah* (*Chanda siamensis* and *Ambassis apogonoides*) and 10 to 20% of it is *trey changwa poht* (*Rasbora caudimaculata*).

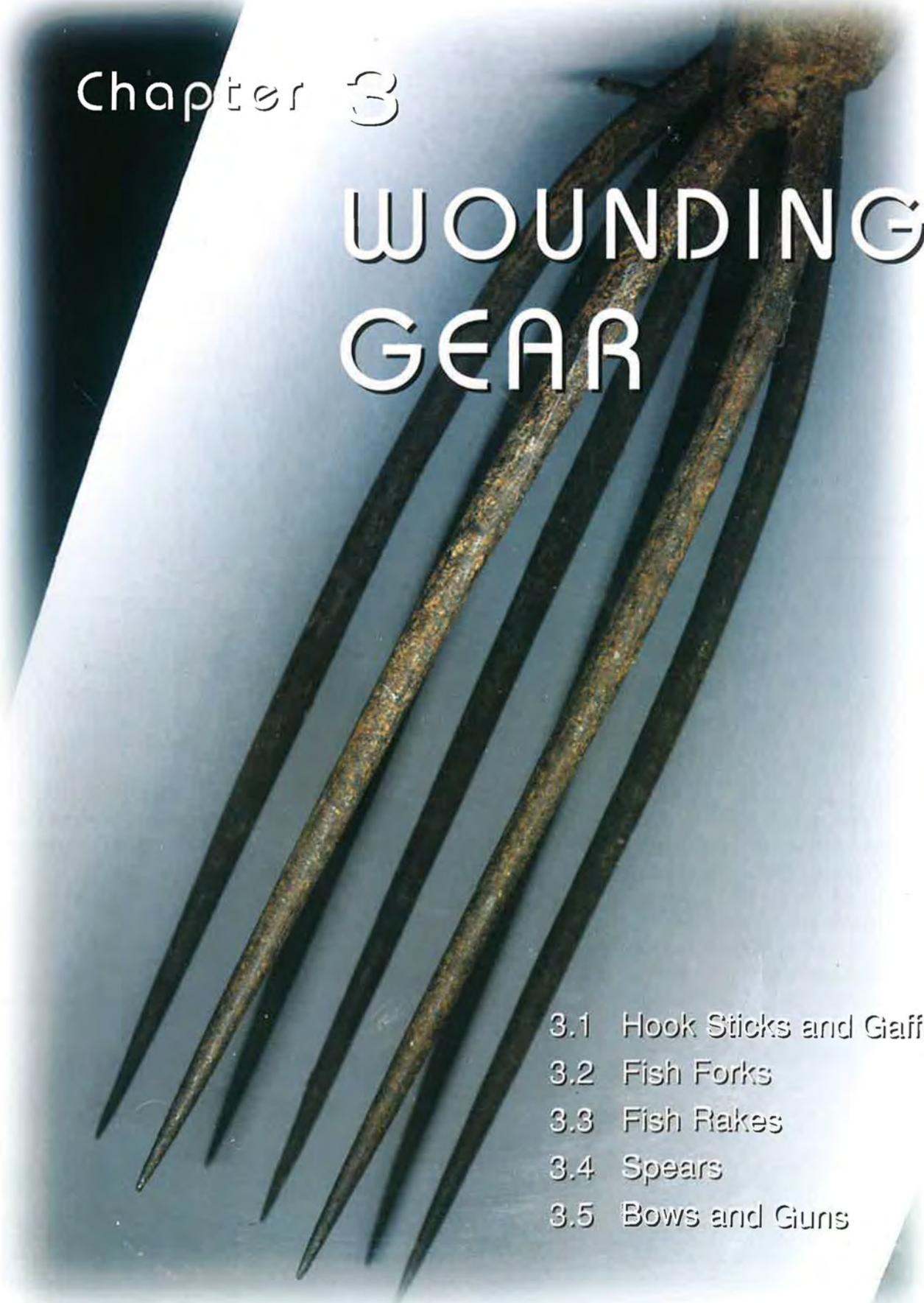
Legal aspects

Any kind of luring tactic for concentrating fish is disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, C).



Chapter 3

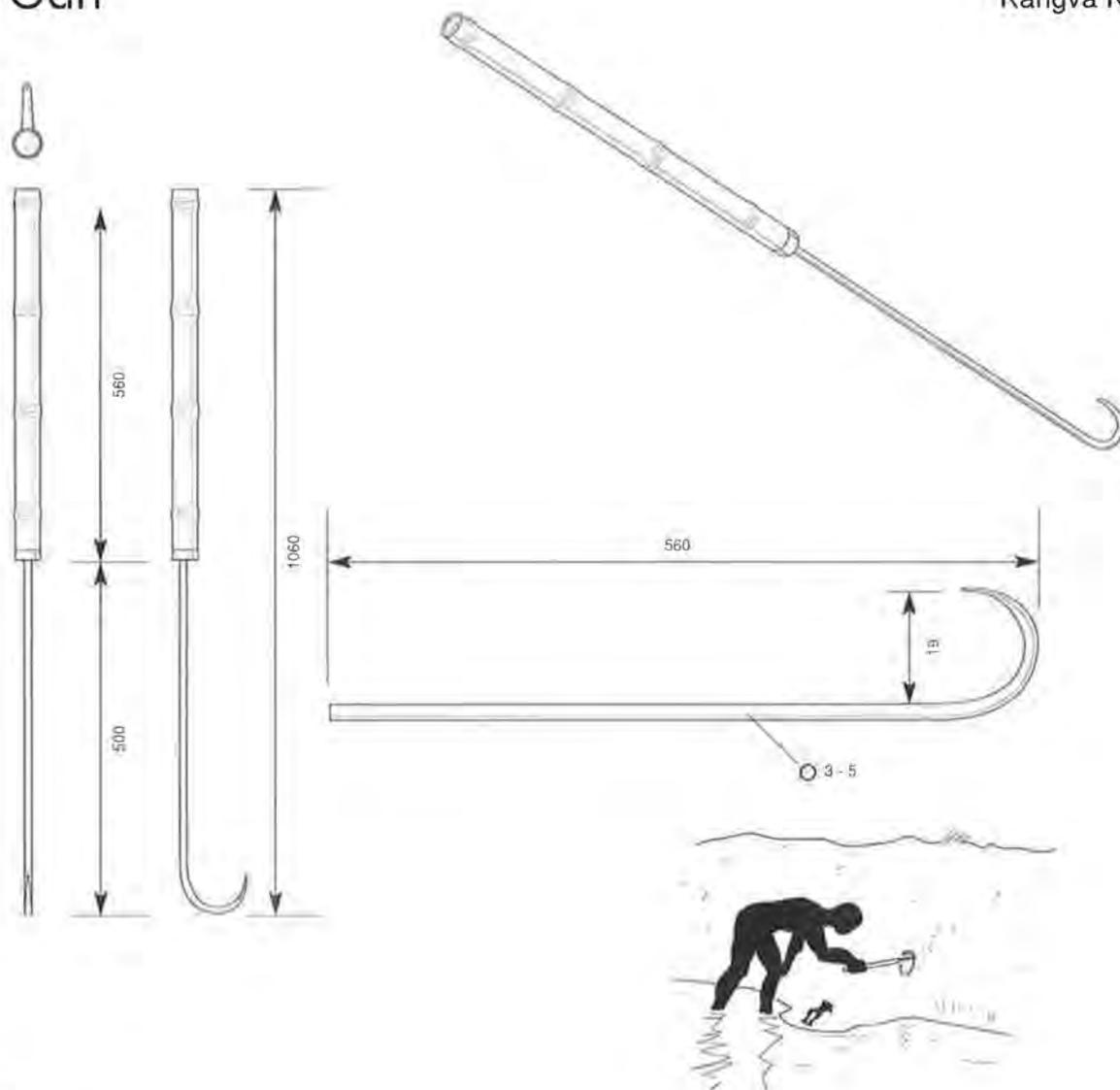
WOUNDING GEAR



- 3.1 Hook Sticks and Gaffs
- 3.2 Fish Forks
- 3.3 Fish Rakes
- 3.4 Spears
- 3.5 Bows and Guns

Frog Gaff

Kangva Kongkaeb

**Description**

This is a grappling gear for catching frogs. Though gaffs are generally classified as auxiliary devices in the hook fishery, in this particular case the gaff is operated as an independent fishing gear. Many variations of this simple but effective gear can be found. The frog gaff is made out of a roughly 90 cm long iron shank with a diameter of 3 to 5 mm, which is inserted into a long wooden handle. The throat of the hook is 20 mm deep and its gap 19 mm. The iron gaff hook and the handle are made by the fishers themselves.

Cost

R. 2.000 to 3.000

Operation

The frog gaff is used at the beginning of the rainy season to search for frogs hiding in holes in riverbanks or in irrigation dykes and walls of irrigation canals and in the rice fields. Children catching frogs for household consumption commonly use the gear.

Often they go out in small groups or take the frog gaff with them while going to and returning from farm work.

Gender aspects

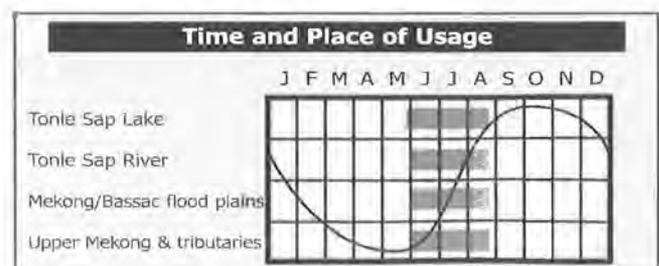
Mainly children use it.

Target species

Frogs; during the end of the flood recession also crabs in rice fields.

Legal aspects

Not classified / not mentioned in the law.



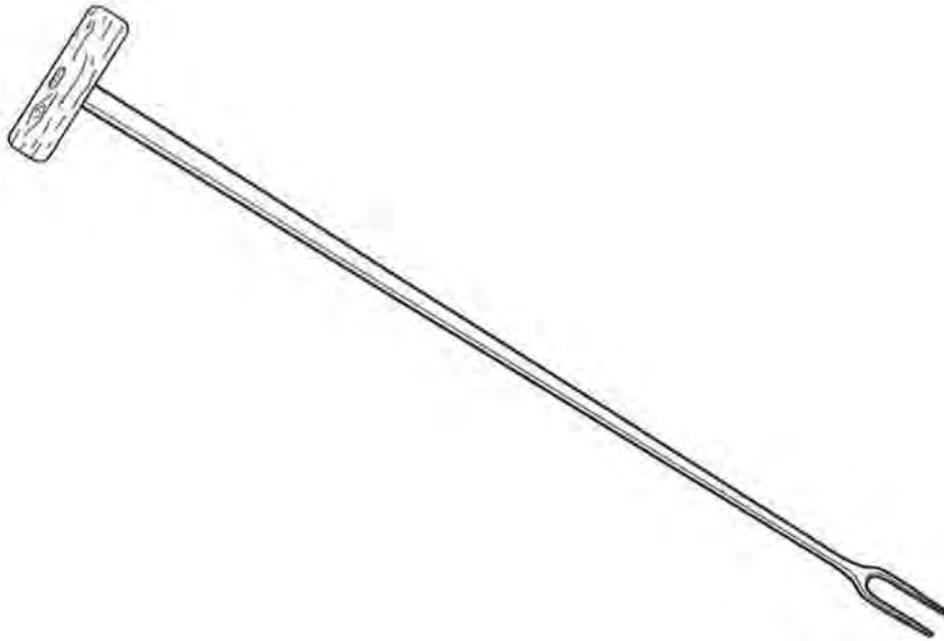
C L O S E - U P



Two pronged eel fork

Two Pronged Eel Fork

Changrop



Description

The gear consists of an iron fork and a wooden handle that is mounted perpendicular to the fork at the upper end. The fork is usually ordered from a blacksmith, but the final gear is assembled by the fisher. The total length of the fork is between 70 cm and 1 meter. The fork pole can consist either entirely of iron or, in order to reduce its weight and facilitate its maneuverability, it may consist of a combination of a wooden stick on which the iron part with the fork proper is attached. The fork point is around 3 cm high and the opening between the fork points is 12 to 15 mm. If maintained properly the gear can last more than 10 years.

Cost

R. 2.000 to 10.000 depending on the design and the quality of the gear construction.

Operation

The eel fork is operated in still and shallow water bodies, in the muddy and soft bottom surface of recession ponds and small lakes at the end of the dry season. It targets eels hiding in the mud. Occasionally it is used on shallow riverbanks starting to dry out during the recession period. The fisher feels for holes in the ground that may be made by the eels. He blocks the entry and exit hole with his feet and then 'combs' the selected spot by sticking the fork into the bottom at small distance intervals. Reaching the maximum depth, the fisher twists the

fork slightly in order to feel if a fish was hit. Once an eel is pierced the fisher holds down the fork with one hand, and with the other hand retrieves the catch, taking it off and collecting it in a basket or bag, tied to the waist. It is commonly used by children or family groups. Occasionally water snakes may be hit, possibly resulting in painful injuries.

Gender aspects

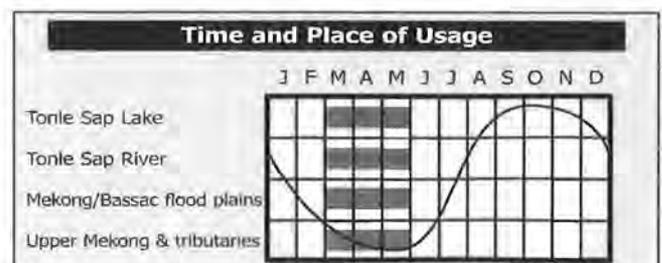
Women and children, as well as family groups, use the eel fork.

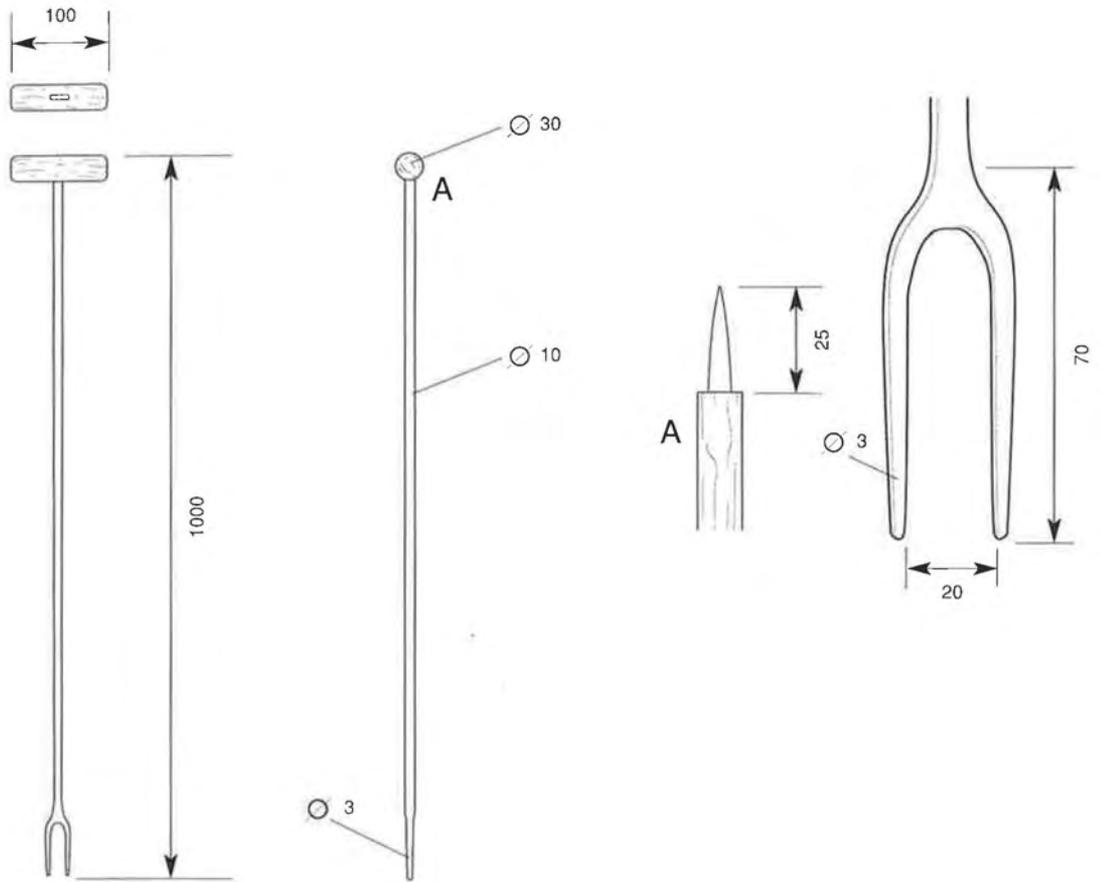
Target species

Eels / trey antong (*Monopterus albus*). Though it is designed for catching eels and snakehead hiding in the mud when the floods recede, any kind of aquatic produce might be caught, including crabs, frogs, water snakes, etc.

Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR).





Trident Fish Fork

Sorm

Description

This hand-held fish stick consists of a wooden handle, three bamboo spikes, each with an iron point arranged at their end in the form of a regular triangle (with 80 mm long sides) and two iron rings. The spikes are kept fixed in their position through a tight vine or strings made out of palm leaves. The iron points are usually ordered from the blacksmith, while the fisher makes the rest of the construction. The iron points and the bamboo spikes are fixed to each other by a thorn inside the bamboo and secured with a metal ring that presses the bamboo from the outside onto the thorn. Likewise, the bamboo spikes are inserted into the handle and secured by an iron ring from the outside. It is important to properly humidify the gear before the season starts in order to tighten the junctions of all functional elements. 10 to 15 cm below the handle an additional stabilizing piece of wood is inserted between the spikes while these are pressed onto it with wire or rattan fibers just below the wood. The total height of the gear can be over a meter. In Battambang a rather rare variation with four metal spikes was observed.

Occasionally, the wooden handle might show a carved eagle head or other symbols accomplishing decorative or spiritual purposes.

Cost

R. 6.000 to 12.000 depending on the province.

Operation

The trident fish fork is used at the end of the rainy season in drying out water bodies and where there is hardly any water current. It is typical for the flood plains. This gear facilitates fishing in areas where the water is between 20 and 50 cm deep and waterweeds hamper the use of other fishing gear. The *sorm* is frequently used by a group of fishers wading through the swamp in a line. Each of the fishers sticks his or her trident with a relatively high frequency into the water, thus giving the fish little opportunity to escape.

This gear used to be very popular in the past (up to the 1980s) but it is rarely encountered nowadays.

Gender aspects

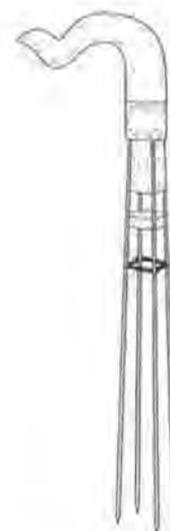
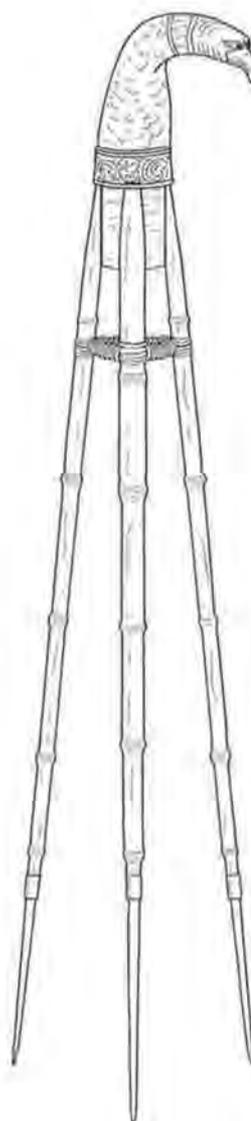
Men and women as well as young people use the trident.

Target species

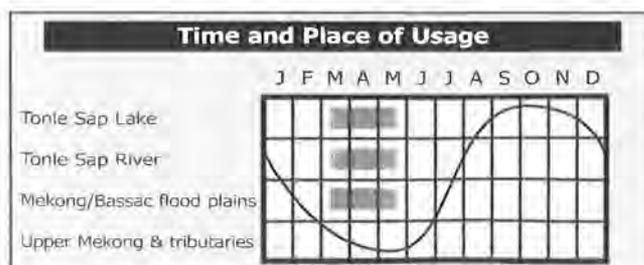
Snakehead (*Channa* spp.), hard- and soft-shelled turtle.

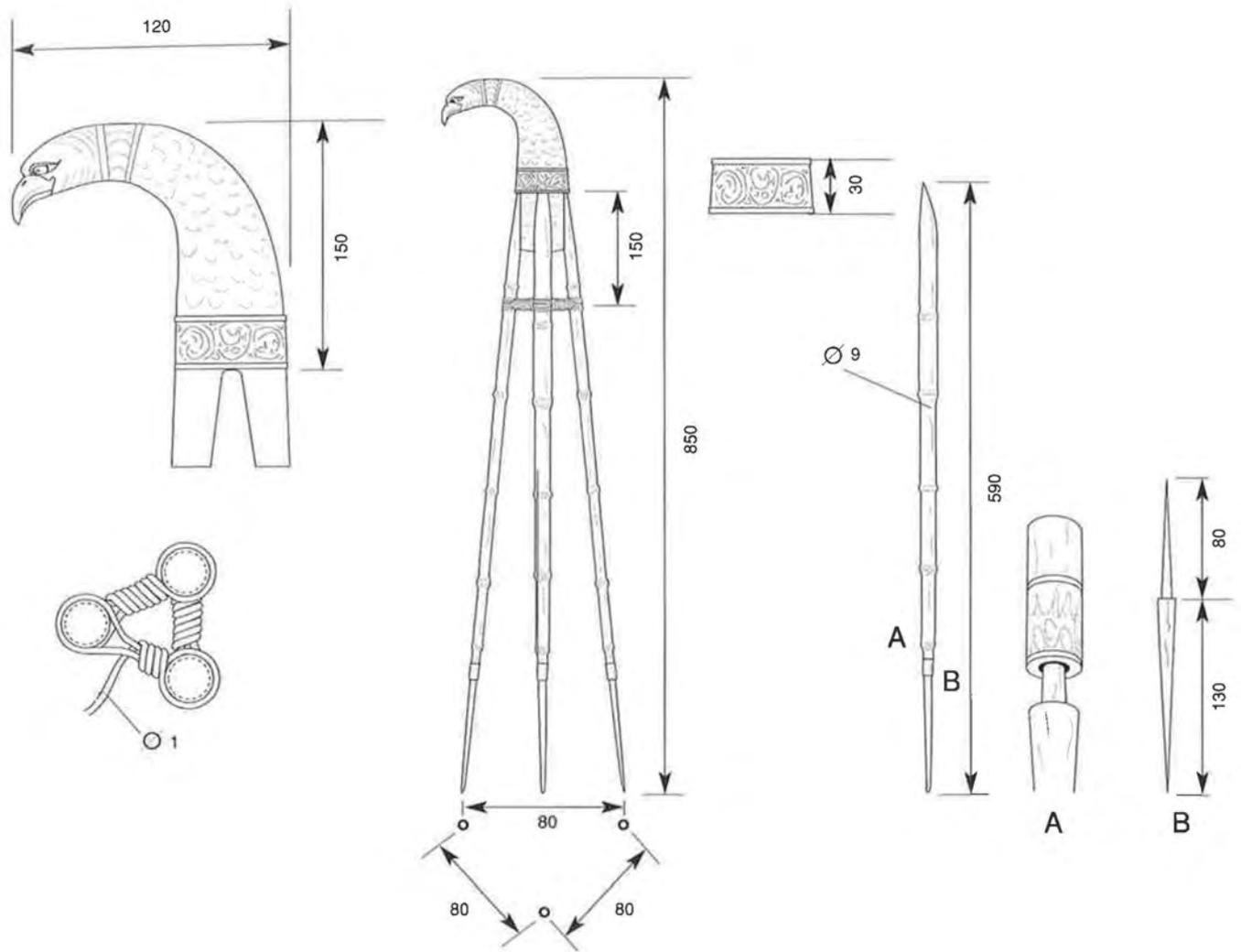
Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR).



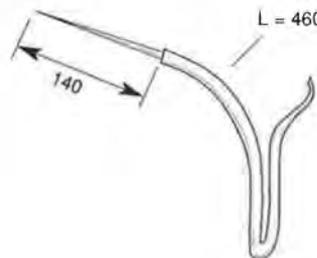
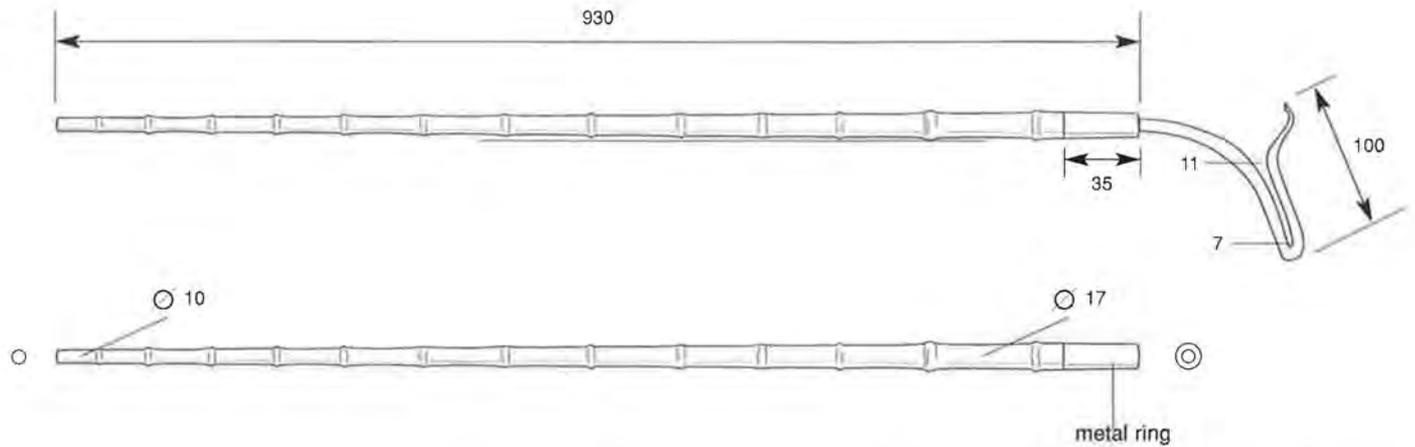
Variation with 4 spikes





Eel Clamp

Kangva Trey Chhlonh



Macrognathus

Description

This eel fork is made out of a roughly 90 to 100 cm long wooden, preferably bamboo, handle with a diameter of 17 mm, which is fixed to a 46 cm long iron that is bent at its end into a sort of clamp. The throat of the clamp is around 10 cm deep and its gap 7 to 11 mm. While the iron part of the gear is made preferably by a blacksmith, the handle is fixed to it by the fisher.

Cost

R. 4.000 to 6.000

Operation

The eel fork with one point is used in shallow waters (less than 0.5 m) of permanent water bodies towards the end of the dry season, only during daytime. The surface of the waterbed must be muddy without any grass or other vegetation. The fisher presses the fork down into the mud and combs it with fast zigzag movements, systematically sifting through a stretch of mud. The eels getting clamped in the fork-head are taken out by hand and stored in a basket that is

carried at the waist.

Often small groups of peers or family members each of them carrying an eel clamp go out fishing together.

Gender aspects

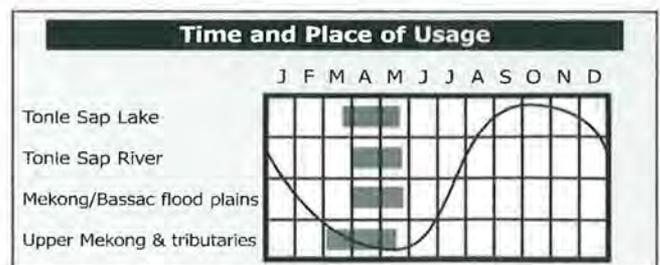
There is no gender specific use of the gear, but men and bigger children usually use it.

Target species

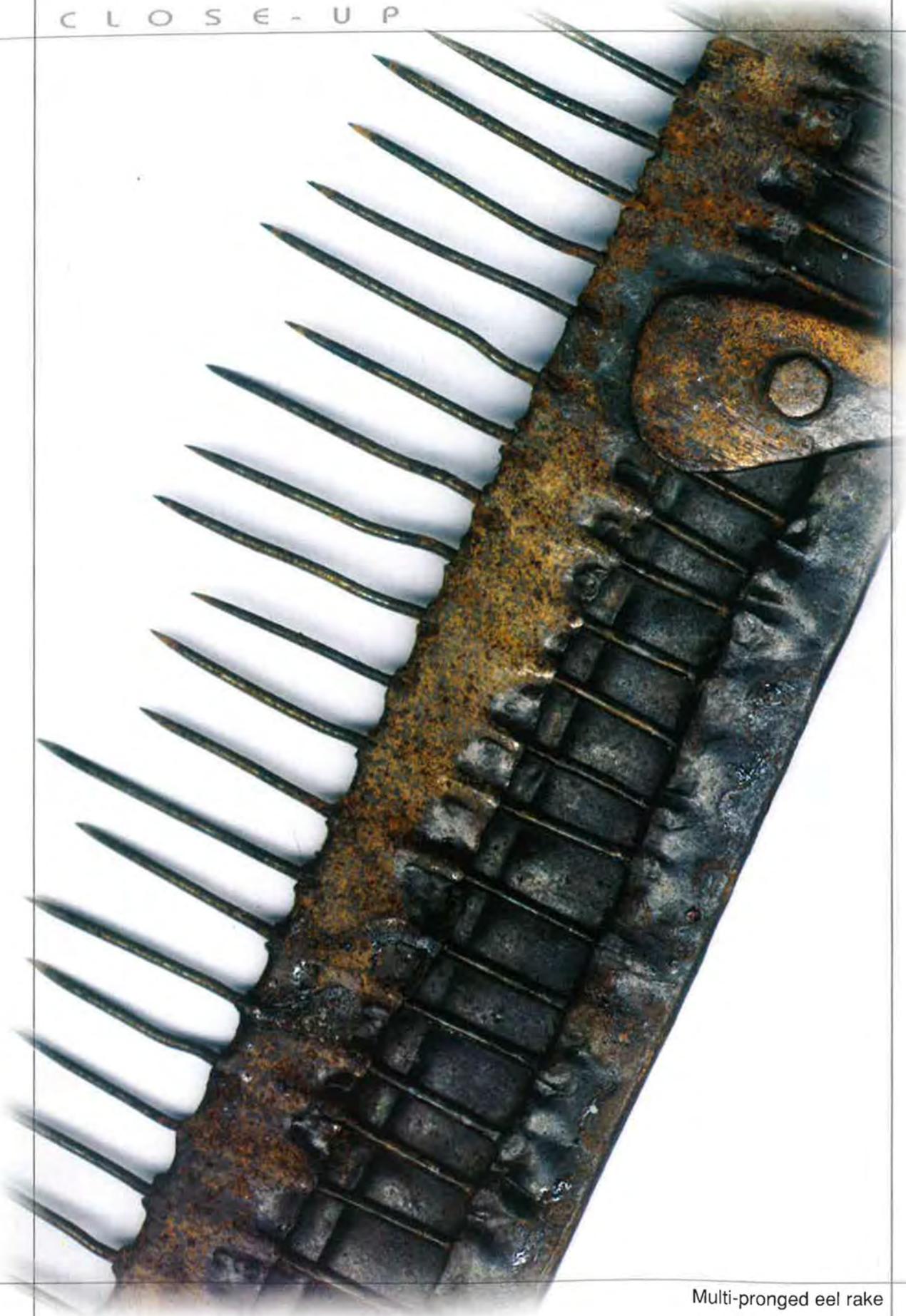
Spiny eels (*Macrognathus* spp.).

Legal aspects

Not classified / not mentioned in the law..



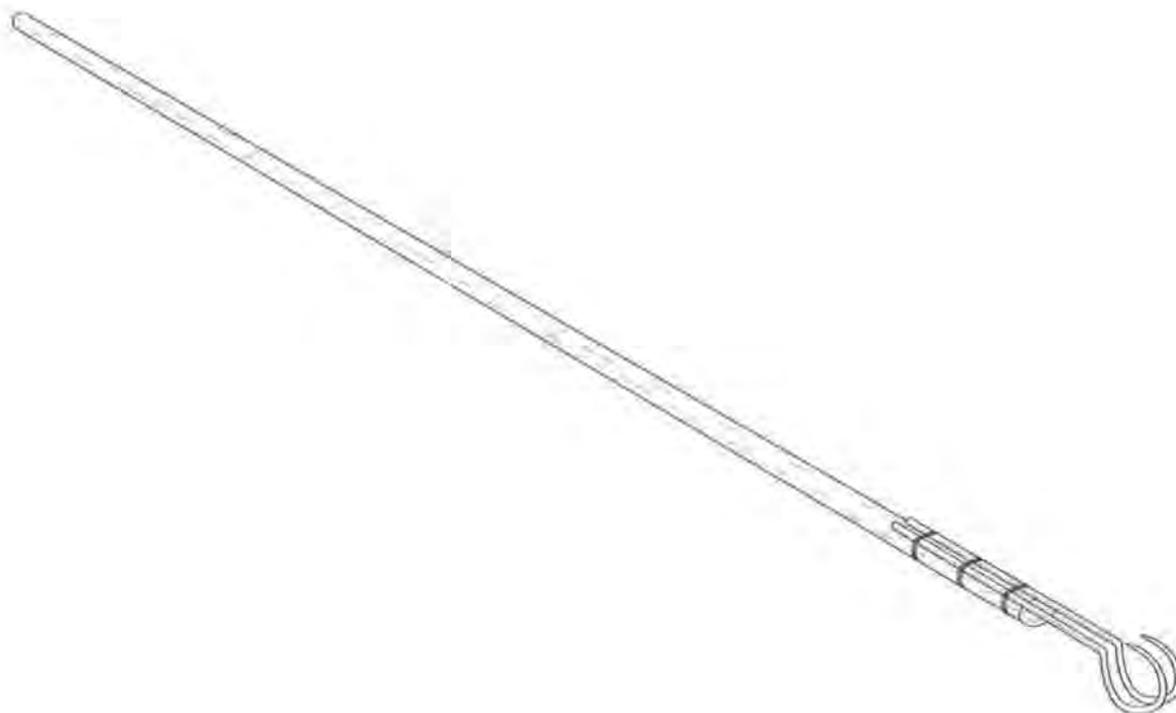
C L O S E - U P



Multi-pronged eel rake

Eel Rake with Two Clamps

Kangva Trey Chhlonh Phlaye Pi

**Description**

The double hook eel rake is made of a 175 cm long bamboo handle with a diameter of between 10 and 25 mm. On one end two 35 cm long, round iron stakes (\varnothing 2 mm) with a hook each are fixed. The iron shank is 31 cm long and the hook itself has a length of 40 mm. The throat of the hook is 35 mm deep. The two hook irons are attached side by side to the handle with a 1 mm thick wire.

Cost

R. 4.000 to 7.000

Operation

The double hook eel rake is used in shallow waters (less than 0.5 m) in rice fields, recession ponds, small rivers and irrigation canals or even in simple mud pools or swamps towards the end of the dry season. It is used only during daytime mainly targeting spiny eels. The surface of the waterbed should be muddy without any grass or other vegetation in order to avoid the gear getting stuck in the roots. The fisher rakes the mud systematically over a defined stretch by walking forward. The eels and fish getting hooked or clamped

are taken out by hand and stored in a basket. Commonly, small groups of peers or family members, each of them carrying a fish rake, go out fishing together.

Gender aspects

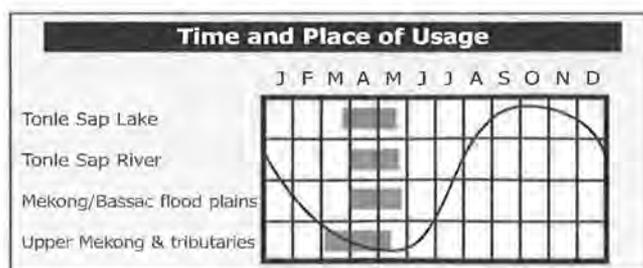
There is no gender specific use of the gear, but men and bigger children usually use it.

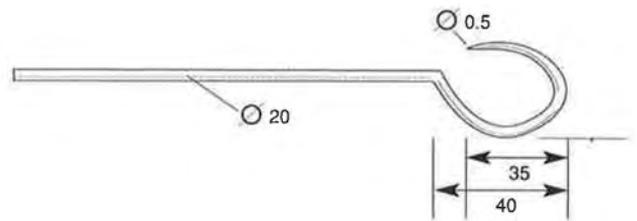
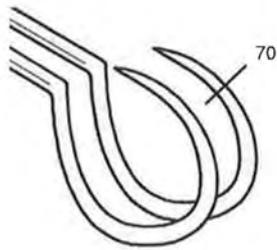
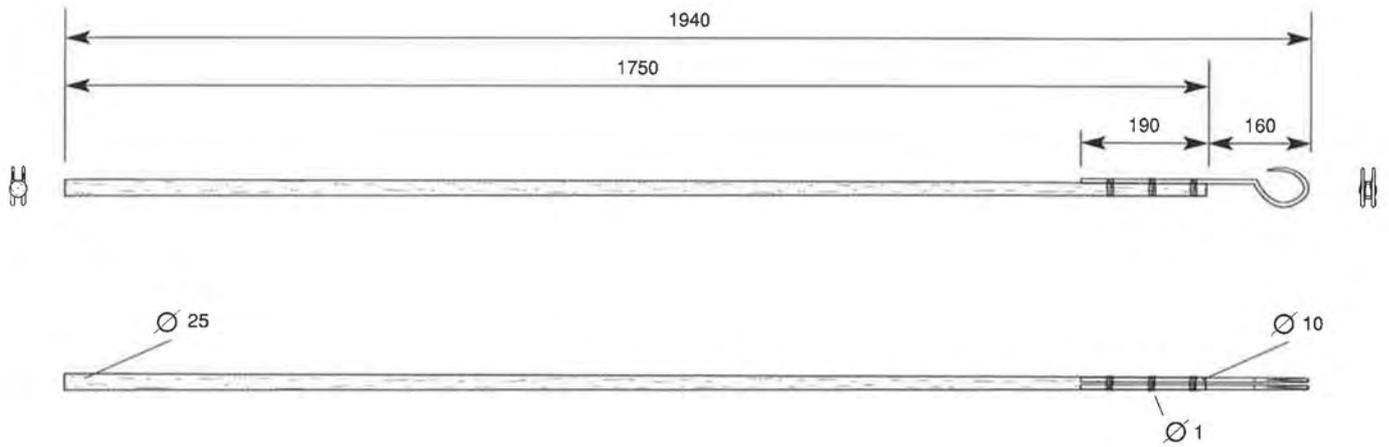
Target species

Spiny eels (*Macrogathus siamensis* and *Monopterus albus*).

Legal aspects

Not classified / not mentioned in the law.





Five-pronged Fish Comb

Dai Kap Trey



Description

The *dai kap Trey* is a 71 cm long hand held fish comb made out of 3 mm thick and 34 mm broad flat iron, five prongs of different length are riveted to the flat iron on one end and a wooden handle (10 cm long, 25 mm diameter) surrounding the iron at the other end. There are three longer prongs of 20.5, 16.6 and 14 cm long with two shorter 11 and 10 cm long prongs inserted between the longer ones.

Cost

R. 15.000

Operation

The *dai kap Trey* was only reported from Prey Veng province. It is used at the beginning of the wet season to catch any kind of fish or aquatic product lurking in shallow and muddy water bodies, such as rice fields, recession ponds, shallow irrigation canals and swamp areas. The fisher operates the gear hitting it like a machete through the surface layer of the bottom from left to right and vice versa. In this process the fish, eel or other animals like frogs or crabs may get pierced or clamped in the prongs. The catch is taken off from the comb and

stored in a basket that is carried at the waist. People operate this gear in small groups of family members or peers. The catch - since most of it is wounded - is predominantly used for household consumption.

Gender aspects

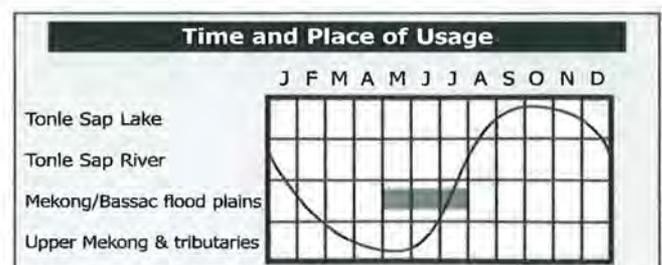
Men commonly use this gear.

Target species

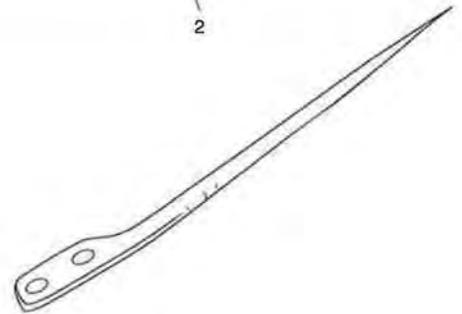
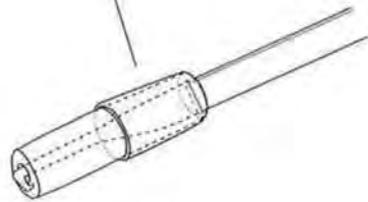
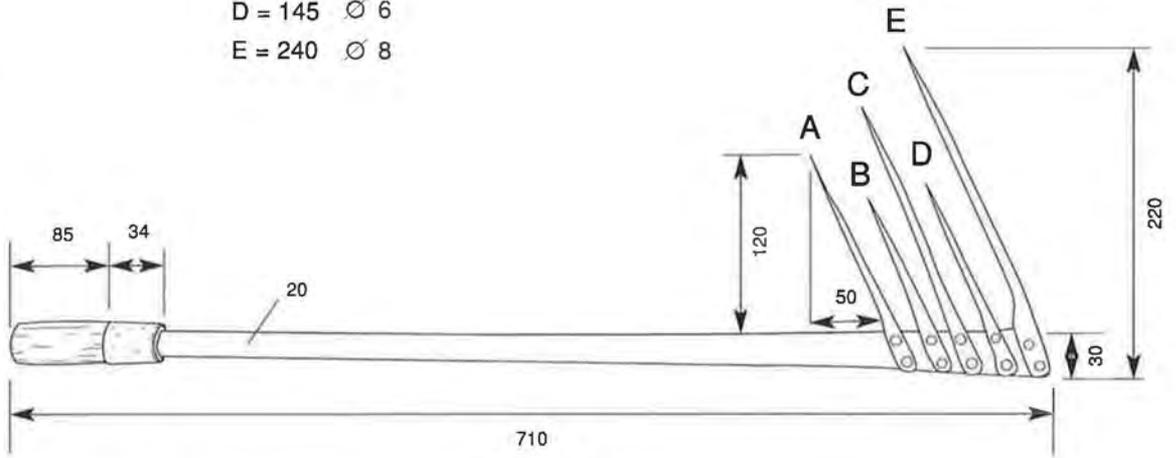
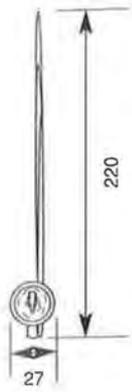
snakehead (*Channa* spp.) and other fish migrating into small streams (*preks*).

Legal aspects

Not classified / not mentioned in the law..



- A = 170 \varnothing 8
- B = 130 \varnothing 6
- C = 200 \varnothing 8
- D = 145 \varnothing 6
- E = 240 \varnothing 8



Multi-spiked Eel Rake

Kangva Bonla

**Description**

The *kangva bonla* consists of a 1.8 to 2 m long bamboo or wooden hand pole and a longitudinal iron rake head. The rake head is made of a 40 cm long tapering metal tube that receives on the superior end the hand pole which is fixed with a nail. At the tapered end the tube is equipped with 5 to 6 pairs of bent round irons (diameter 5 mm) with pointed spikes. The spikes are arranged in a row with the upper pair of spikes the longest and the inferior spikes the shortest. However, the operational length of the spikes can be adjusted according to the hardness and consistency of the bottom surface of the fishing ground (see photo).

Cost

R. 15.000 to 20.000

Operation

This fish rake is used in drying out or low level water bodies such as recession ponds, irrigation canals, rice fields and swamp areas. The depth of the water is usually not more than 1 m. Preferably, the bottom of the fishing ground shouldn't contain any roots or vegetation. The fisher operates the rake by setting it out as far away from his body as possible and then pulling it back. This movement is continuously

repeated, describing parallel lines through the bottom and covering a rectangular bottom surface area. The fisher may work many rows in this way according to the purpose of fishing and time available. The catch is removed from the rake as it is caught and collected in a floating basket or plastic foam box, anchored next to the fishing ground.

Gender aspects

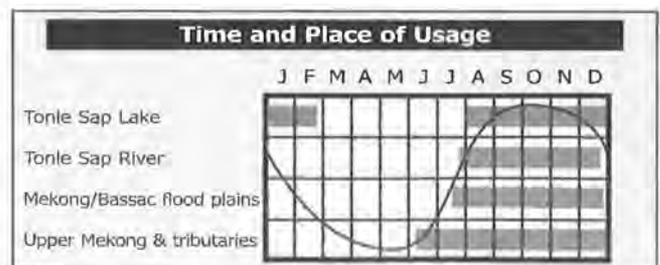
Men and children are very much involved in this type of fishing operation.

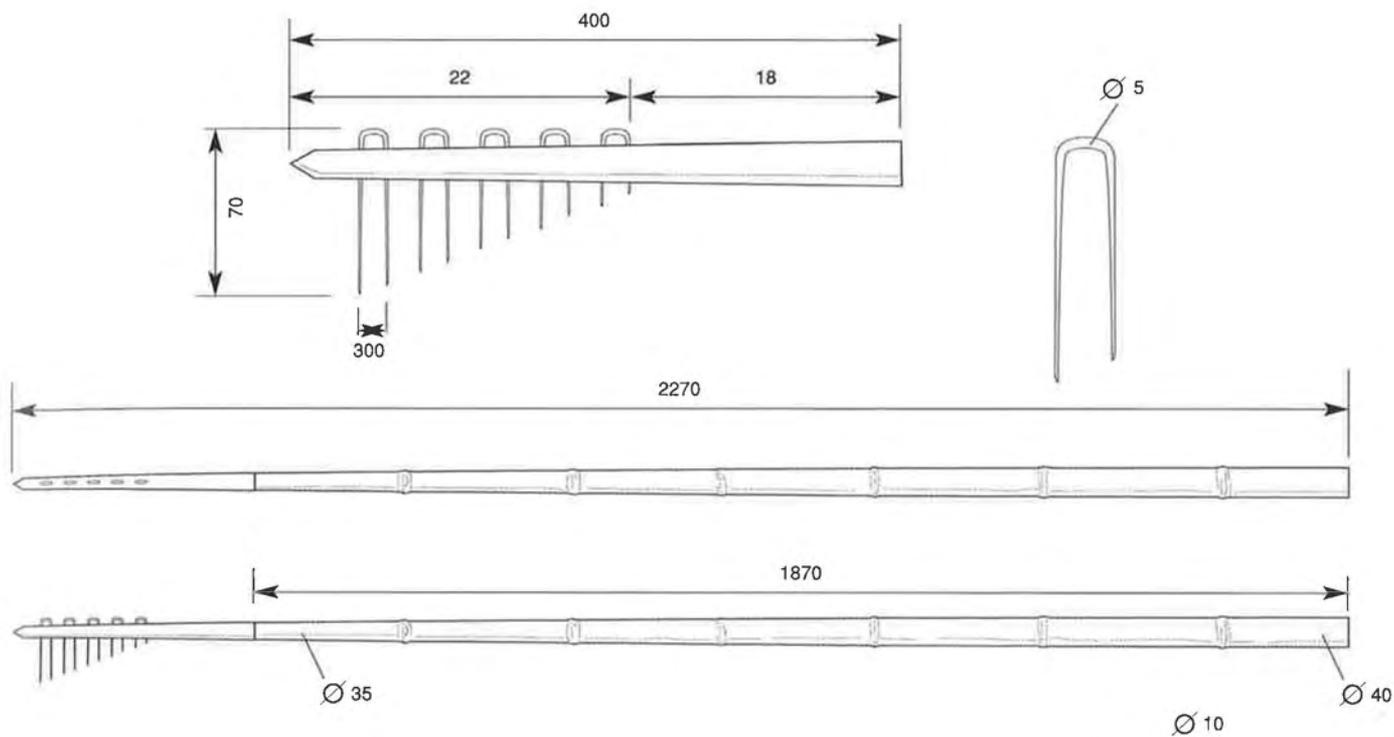
Target species

Mainly spiny eels (trej chhlounh, *Macrognathus* spp.).

Legal aspects

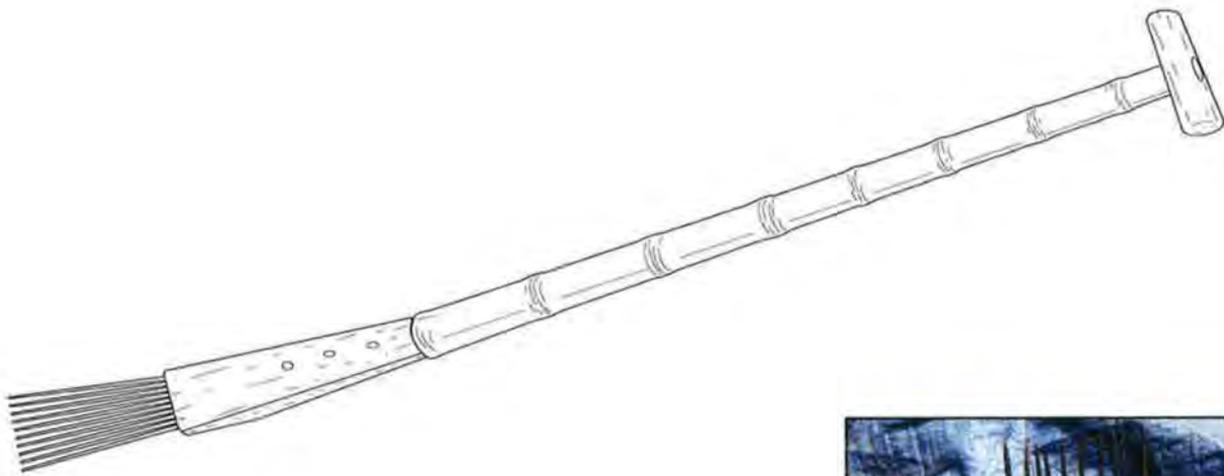
Not classified / not mentioned in the law.





Push Eel Fork

Chhbouk Chhak Trey Chhlonh

**Description**

The eel fork resembles a spade in which the iron blade is substituted by a series of 10 parallel 15 cm long spikes. The spikes are inserted and fixed to a short shaft made of hard wood, which in itself is inserted into a bamboo pole. The 2.8 m long bamboo pole ends in a 13 cm long transverse wooden handle.

Cost

R. 10.000 to 17.000

Operation

This eel fork is, similar to other eel rakes, operated in recession ponds or shallow parts of rivers at the end of the dry season. Due to its relatively long bamboo pole the fisher can explore up to 1.2 m deep fishing grounds. The gear is pushed forward (like a shovel or a pitch-fork) with short stretches through the muddy underground surface. The catch retrieved from the gear is gathered in a floating container connected to the waist by means of a string.

Gender aspects

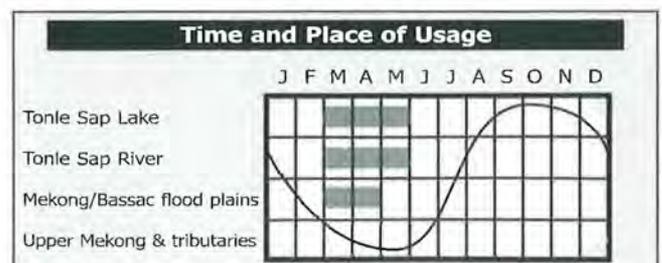
No gender differences have been observed in the use of this eel rake.

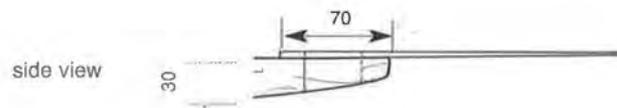
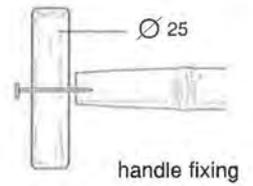
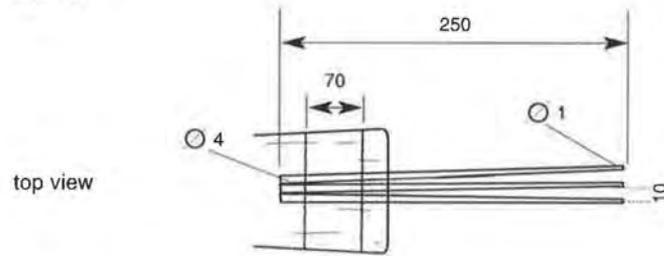
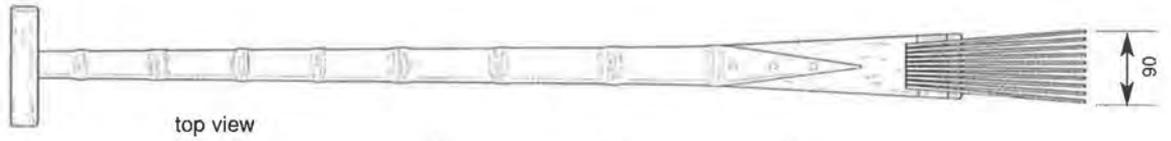
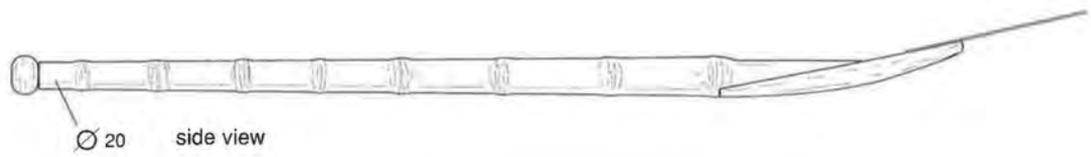
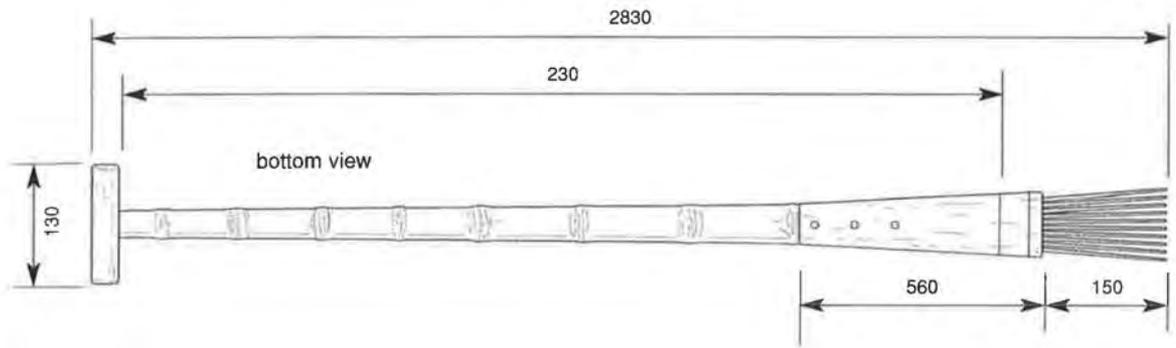
Target species

Bottom dwelling fish such as eels (*Macrognathus* spp. and *Monopterus albus* and occasionally snakehead (*Channa* spp.).

Legal aspects

Not classified / not mentioned in the law..





Multi-pronged Eel Rake

Kangva Trey Chhlonh Phlaye Chraan or Ronuh



Description

The multi-pronged eel rake resembles a common garden rake. A 2.5 to 3 m long bamboo handle (in Takeo province the handle may be up to 5 m long) is attached to a rake head consisting of a rake comb and the three stabilizing metal rods. The metal rods (Ø 9.5 mm) are bent at their ends into a semicircle (which determines the operational depth of the rake) and connected to the rake blade to keep it firmly in position. The rake blade is 60 cm wide and may carry between 23 and 86 spikes (Takeo) or prongs. The spikes are 40 to 65 mm long, arranged at a distance of between 2 and 6 mm from each other. In some variations of the *ronuh* the length of every second spike is shorter or longer respectively.

Cost

R. 15.000 to 40.000

Operation

The multi-pronged eel rake is used in waters of recession ponds, rivers or irrigation canals towards the end of the dry season. The bottom surface is free of vegetation where spiny eels lurk in the soft mud.

While operating the rake the fisher walks slowly backwards pulling the rake through the bottom surface. The eel get stuck between the prongs. Frequently, the fisher needs to retrieve the rake and remove the catch in order to avoid damaging or losing it.

Gender aspects

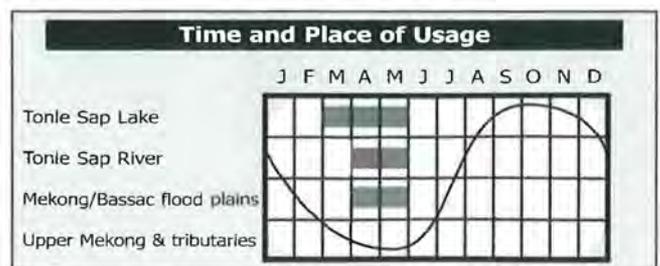
There is no gender specific use of the gear, women and bigger children often use it.

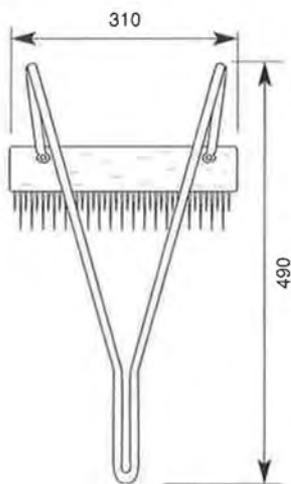
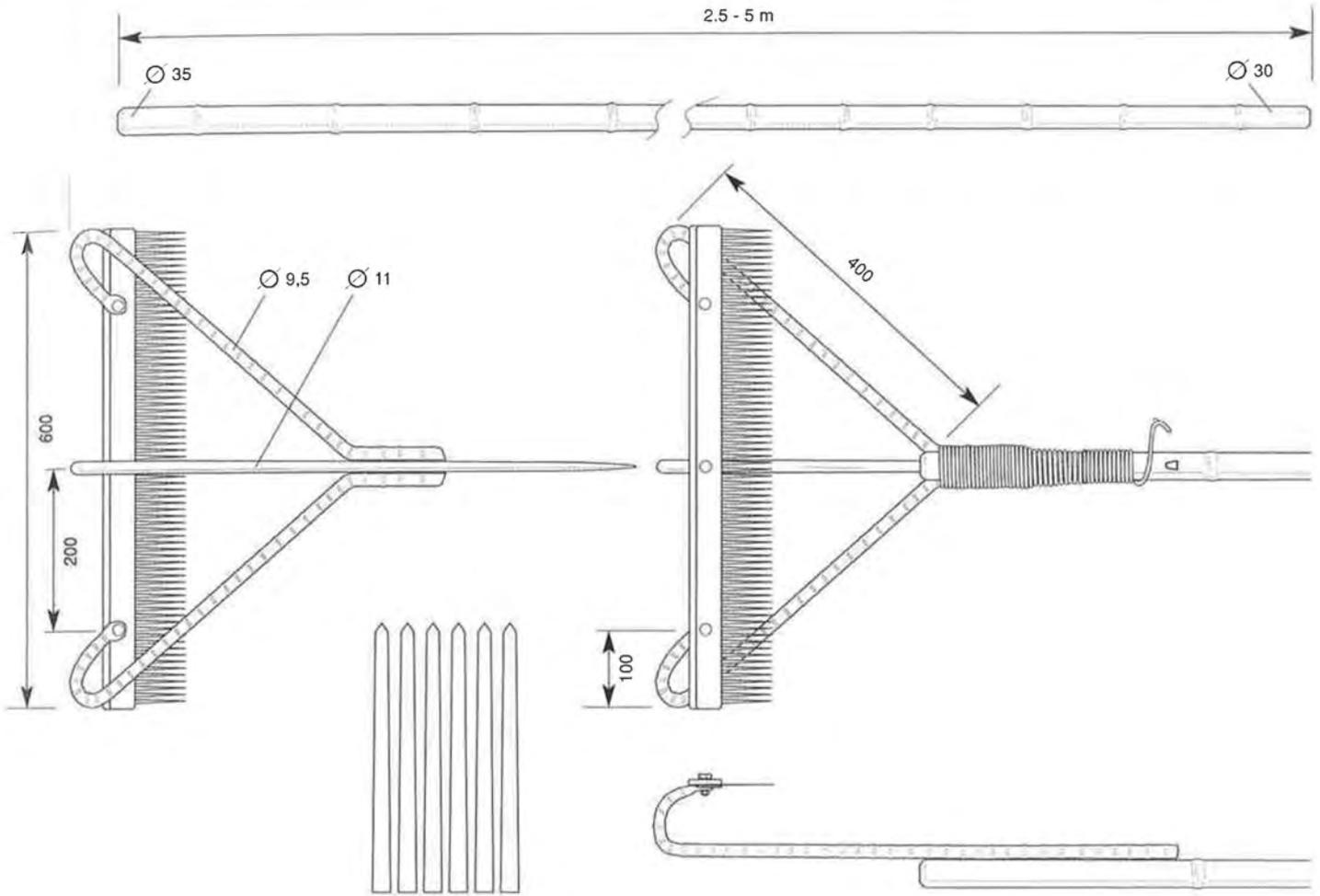
Target species

Spiny eels (*Macrognathus* spp.).

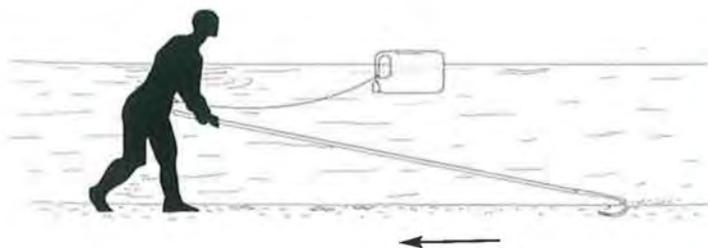
Legal aspects

Not classified / not mentioned in the law.



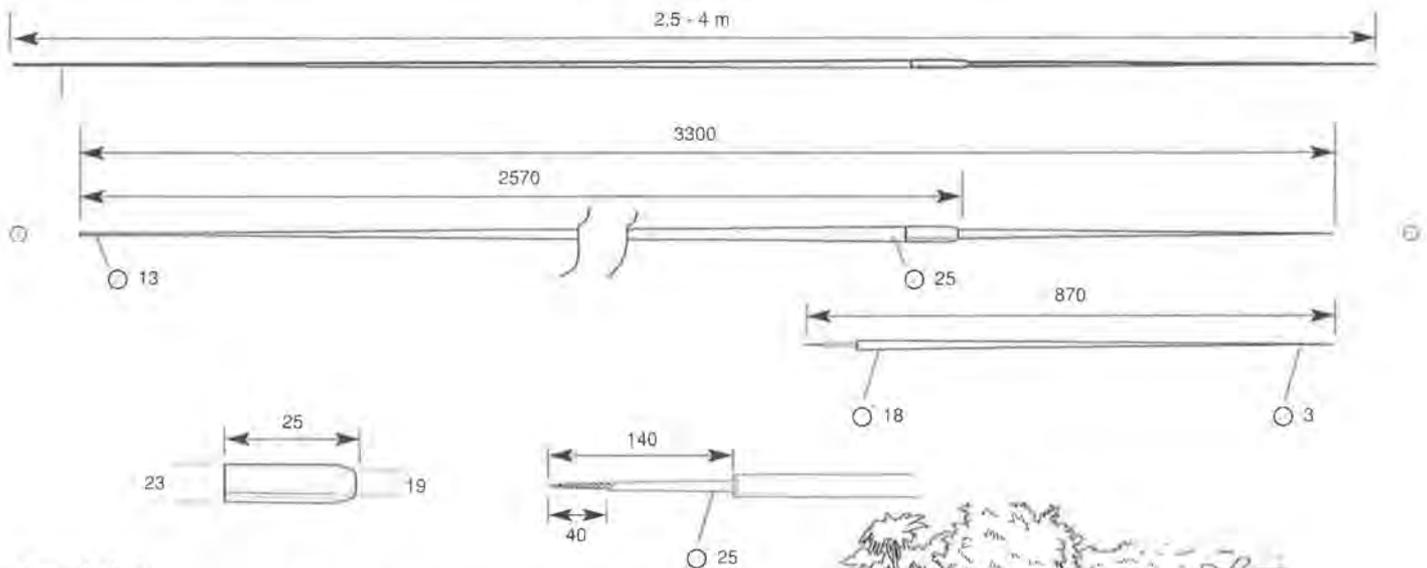


variations



One-pronged Barbless Spear

Snor



Description

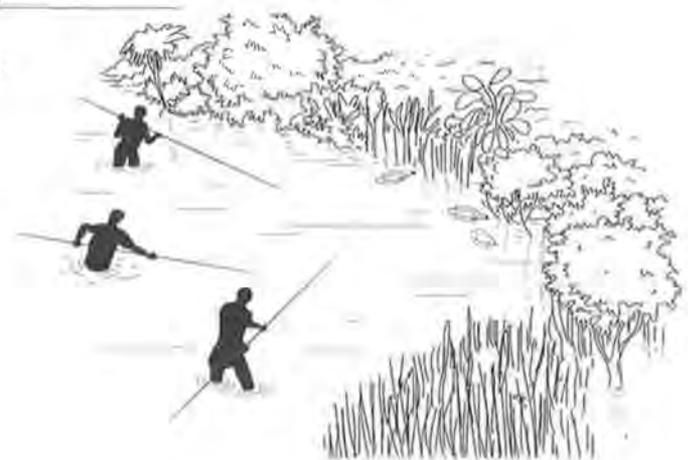
The spear consists of a bamboo handle and an iron one-pointed spearhead. The bamboo must be properly dried out before being used as spear handle. Occasionally the bamboo's surface is smoothed, then carefully toasted and finally it must be assured that it is perfectly straight. The spearhead is fixed into the handle by means of a winding thorn, while an iron ring from the outside secures the stability of the junction. The total length of the gear can vary from 2.5 m to over 4 meters, with the spearhead having a length of up to 75 cm. As with other spears the iron head is made by a proficient blacksmith and the rest of the construction work is done at home. The life span of the gear is commonly very long. While the handle may last up to 10 years, the spearhead is occasionally inherited from one generation to the next. Sometimes a string is tied to the spear for easier retrieval.

Cost

R. 14.000 on average, but big price differences were reported, ranging from R. 5.000 in Kandal province to R. 35.000 in Siem Reap province.

Operation

This gear is usually used in inundated grasslands or flood forests, or in streams, lakes and pools nearby inundated vegetation in water no deeper than 1 meter. It is used mainly during the flooding season or at the beginning of the recession. A calm water surface facilitates the spear fishing operation. The two-man fishing crew operates from a paddled boat, gliding smoothly along the fishing ground where the pilot manoeuvres the boat from the stern, while the fisher stands in the bow with the spear, watching out for big fish. Sometimes several people operate in a group,



approaching flooded vegetation or a river lagoon on foot. Thus, any scared fish can easily be spotted and targeted by any of the group members.

Gender aspects

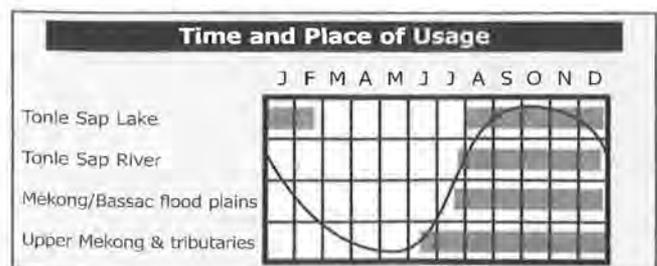
This gear is made and used only by men.

Target species

Mainly snakehead (*Channa* spp.) and trey sanday (*Wallago* spp.).

Legal aspects

Small-scale fishing gear (No. 028 KOR SOR KOR). The use of "spears combined with illuminating lamp (to attract the fish)" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, D).



C L O S E - U P



One-pronged barbless spear

Three-pronged Barbed Spear

(arranged in line)

Chhbok



Description

- The spear consists of a bamboo or wooden handle and an iron spearhead with three prongs. The spearhead is fixed into the handle with a thorn while an iron ring from the outside secures the junction. The total length of the gear can vary from 3 to over 4 meters, with the spearhead having a length of around 20 cm. The three barbed prongs are arranged in a regular triangle with the points 5 to 8 cm from each other. The barbs may have an opening of up to 10 mm and the length of the shank can be up to 20 cm; usually it is less. The pole handle is usually made out of bamboo, with a diameter of 20 mm on one end and 30 to 40 mm at the end where the spearhead is fixed.

There are many variations of spears, with three or more points, and with or without barbs. The handle is sometimes made of hardwood and carved into a paddle.

Cost

R. 6.000 (Takeo) to R. 30.000 (Battambang).

Operation

This spear is operated either from a boat or – less frequently – by wading through shallow water. Usually, two people are needed, one piloting the boat at the stern and the spear fisher operating the gear in the bow. Good understanding and communication by signs is needed within the two-man team in order to fish successfully. Usually this operation needs very calm waters, since any wave movement hinders spotting the fish. Thus the spear is predominantly used within the

flood forest or in quiet lagoons at the river shore. The use of the spear in combination with torchlight at night is very popular, though legally forbidden (see below). Its use depends strongly on the micro-environments of the given fishery. So it can be used when the waters are rising and the fisher follows snakeheads into the flood forest, or during the recession, when he may await the fish coming out of the flooded forest areas.

Gender aspects

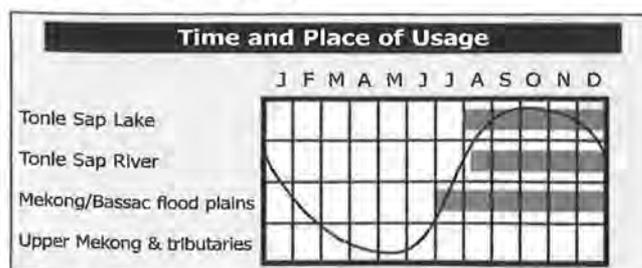
The three pronged barbed spear is made and used only by men.

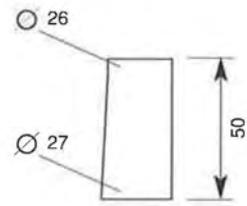
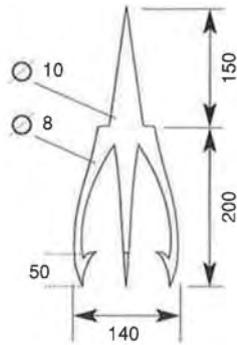
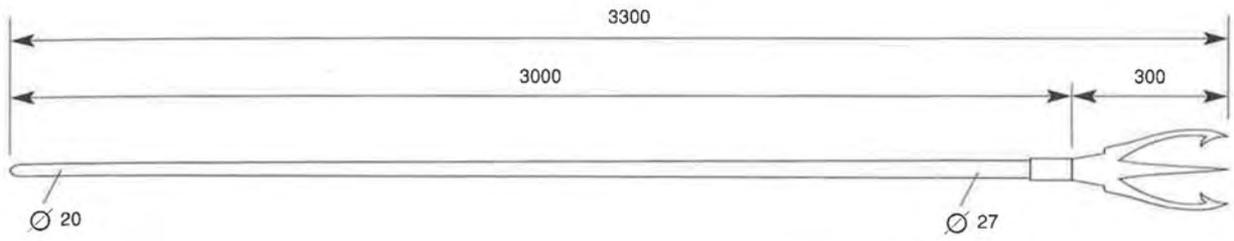
Target species

Mostly snakehead (*Channa* spp.) and trey sanday (*Wallago* spp.).

Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR). The use of "spears combined with illuminating lamp (to attract the fish)" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, D).





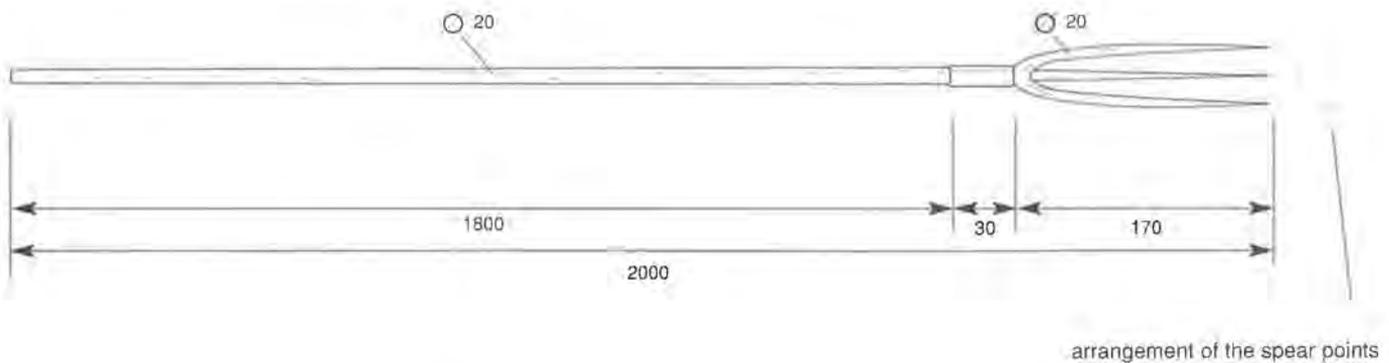
ring for fixing prongs



Three-pronged Barbless frog Spear

Chhbok Kongkaeb

arranged in line



Description

The spear consists of a bamboo or wooden handle and an iron spearhead with 3 unbarbed spikes, arranged in a row. The spearhead is fixed into the handle with a thorn while an iron ring from the outside secures the junction. The total length of the gear can vary from 1.8 to 4 m, with the spearhead having a length of 17 cm. The distance between the spikes is 35 mm. Commonly, a local blacksmith makes the spearhead and the fisher assembles the gear. However, fishers are increasingly using alternative ways of construction using bicycle wheel spokes as spikes.

Cost

R. 3.500 to 6.000

Operation

This gear is operated in rice and crop fields, grasslands and swamps mainly during and after rainfall. The frog hunter follows the sound of croaking frogs and pierces it as soon as he spots it. Frog hunting at night is very popular by using torch lights attached to the head (like a miner's torch lamp). Often smaller groups of people hunt together by

systematically sweeping a selected hunting ground.

Gender aspects

Men and children commonly hunt with this spear.

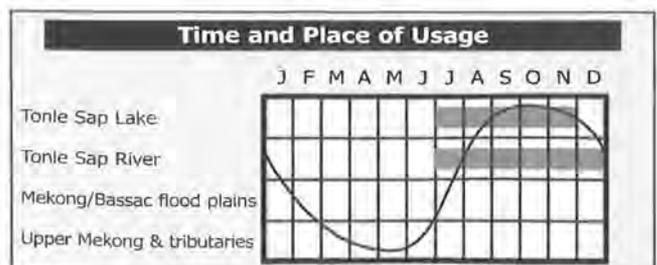
Target species

Especially frogs. Occasionally snakeheads (*Channa* spp.) might also be caught.

Legal aspects

Not classified.

The use of "spears combined with illuminating lamp (to attract the fish)" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, D).



C L O S E - U P



Barbed spearheads

Multi-pronged Barbless Spear

(arranged in area)

Chhbok Mouk Chhraan



Description

This spear consists of a bamboo or wooden handle and an iron spearhead with (4 to) 7 barbless prongs. The points of the prongs describe a more or less regular hexagon with the seventh prong located in its center. The 3 to 4 m long pole handle is tightly inserted into the case socket (diameter 30 mm) of the spearhead and is flattened towards its other end. Additionally, the spearhead is secured by a rope passing through the base of the prongs and a small hole in the pole 35 cm above the prongs. The iron spearhead is 28.5 cm long, including the 7 cm long case socket. The distance between the points is between 38 and 27 mm, the maximum total width is 74 mm. The superior end of the wooden pole is carved into a paddle.

Cost

R. 20.000

Operation

The *chhbok mouk chhraan* is commonly operated from a boat near inundated vegetation or flooded forests during high water levels, and with a quiet water surface. Usually two people are needed, one piloting the boat at the stern and the spear fisher operating the gear in the bow. Good understanding and communication by signs is needed within the two-men team in order to fish successfully. The use of the spear in combination with torchlight at night is very popular.

Its use depends strongly on the micro-environments of the given fishery. So it can be used when the waters are rising and the fisher follows snakeheads into the flood forest, or during the recession when he may await the fish coming out of the forest areas.

Gender aspects

The multi-pronged barbless spear is made and used only by men.

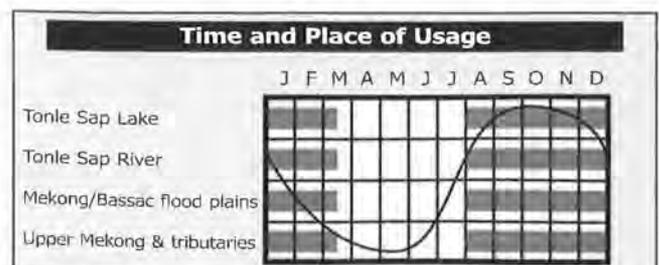
Target species

Mainly snakehead (*Channa* spp.), trey sanday (*Wallago* spp.).

Legal aspects

Not mentioned in the law..

The use of "spears combined with illuminating lamp (to attract the fish)" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, D).



Multi-pronged Barbed Spear

(arranged in line)

Sang

Operation A

Description

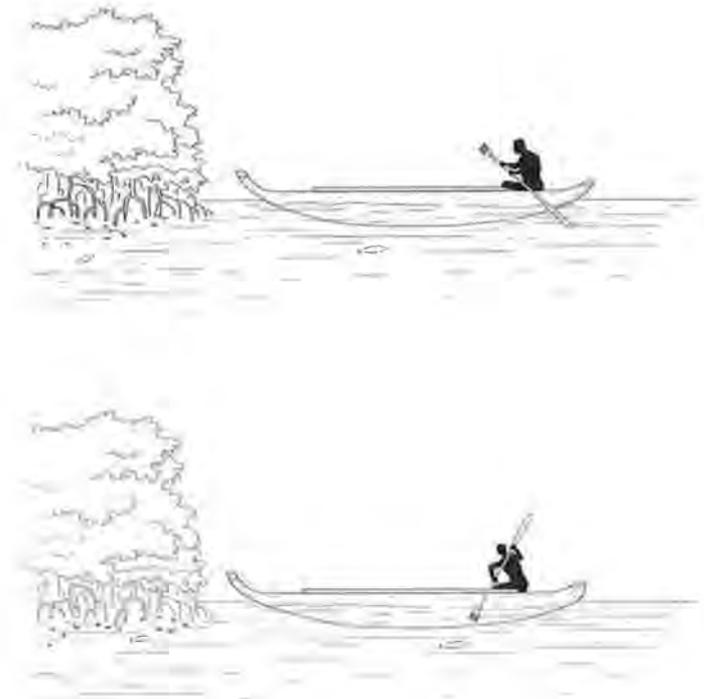
This type of spear consists of a long wooden (sometimes bamboo) handle, connected to a spearhead with four to six barbed prongs arranged in a line. An iron thorn, which is an integral part of the spearhead, is inserted into the spear-handle and pressured from outside by a metal ring in order to fix it firmly. A blacksmith irons the spearhead while the final assembly is usually done by the fisher. The total length of the spear is between 3.4 to 4 m, of which the spearhead is some 15 cm. The prongs are arranged in a single line with the straight barbs directed towards the center of the spear. The gap distance between the points is around 3 cm. Commonly, the handle is made out of a wooden pole with the end carved into a paddle to be operated from a boat. A tightened rope gives additional security to the spearhead's linkage to the shaft. The construction of this gear requires specialized skills from the blacksmith as well as from the fisher who assembles it. *Sror lauv* wood (*Lagerstroemia*) is preferably used for the handle and before assembling the gear it has to be thoroughly dried.

Cost

R. 13.000 on average, but big price differences were reported, ranging from R. 7.000 in Takeo province to R. 40.000 in Pursat province. The construction, including the iron spearhead and the assembly, takes a maximum of 2 days.

Operation A: by boat

This gear is operated mainly during rising and receding floods, both during the day and at night. When operated during the night torchlight is used, both at dark moon or full moon. For its successful operation a smooth and waveless water surface is required, thus it is operated preferably among flooded vegetation inside the flood forest, next to floating patches of water hyacinth or in shady, quiet lagoons at the riverbanks. Operating from a boat can be a one- or a two-man job. If one man, the fisher uses a spear-paddle combination (not a spear with a bamboo pole handle). If two men, the pilot sits in the stern manoeuvring the boat, while the fisher stands in the bow. Commonly, this gear is used at peak flooding period when snakeheads (*Channa* spp.) protect their fry and *Pangasius* species feed on the plankton-die-



off (called prom). Usually the spear is used handheld but occasionally it is also used as a harpoon, i.e. it is thrown at the prey, particularly so if it is a snake.

Gender aspects

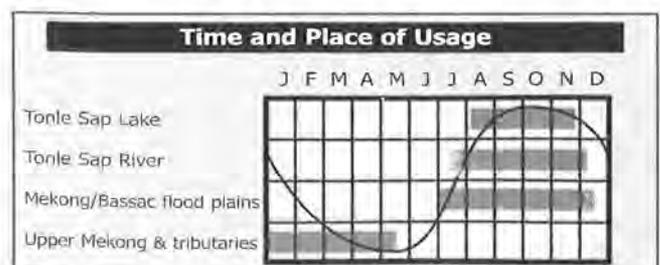
Construction and operation of spears seems to be undertaken only by men.

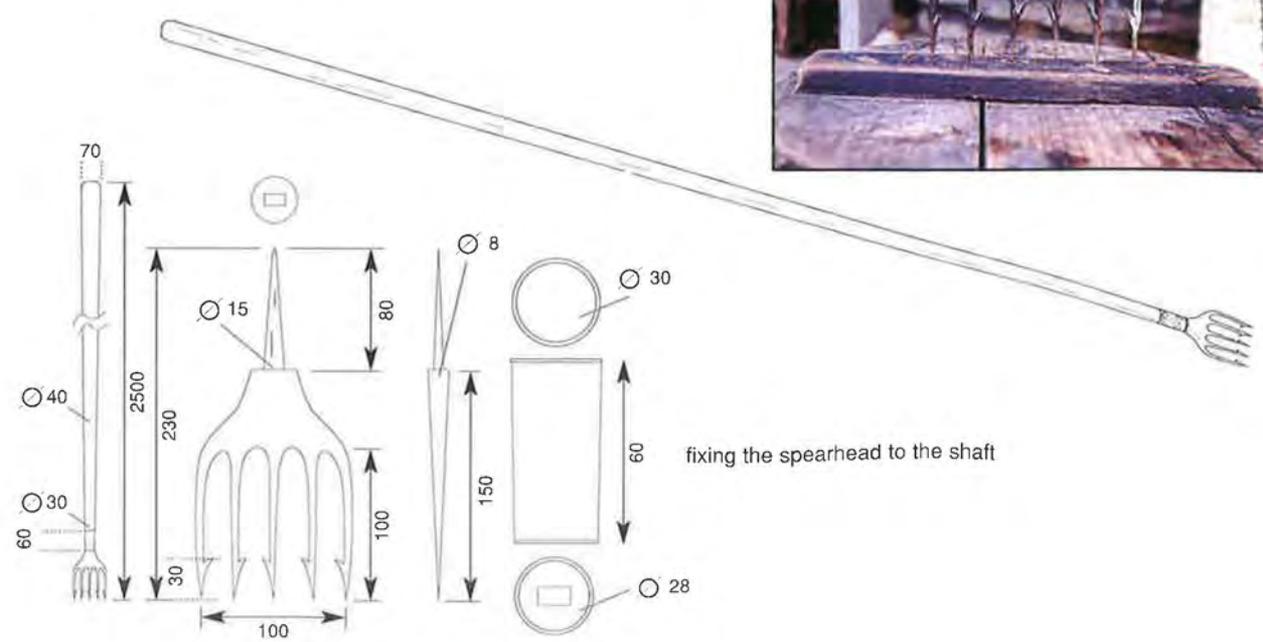
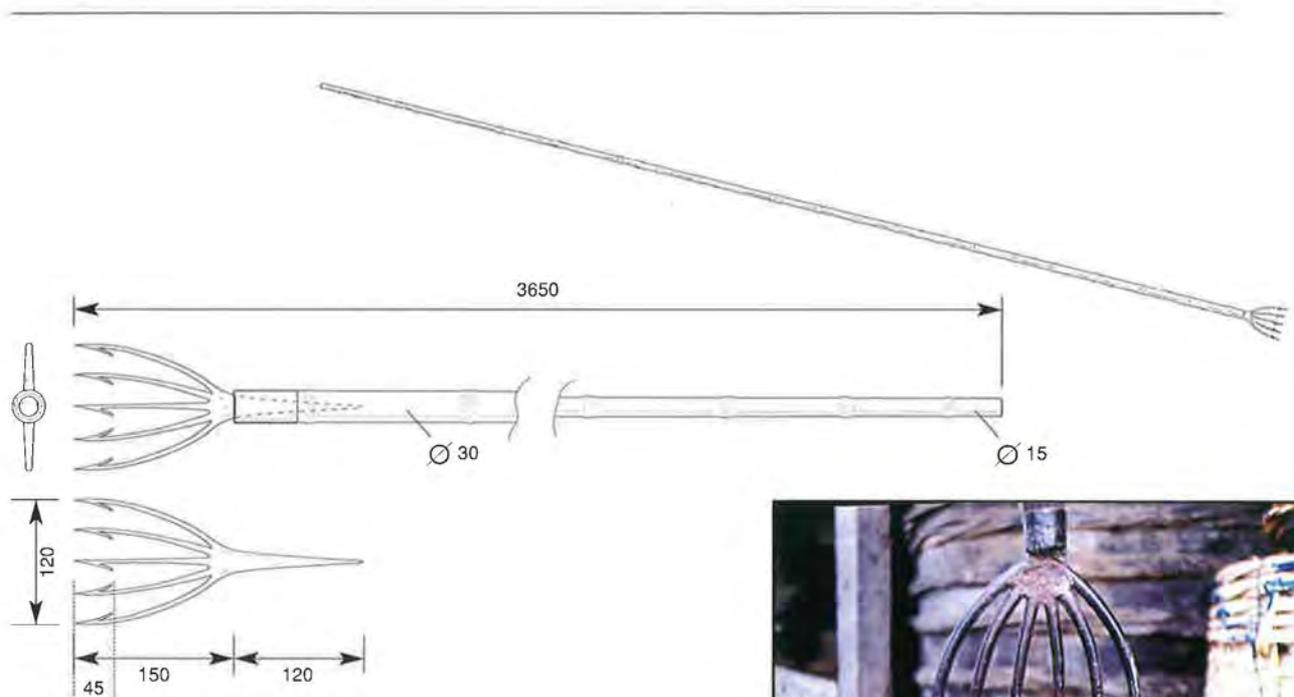
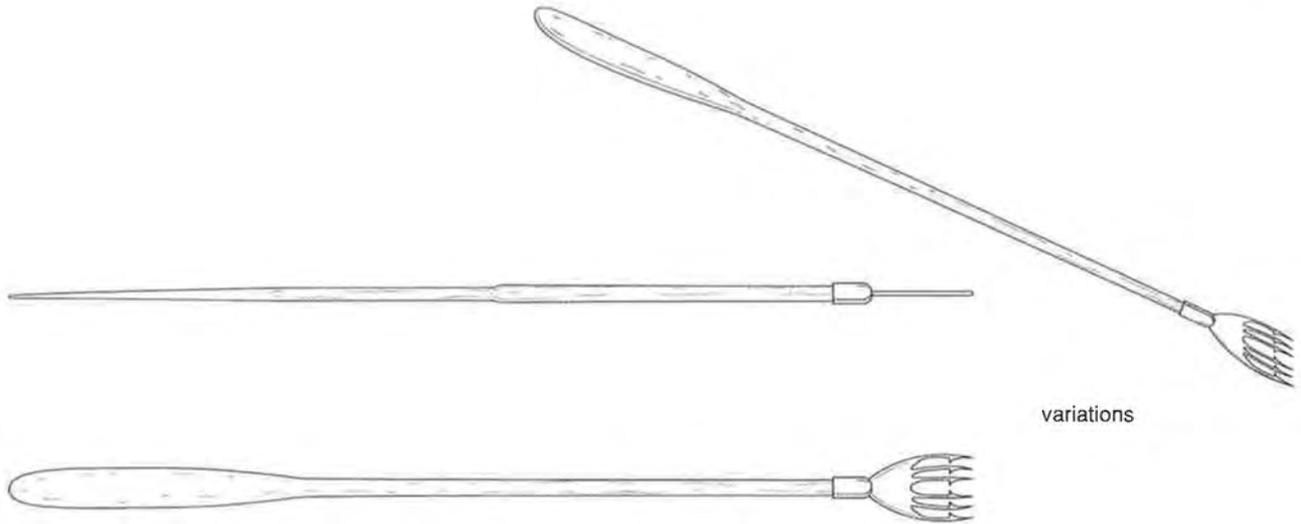
Target species

Snakeheads (*Channa* spp.), catfish (*Pangasius* spp.), trey sandai (*Wallago* spp.), water snakes (*Enhydris* spp., *Homalopsis bucata*, and *Erpeton tentaculatum*).

Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR).

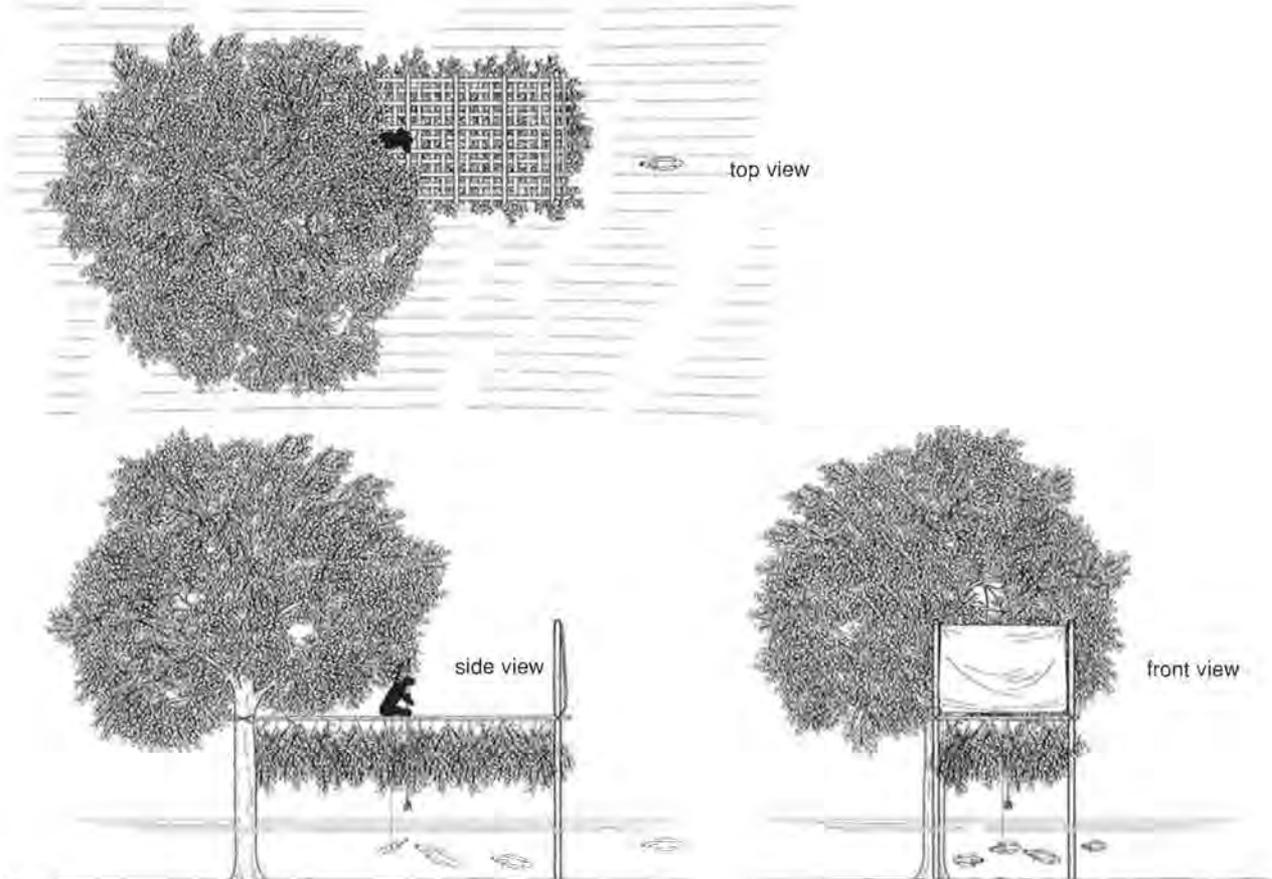




Multi-pronged Barbed Spear (cont.)

Sang Rumphsom Thneah

Operation B

**Description**

The fishing gear installation consists out of a rectangle platform made out of wooden poles mounted horizontally on sustaining wooden pillars close to a tree in the flooded forest. The tree provides additional stability and most importantly shade to the platform. The platform measures around 3 x 4 m and has a hole (40 x 40 cm) in its middle. Below the platform, bundles of tree branches are hung just above the water surface. At the edge opposite of the tree a piece of cloth is suspended to provide additional shade to the platform. It is preferably situated above paths fish move along through the flooded forest. For the purpose of this type of fishing operation a five- or six-pronged spearhead is fixed to a 3.5 m long thin bamboo pole (instead of the usual wooden pole with a carved paddle at the other end).

Operation B: from hideout platform

This fishing operation is a combination of spear fishing (wounding gear with sharp projectiles) and a FAD (fish attracting device).

This spear fishing installation is used exclusively in the flood forest area around the Great Lake Tonle Sap during the peak flooding season targeting specifically snakeheads. The shade of the installation and the additional lure attract the fish. The fisherman, waiting

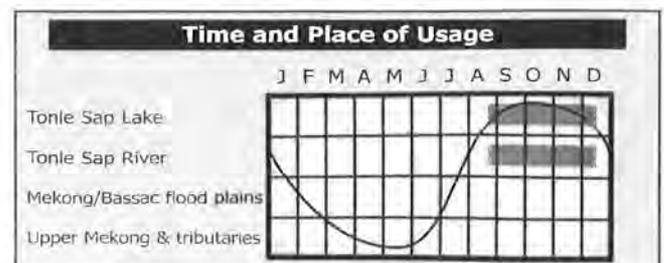
on top of the platform, spears through the small fishing hole. A dead snakehead or other fish species - even a wooden fish - is suspended on a line between 20 to 30 cm below the water surface to lure other snakeheads to the spot. This type of fishing is exclusively conducted during the day and could be regarded as the reversal of spear fishing at night with torchlight. Part of the fishing principle is that the fish cannot see the fisher, hidden in the shade of the tree. Sometimes electric fishing gear is used in combination with a spear.

Target species

Snakehead (*Channa* spp.).

Legal aspects

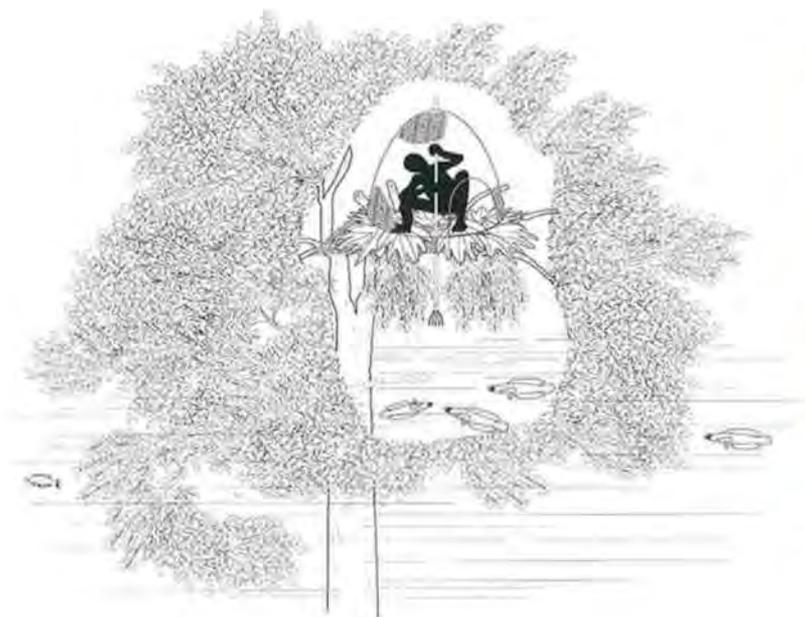
Small scale fishing gear (No. 028 KOR SOR KOR).



Multi-pronged Barbed Spear (cont.)

Sang Rumphsom Thneah

Operation C

**Operation C:** from 'igloo' hideout

This fishing operation is a variation of spear fishing, using a FAD (fish attracting device).

The operation is undertaken from a small 'igloo' type hut, installed on top of branches in flooded forest, around 1.5 m above the water surface. It is made of a frame of bamboo slats with grass or dried sugar palm leaves attached to it. The height of the igloo hut is usually between 1 to 1.30 m and its diameter at the base is about 0.80 to 1.20 m. A small door opening in the wall is covered by a blanket during the fishing operation to darken the interior as much as possible. To install the 'igloo', the branches of the selected tree are cut to form a sort of platform on which straw mats can be put, and the hut is then placed on top.

Like the previously mentioned spear operation this single-man fishing operation is exclusively used in the flooded forests around the Great Lake during the peak flooding period. Due to the darkness in the hut the snakehead cannot see the fisher. Through a hole in the branches the fisher lowers a snakehead attached to a line some 20 to 30 cm below the water surface luring other snakeheads to the spot. Once the snakehead appears the fisher pierces it with the spear. Its long bamboo handle can be manoeuvred freely through a small opening in the top of

the hut. After finishing the fishing operation the hut is easily removed and transported in a rowing boat. This particular type of installation has only been observed in the flooded forests of Kampong Thom province.

Gender aspects

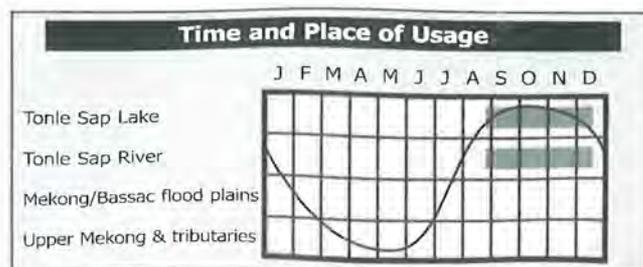
This type of fishing is undertaken only by men.

Target species

Snakehead (*Channa* spp.)

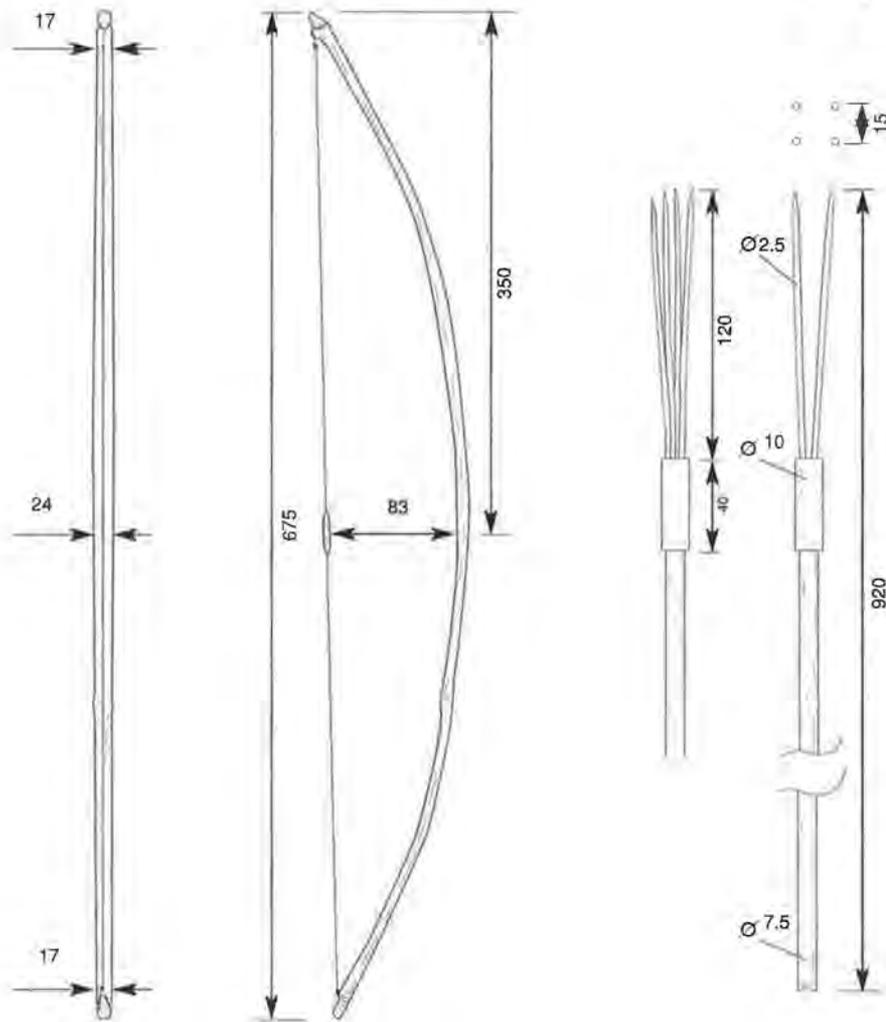
Legal aspects

The spear is classified as a small-scale fishing gear (No. 028 KOR SOR KOR). The different ways of operating are not classified and not mentioned. However, the use of "spears combined with illuminating lamp (to attract the fish)" is prohibited (Fiat Law on Fishery Management and Administration, No.33 KRO.CHOR Chapter 2, Article 17, D).



Bow and Arrow
Cross Bow
Spear Gun

Thnu Ban Trey
Snaa Ban Trey
Kamphleung Ban Trey



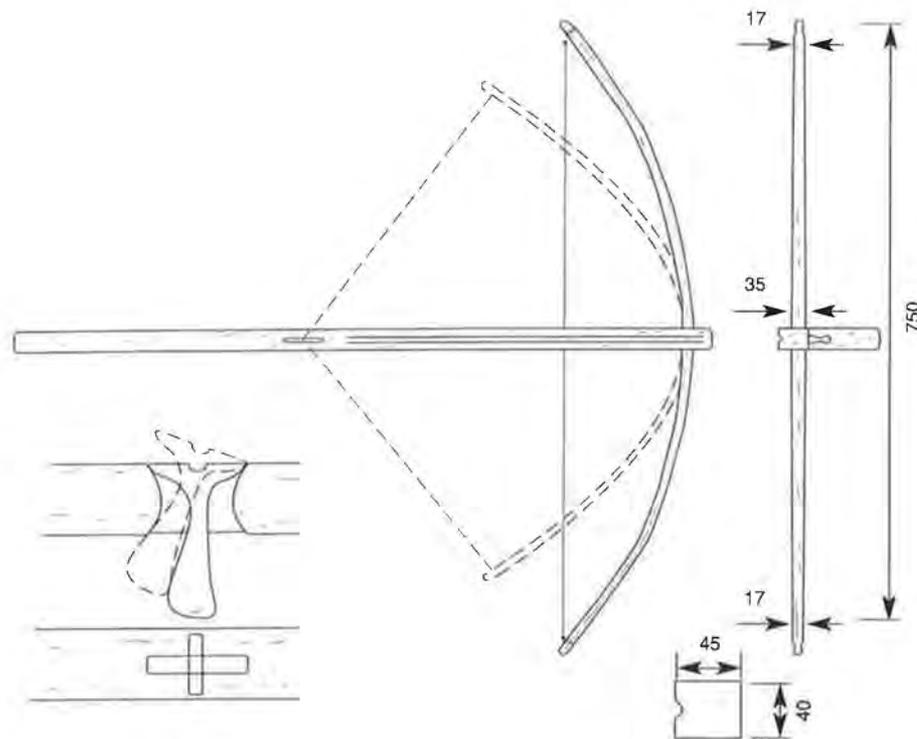
Descriptions

Bow and arrow is basically a hunting gear adapted to a fisheries setting. The bow is, like all hunting bows, made out of bamboo or a special hard wood, which needs to be soaked and fire hardened to make it resistant. The bow slat is around 7 to 8 mm thick and in its center 24 mm wide. Towards both ends its width is reduced to 17 mm. Small grooves at each side of the endpoints of the bow slat receive the string usually made out of twisted hemp fibers or nylon.

The arrow consists of a wooden shaft and a metal arrowhead that may be made of one to four pointed thin metal spikes (12 cm long and 2.5 mm diameter). These spikes are directly inserted into the arrow shaft and a metal cartridge case (40 mm long and 10 mm diameter) covers the shaft from the outside, thus stabilizing the spikes and preventing the wood from splitting. The spikes are often recycled from bicycle wheel spokes, both ends sharpened to points.

Cross bows can be found in many shapes and sizes; one of them is an imitation of a rifle. Its shaft is carved from a 4 cm thick wooden slat, fixed on a 85 cm long rifle body. A 74 cm long wooden bow is inserted, passing perpendicular through the front part of the rifle. The bowstring is pulled back by 31 cm to 'load' the weapon. On top and in the center of the front part of the rifle a straight guide groove is carved out to position the arrow. This allows for aiming at the fish. The arrows are made of bamboo sticks (3 mm diameter) and may or may not come with stabilizing dart wings at their end.

The **spear gun** together with a facemask is used for hunting fish under water. It has strong elastic bands attached to a shaft that can be strung out to a trigger for releasing a metal dart or spear, which often has a rope attached to it to facilitate retrieval.

**Cost**

R. 3.000 to 10.000

Operation

The bow and arrow may be used in many different settings throughout the year. Generally, during the rainy season or after rains in the dry season they are used for hunting frogs in rice fields and grasslands. In this case it is called thnu ban kongkaeb. The bow and arrow is also used in open waters in conjunction with a torch lamp during nighttime in the same way as a spear is operated.

The cross bow is a hunting and fishing device and it is used in the same way as the bow and arrow with the difference that it is quicker to handle. Once a fish is spotted it can be targeted and shot immediately without needing valuable seconds to tighten the bowstring by hand. Immediately after hitting a fish the fisher / hunter has to go after the catch in order not to lose it. The cross bow is operated mainly from a boat in inundated floodplains and close to floating vegetation where fish are likely to hide. In forest areas and upstream tributaries in Mondulakiri and Ratanakiri the crossbow is occasionally used in river fishery, as part of hunting excursions during the low level and clear water season.

The spear gun is a more recent addition.

Gender aspects

These gears are not used commonly; male children and youth mostly use them as a hunting toy, yielding valuable food for household consumption. Male adults may use them at night time in combination with a torchlight.

Target species

When the water is clear, from October to February, snakehead (*Channa* spp.) is targeted. Later on, when the water has all but evaporated, spiny eels (*Mastacembelus* spp.) stick their snouts out of the liquid mud to breathe during the hottest part of the day, thereby making a target for the fishers.

Legal aspects

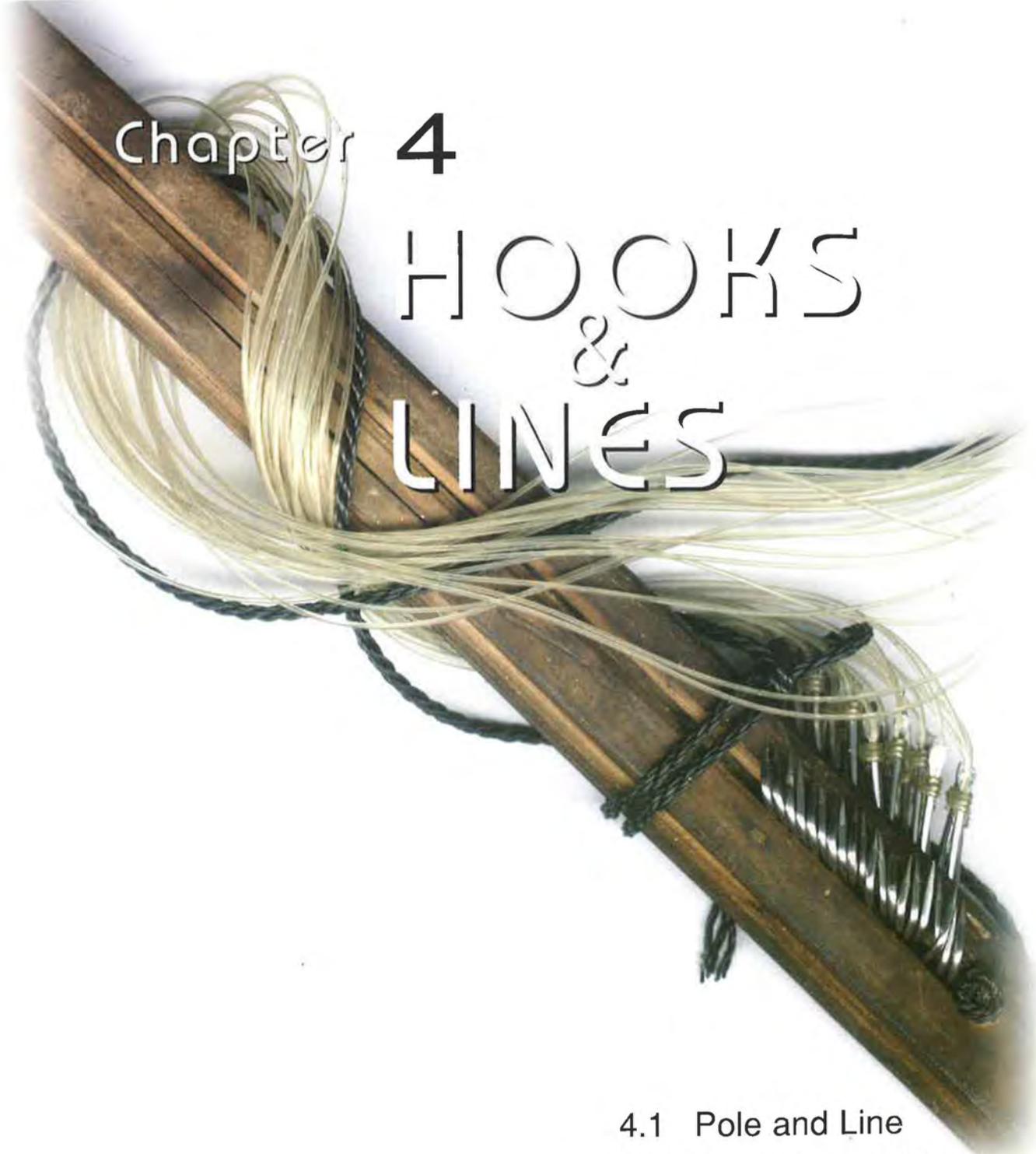
Not classified / not mentioned in the law..





Chapter 4

HOOKS & LINES

A photograph of a traditional wooden fishing pole, likely made of bamboo or a similar light wood. The pole is wrapped with a thick, braided black rope. A large bundle of thin, yellowish fishing lines is coiled around the pole. At the end of the pole, a set of metal hooks is visible, attached to the lines. The background is plain white.

- 4.1 Pole and Line
- 4.2 Set Pole and Line
- 4.3 Long Lines
- 4.4 Jump Traps

Common Fishing Rod

Santouch Bobok

Description

The *santouch bobok* consists of a rod with supporting device, a nylon line, a so-called gut cast wire and a hook. The cast wire, which protects the hook from being bitten off the nylon line is usually composed of a sequence of small twisted wires serving as basic swivels. The total length of the cast (between 3.5 and 155 cm) depends on the targeted fish species. For example, when more aggressive fish is targeted, the fisher may insert a longer cast wire. The bamboo rod is between 5 and 8 m long and the line is between 7.5 and 15 m long. The hook size varies considerably as well. Most frequently, the hooks are fabricated at home and don't follow any industrial standards. According to the gap opening, their size resembles those of industrial standard hook sizes between #5 and #8. In Kandal province a very big hook (#1) was observed while in Kampong Chhnang the gear carried a hook as small as #14. The smaller hooks can be easily purchased in gear shops, though.

A semi-circled or 'Y'-shaped wooden supporting device is inserted into the thick hollow end of a bamboo rod, which facilitates comfortable handling of the pole during the fishing operation.

Length of rod:	5 - 8 m
Length of line:	7.5 - 15 m
Length of cast:	3.5 - 155 cm
Hook size:	#5 - #10

Cost

R. 800 to 7.000

Operation

The common fishing rod, one of the most popular individual gears all over the country, is used mainly in inundated rice fields, small lakes or ponds, and creeks or canals. This gear is operated during the whole year in any kind of water body with relatively calm and still water and next to inundated or floating vegetation. It cannot be operated in small creeks in the forest areas due to lack of operational space (hooks get entangled in the branches). There are differences in bait and ways of using it in different seasons. It is reported that after rainfall the fish go for baited hooks more actively. The best daytime for operating the rod is either at dusk or at dawn.

For bait, different species of frogs, toads and geckos, as well as a huge variety of insects, are used. During the dry season small mice and baby birds are used. In areas with floating water hyacinth mats some of the water surface must be cleared. The fisher prepares



several vegetation-free paths, in order to avoid entangling of the hooks. The fisherman, standing on the shore or in the boat, or on a specially installed platform above the water surface (like those sometimes used in the cast net fishery), holds the rod upright and supports the rod end on one of his thighs. With the other hand he takes the line 50 to 80 cm above the baited hook and swings it in circles in order to achieve throwing force before he casts it into the targeted fishing spot. He then starts pulling it slowly towards himself. Once he senses a fish on the hook he moves it gently forward in order to invite the fish to bite once again. At the fish's second attempt to catch the bait the fisher jerks back the rod in order to hook the fish firmly. One 'path' is usually used 2 to 3 times before the fisher changes to another path or spot.

Gender aspects

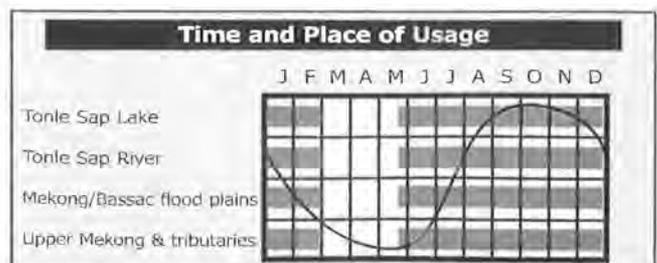
Only men make this gear.

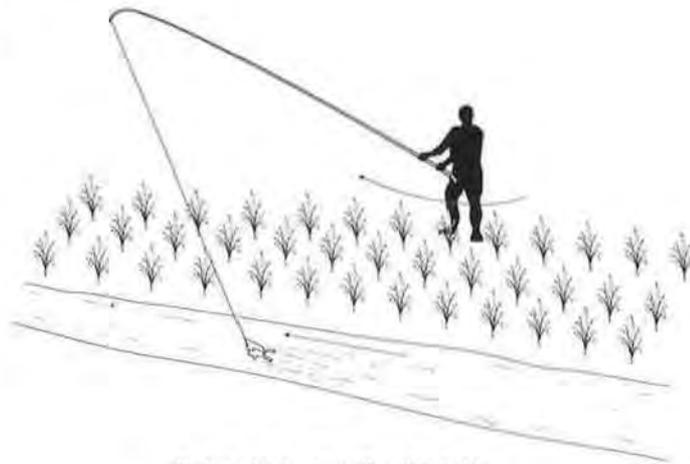
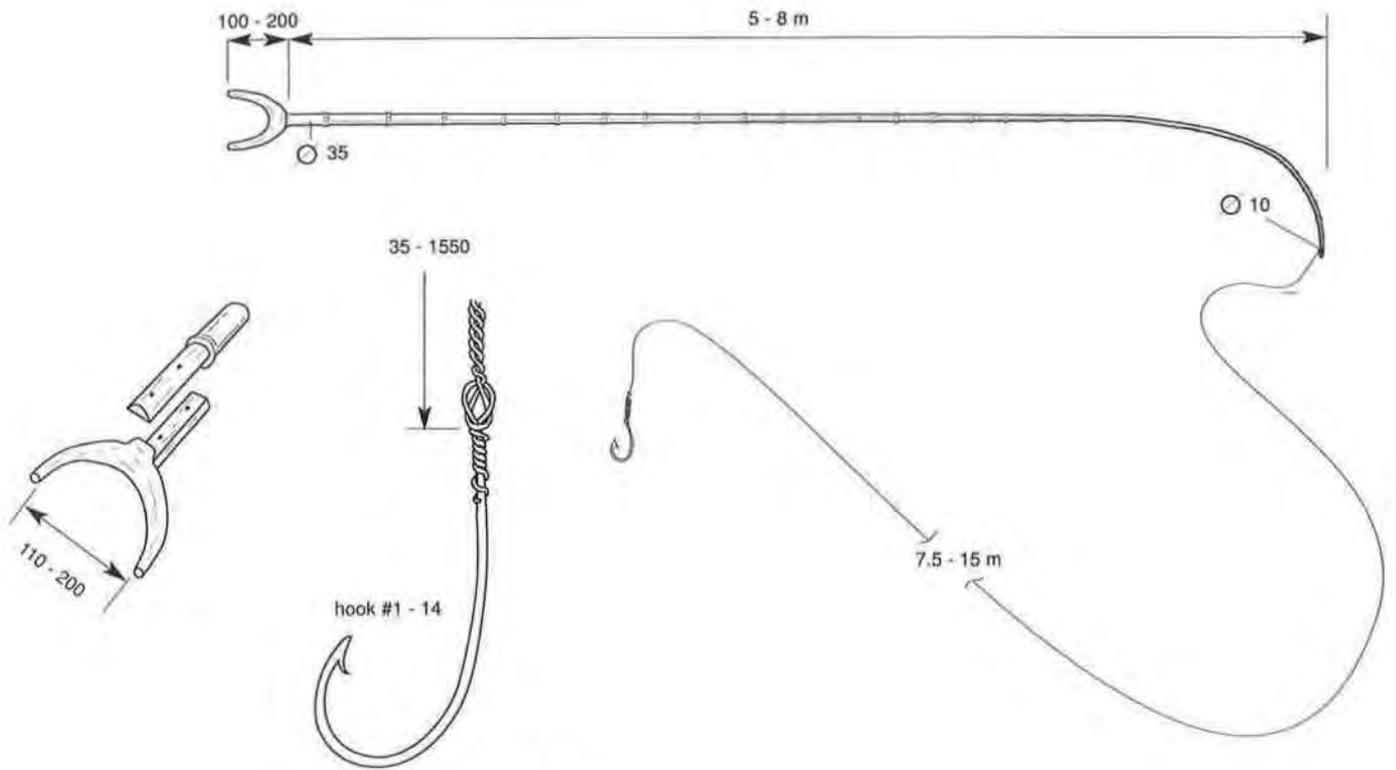
Target species

Snakehead, trey raws (*Channa striata*), accidental catch of frogs.

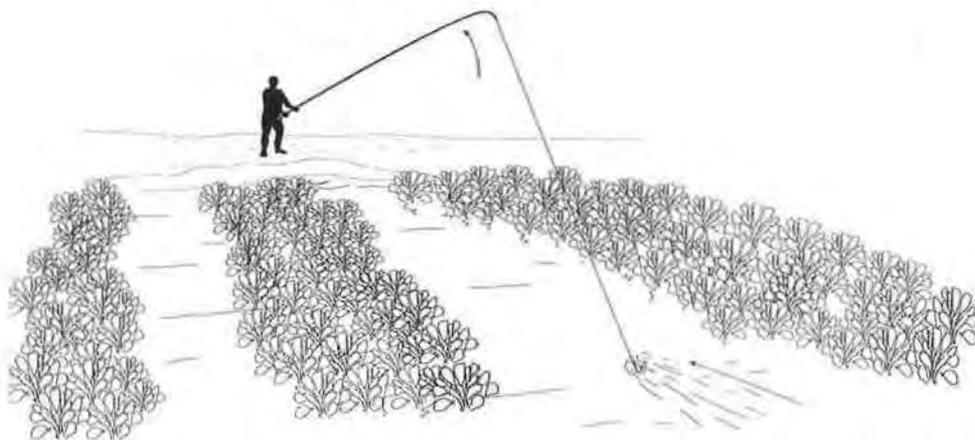
Legal aspects

Small scale fishing gear (No. 028 KOR SOR KOR)





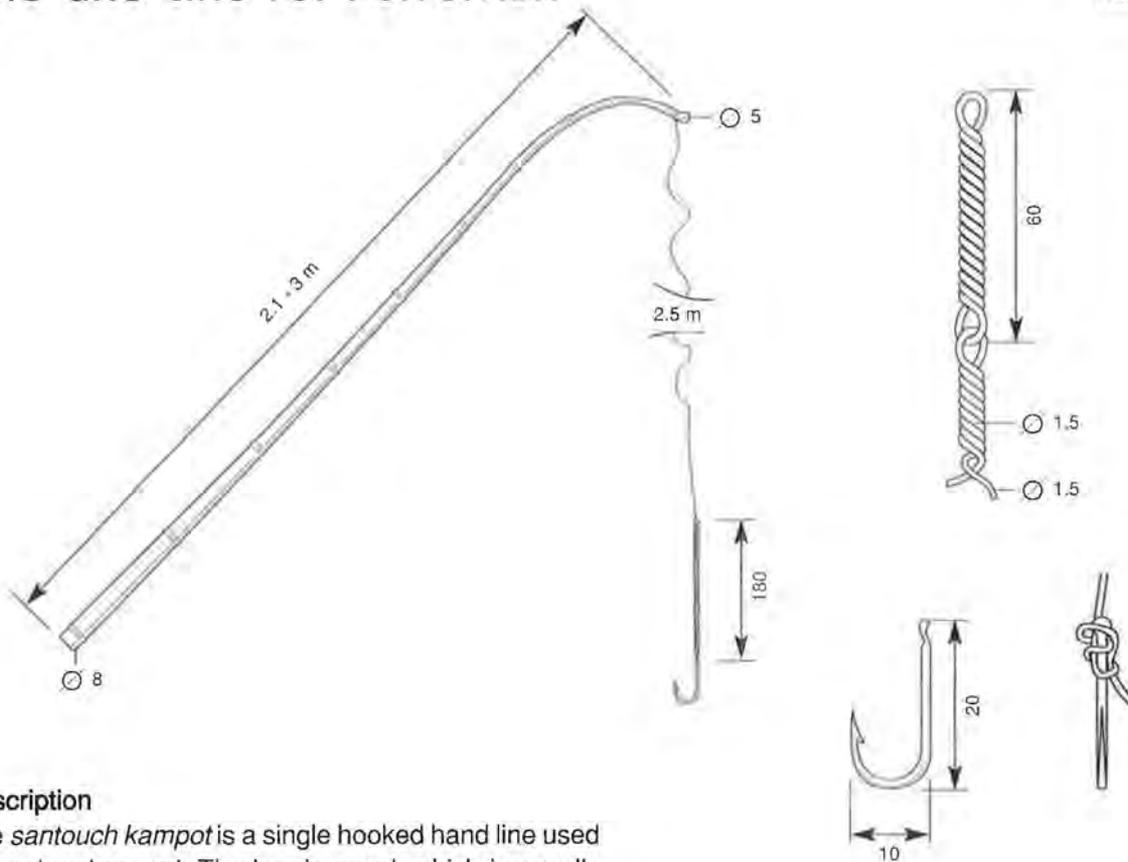
Fishing for frogs in the rice fields



Fishing for snakehead in man made vegetation free paths

Pole and Line for Pufferfish

Santouch Kampot



Description

The *santouch kampot* is a single hooked hand line used with a bamboo rod. The bamboo rod, which is usually more than 2 m long, is slightly curved. The hook line is fixed on the thinner end (Ø5 mm). The hook is directly connected to a sequence of three swivels, made of twisted wire and serving as a gut cast. The use of wire is a security measure, since puffer fish have a very sharp beak and can easily bite through nylon line. In total, the three segments of swivels are 18 cm long; the last one is hung into the nylon line by means of a reef knot. The nylon line is around 2.5 m long.

Cost
R. 500

Operation

This puffer fish rod is only reported from Takeo province, where it is used exclusively in rivers or canals during the beginning of the recession period. Puffer fish do not occur in rice fields, nor in inundated grasslands or flooded forests. The rod is preferably baited with trey linh (*Thynnichthys thynnoides*) but also snails and small crabs are used. The wire elements of the hook line also function as sinkers, submerging the baited hook on the bottom of the river. Trey kampot is usually processed into long lasting dried salted fish, popular with people drinking alcohol.

Gender aspects

No gender discrimination is observed. Women and children are very much involved in this type of fishery.

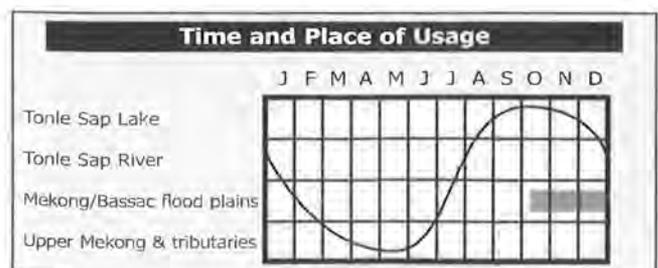


Target species

Trey kampot or puffer fish (Tetraodontidae).

Legal aspects

Not classified / not mentioned in the law.



C L O S E - U P



Line for pufferfish, made of twisted wire because of the puffer fish's sharp beak

Pole and Line for Frogs

Santouch Bobok Kongkaeb



Description

The *santouch bobok kongkaeb* consists of a single hooked hand line attached to a long bamboo rod. The rod, which is usually more than 3 m long (in Kg. Chhnang a rod of 12 m length was reported), is slightly curved and the hook line is fixed on its thinner end (\varnothing 20 mm). The nylon line is between 3 and 4 m long. It may come with or without a hook, depending on the type of operation it is used for. When equipped with a hook it may have the following characteristics: gap: 6 mm; length: 20 mm; throat: 7 mm (approx. #13 or #14). A fork-shaped wooden supporting device is attached to the thick end of the bamboo rod.

Cost

R. 800

Operation

This frog angling gear can be used during the whole year. However, it is more frequently used in small ponds and lotus fields during the dry season; during the rainy season other more efficient methods to catch frogs are used. Favorite baits are small to medium-sized frogs, but also insects such as dragon flies and beetles or even the yellow flowers of the *nonoong* plant (*Solanum melongena*) are used. During the fishing operation the rod rests with its Y-shaped supporting device on the fisher's upper leg. By means of a short striking movement the hook is swung out onto the water surface and pulled back with small jerking movements. This type of fishery is also called surf fishing.

a. Operation without hook

A small to medium-sized frog is attached to the end of the hook-less branch line by means of a tightened loop. Any frog lurking between the surface vegetation close enough to the path of the surfing

bait may snap at it. A big frog may bite into the bait frog though it may not be able to swallow it, but it would cling firmly to the smaller frog. The fisher may lift the catch and maneuver it above a textile bag. As soon as the bigger frog is touched, it releases the bait and falls down into the bag.

b. Operation with hook

The hook is inserted into the bait frog. The point of the hook is covered with a short stalk of cassava leaf or morning glory. This prevents the point getting hooked in any kind of vegetation or floating objects. As described above, the big frog will cling firmly to the bait frog. Insects or similar bait can also be inserted onto the barbed hook, covering its point. By snapping at the bait the frog gets hooked and can easily be retrieved from the fishing ground.

Gender aspects

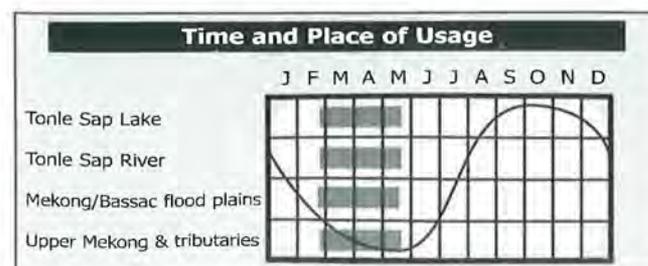
No gender discrimination is observed. Women and children are very much involved in this type of fishery.

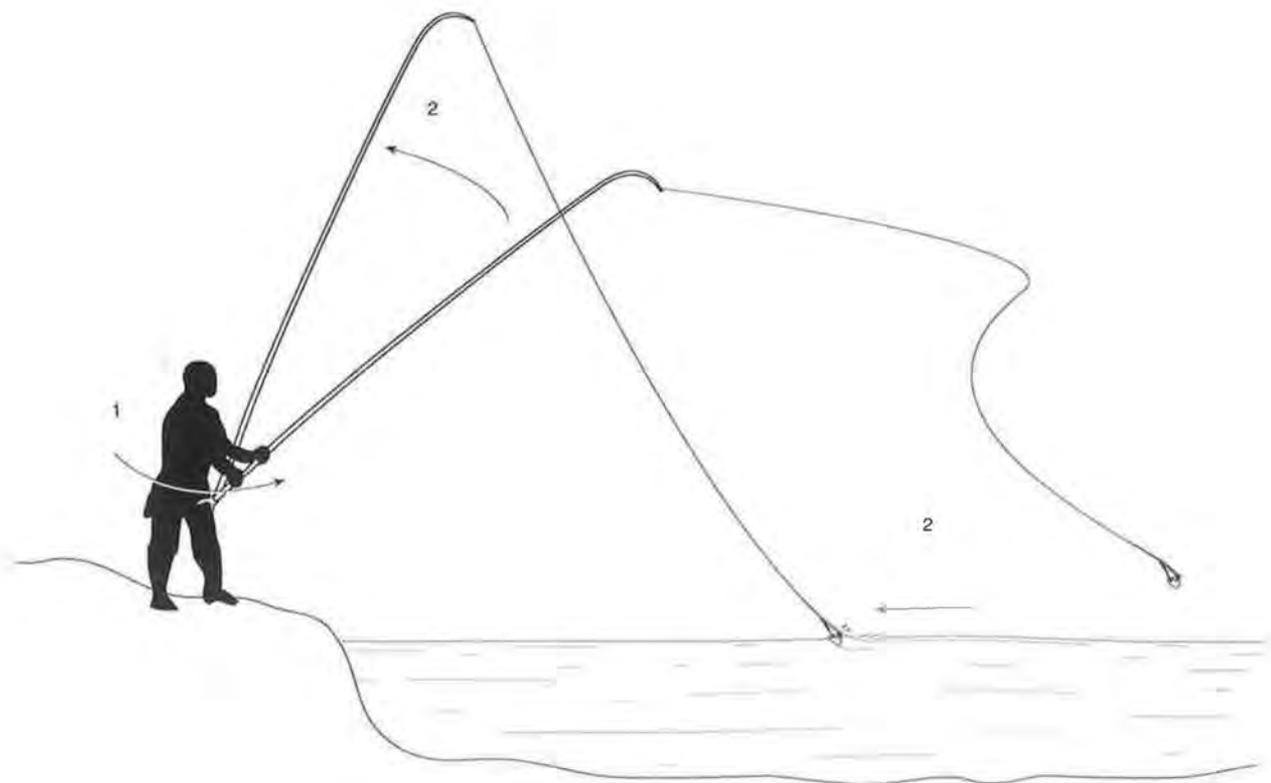
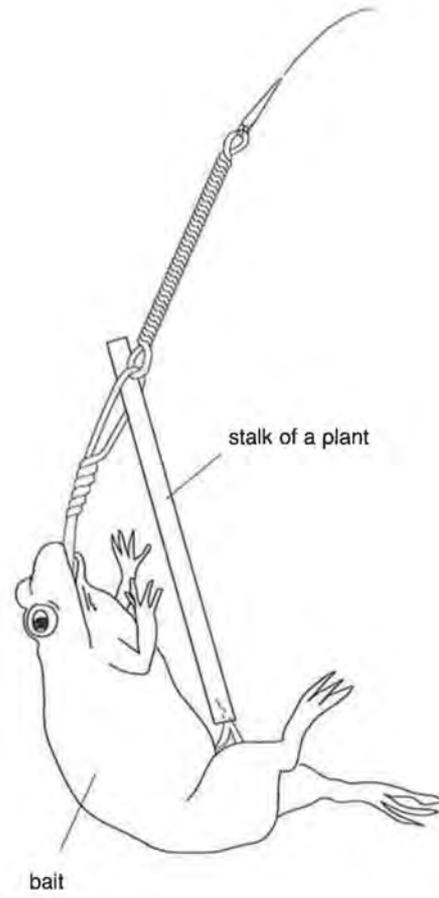
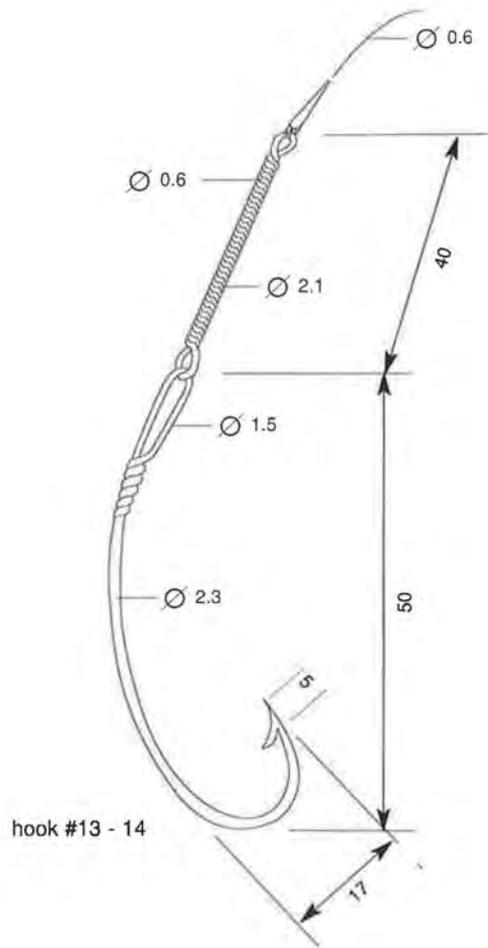
Target species

Frogs.

Legal aspects

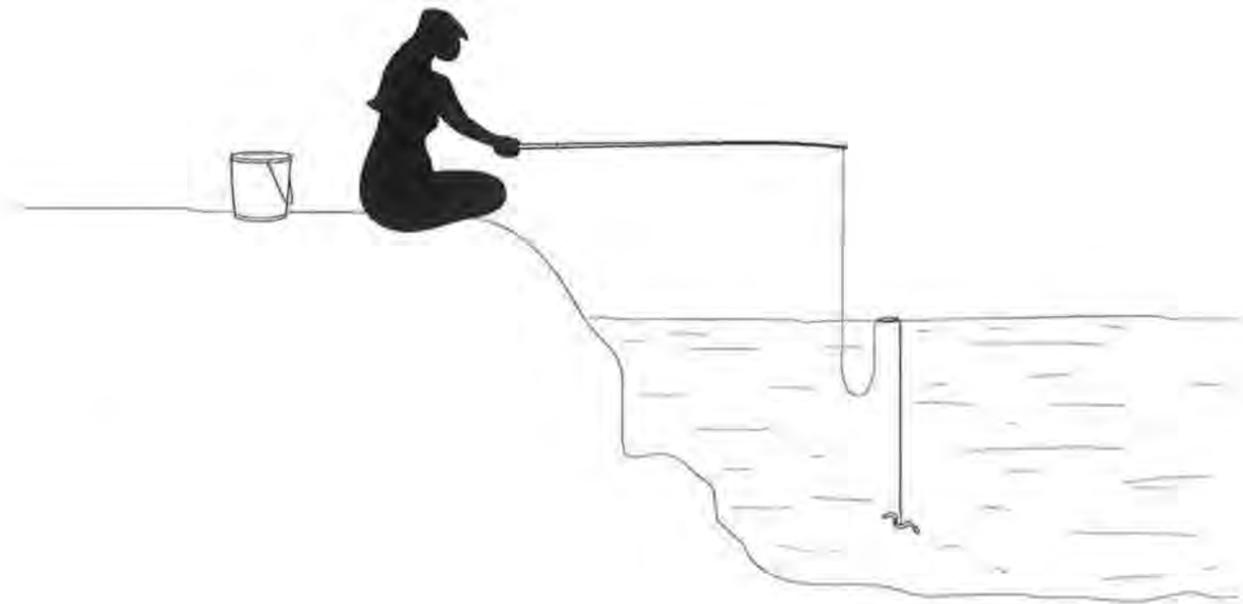
Not classified / not mentioned. It may be classified as "santouch bobok", which is legally classified as a small-scale fishing gear, since the operation is identical.





Common Single Hook Line

Santouch Phlaye Muoy

**Description**

The *santouch phlaye muoy* is a very basic hand rod consisting of a bamboo pole and a nylon line with a hook. The rod is between 1.3 and 2.3 m long and its line is approximately the same length as the rod. The end of the line (\varnothing 0.6 to 1 mm) is attached to a small hook, generally size #15. A float, usually made of a small piece of plastic foam (cut out of an old sandal or flip-flop), is inserted onto the line and positioned above the hook to establish the fishing depth. Sometimes, a small lead sinker is attached to the line between the hook and the float, but closer to the hook. It may take less than half an hour to assemble the gear.

Cost

R. 4.000 to 6.000

Operation

This type of hand line is very popular and is used from the shore at any type of water body or from a boat, mainly in the middle of the recession period and the early flooding season. In most rivers it may be used throughout the dry season as well. Most frequently earthworms are used as bait, but also small live fish and snail meat or fish paste is used,

depending on what kind of fish is expected in a particular fishing ground.

Gender aspects

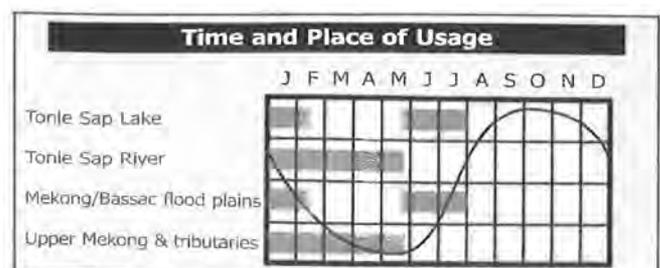
Mostly women and children use this rod line.

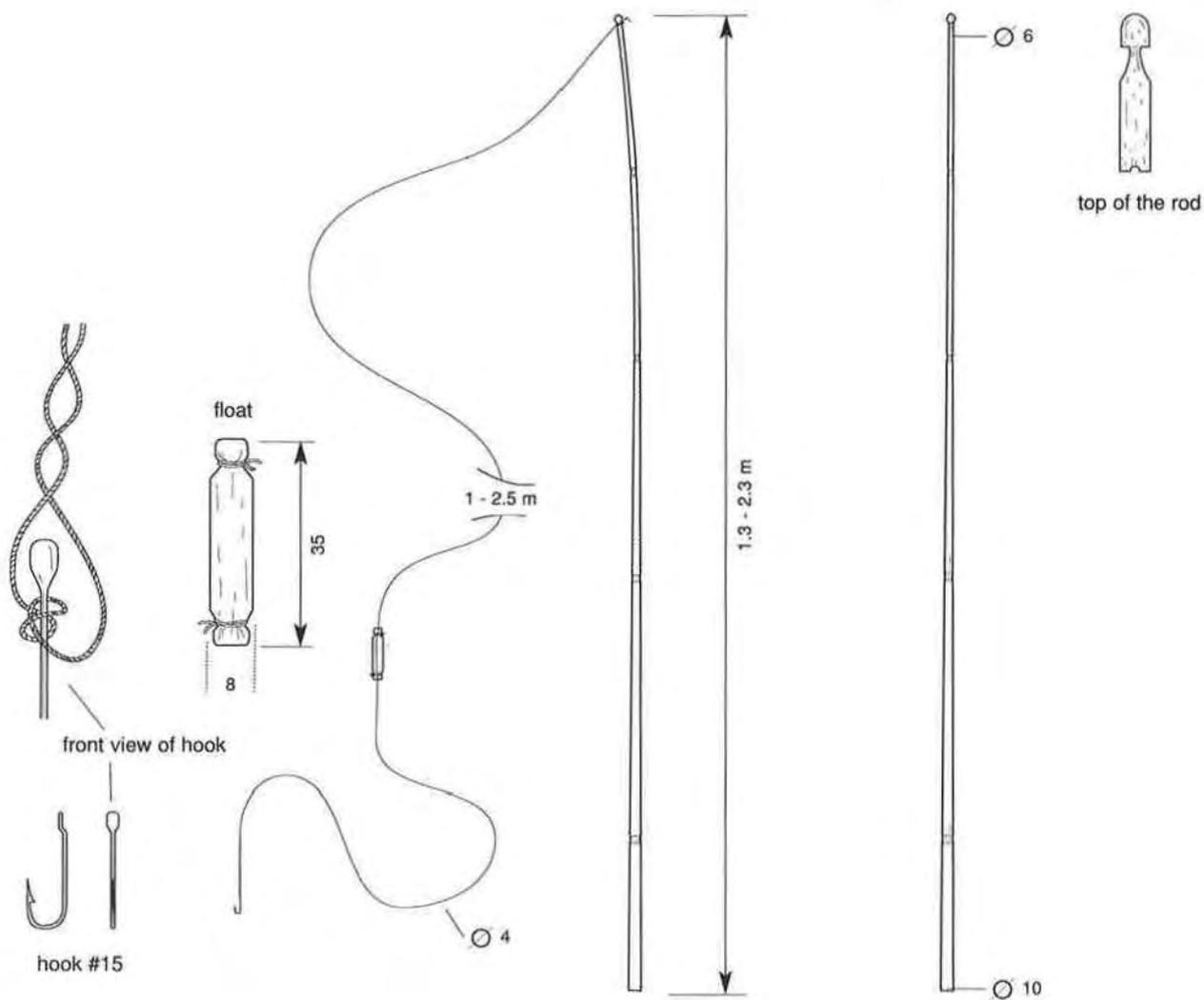
Target species

Mid-water and bottom dwelling fish such as trey kanchoh, trey chhlang (*mystus* spp.), trey chlounh (*Ma-crognathus* spp.), trey kranh (*Anabas testudineus*), trey andaing (*Clarias* spp.), trey krum (*Osteochilus melanopleurus*), trey kros (*Osteochilus* spp.)

Legal aspects

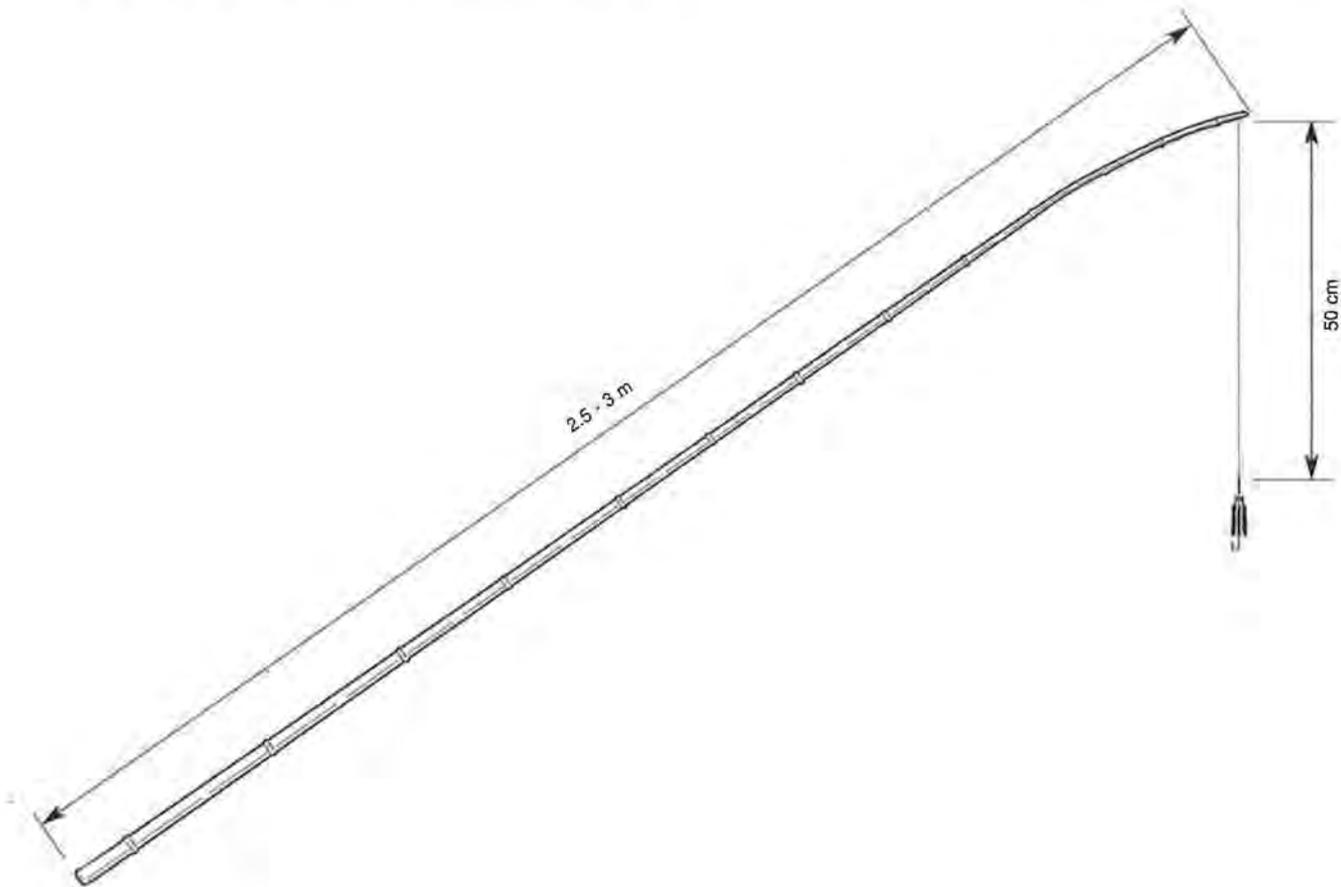
Small scale fishing gear





Hand Line with Feather Lure

Santouch Krovy

**Description**

The *santouch krovy* is a middle-sized pole and line gear that attracts the fish by means of a feather lure. The light bamboo rod is between 2.5 and 3 m long, attached to a relatively short line (50 cm). At the end of the line a hook (sometimes two; size between #3 and #6) is attached to the line by means of a wire cast of 8 to 12 cm length. Two split black feathers, i.e. four half feathers of 8 cm length, are fixed to a short, hollow, tube like body. Usually feathers of the darter (*Anhinga melanogaster*) are used. The line passes through this tube (in some cases a pen cap is perforated for this purpose), allowing the feather device to turn freely. A multiple knot establishes the position of the feather device on the wire cast and its distance to the hook.

Cost

R. 1000

Operation

This type of hand line has only been documented from Battambang and Pursat provinces. It is exclusively used in the flooded forest during the flooded season, targeting giant snakehead. The hook is baited with live trey kamphleanh (*Trichogaster*) or trey changwa (*Ras-*

bora). Generally, an individual fisher paddles out into the flood forest and watches out for schools of snakehead. The baited hook with feather lure is set onto the water surface and pulled with the rod back and forth describing half-circles (180°). The feathers tend to rotate like a fan, thereby catching the attention of the snakehead.

Gender aspects

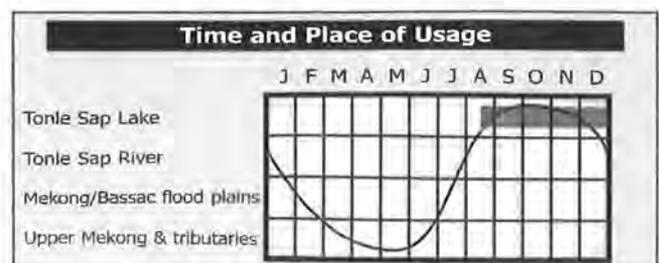
Only men were reported to operate this gear.

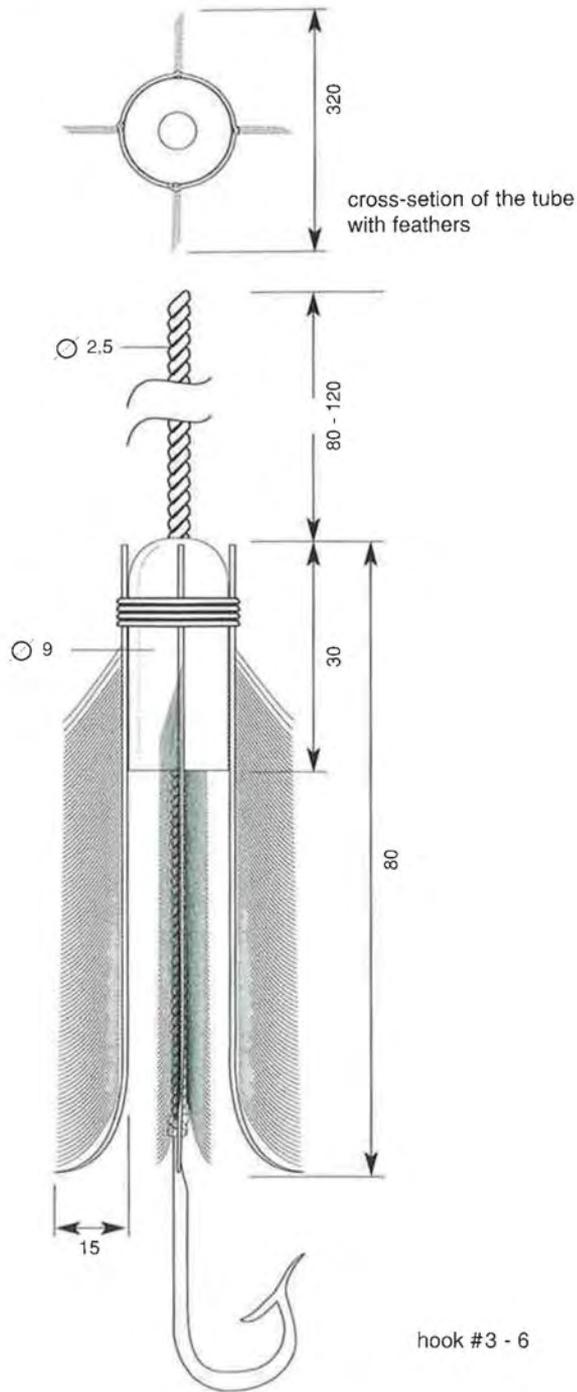
Target species

Snakehead (trej diep / trej chhdaor, *Channa* spp.)

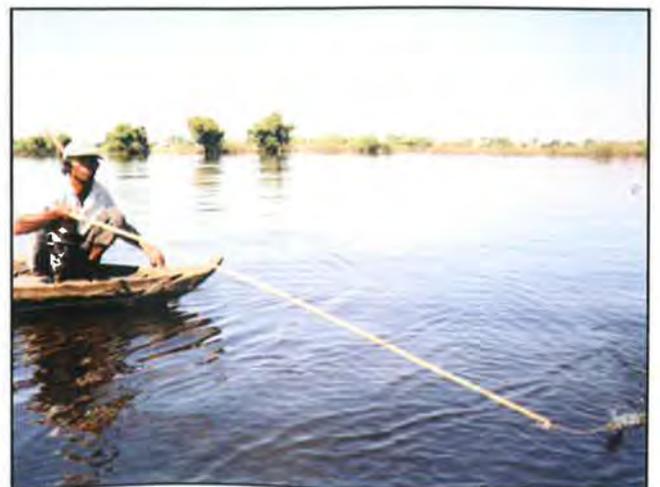
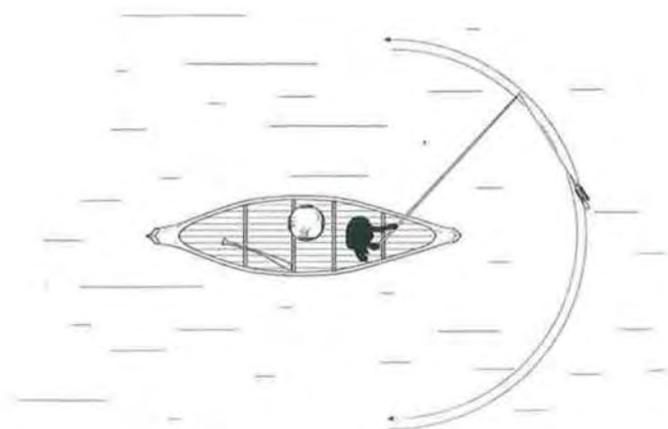
Legal aspects

Not classified / not mentioned in the law.



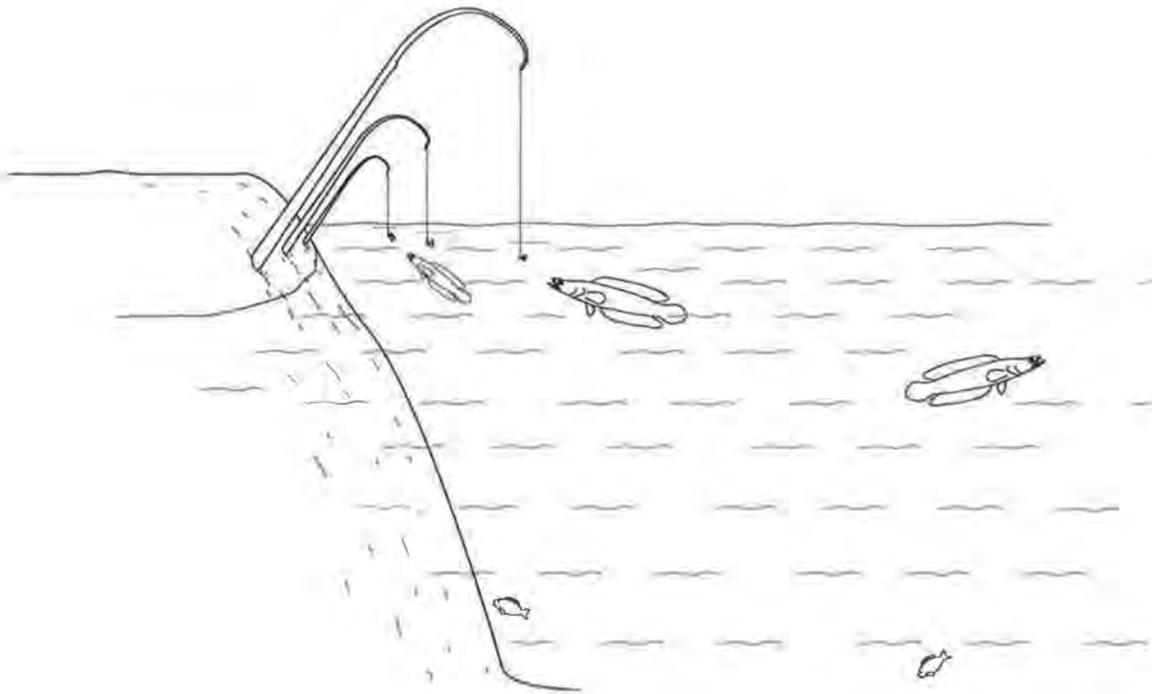


Variation with two hooks



Single Hook Set Pole and Line

Santouch Bongkai

**Description**

The *santouch bongkai* is a small-sized pole and line gear used as a passively operating set line. The bamboo rod is generally between 65 and 130 cm long; its thinner end is bent downwards slightly. In Kampong Chhnang an unusual 2 m long rod was observed. Most commonly the length of the line is between 30 and 40 percent of the length of the rod. The hook size is usually very small; size numbers 12, 13 and 14 are commonly used. While not in operation the hook is temporarily hung into a loop in order to avoid the line and hook entangling with other lines. Particularly so, since this gear is transported to the fishing ground in bundles of 50 or 100 rods.

Cost

R. 6.000 for a bundle of 100 rods.

Operation

This type of setline is very popular for fishing in rice fields during the rising flood season and to a lesser degree during the recession period. Occasionally it is used at river and canal banks. The rods are driven slightly inclined into the muddy soil close to the water, forming a long row of rods standing 2 to 3 m from each other. If baited with earthworms or, less often, with shrimps, the hooks are submerged at least 10 cm to

catch catfish; more often a small fish or small frog is used as bait right on the surface. Then the aim is to catch snake head. A fisher may set his rods out in late afternoon until early the following morning, checking them a few times at night.

Gender aspects

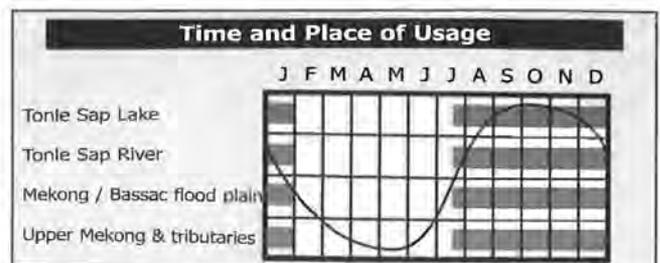
Women and children are very much involved in operating this gear.

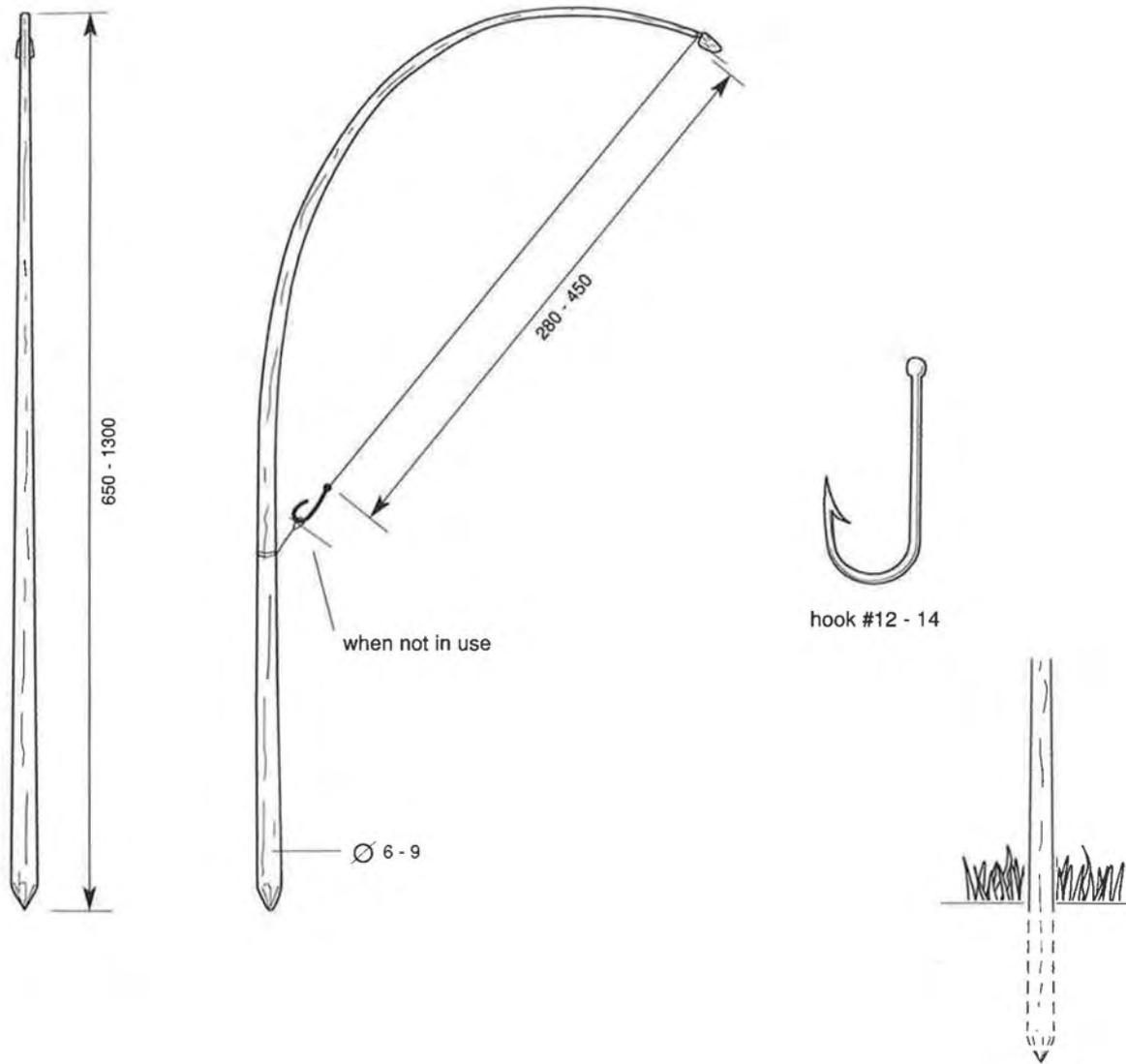
Target species

Snakehead, mainly *trey phtuok / trey raws (Channa striata)* in September to January, and catfish: *trey andaing, trey chhlang* and *trey kantchoh* in July to September.

Legal aspects

Not classified / not mentioned in the law.





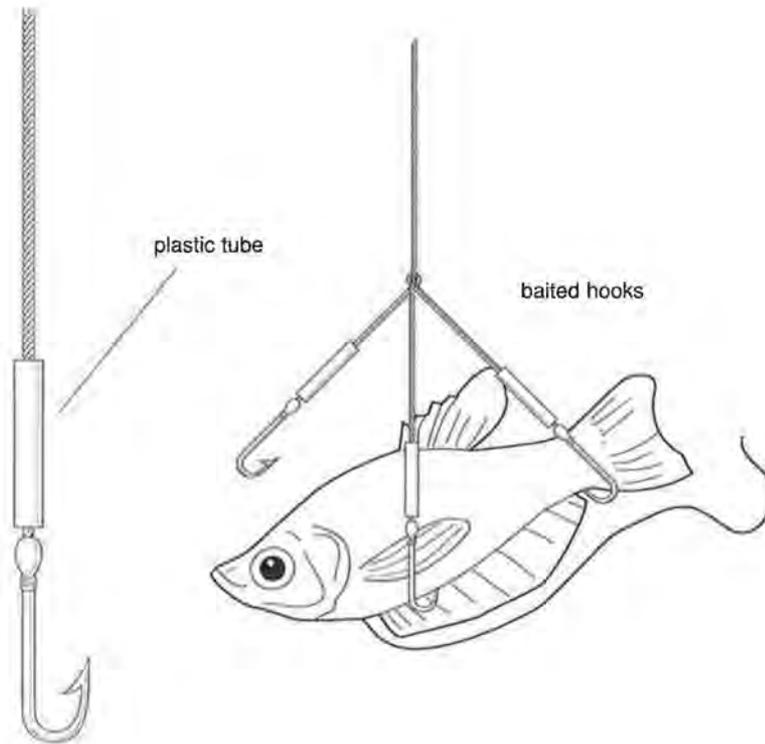
Fishermen carrying bundles poles.



Young fishers on their way to a fishing ground.

Set Line with Three Hooks

Santouch Bongkai Trey Chhdaor or Santouch Bongkai Phlaye Bei



Description

The *santouch bongkai troy chhdaor* consists of one or two short hand lines supporting a bundle of three hooks. Each of the hooks, sized between #5 and #9, is attached to a short snood, one of which is slightly longer (28 cm) than the other two (23 cm). The three snoods are attached at one point to the branch line, which can be a single or double nylon line. In some cases it may be fixed to a metal swivel and two anchor lines. The snoods are usually protected by a plastic tube located just above the hook in order to prevent the targeted fish (giant snakehead) from biting through the line.

Cost
R. 800 to 1.000

Operation

This treble hook line is typically used in the flooded forests during the flooding season. Live bait (climbing perch / troy kranh, botia / troy kanchrouk, gourami / troy kawmpleanh) is fixed to one or two of the hooks while

the line is attached to branches of inundated trees. One fisher usually operates several of these lines.

Gender aspects

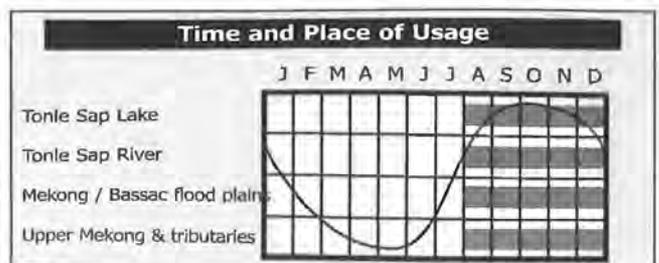
Mostly men use this gear.

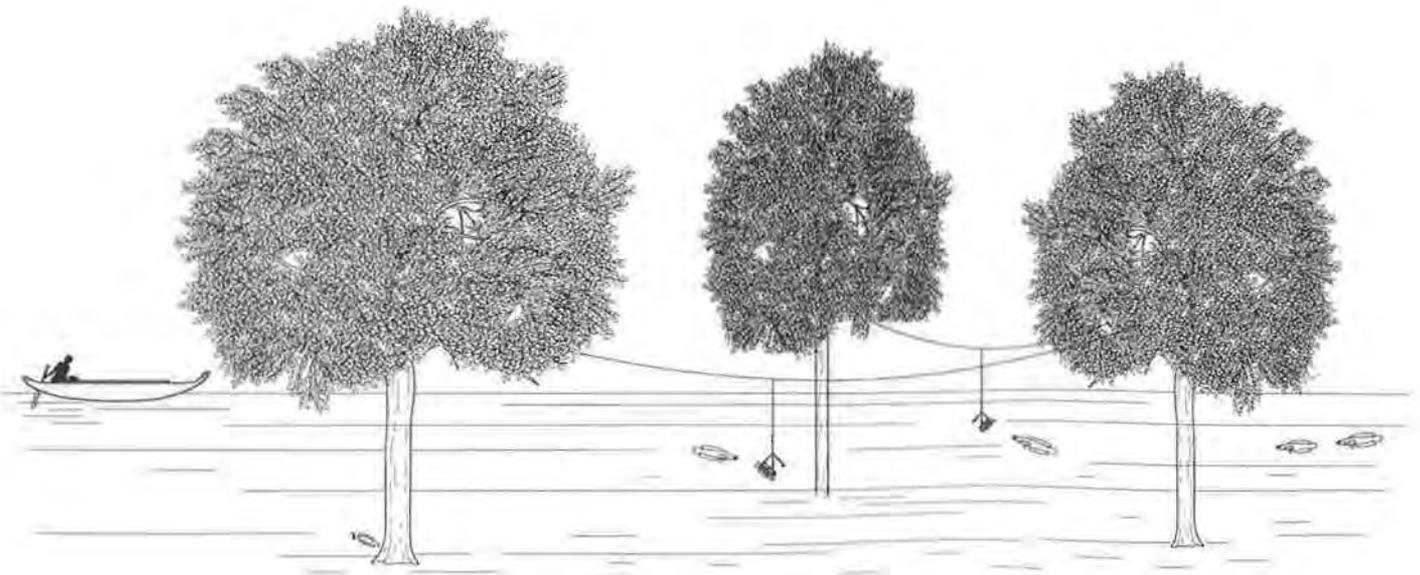
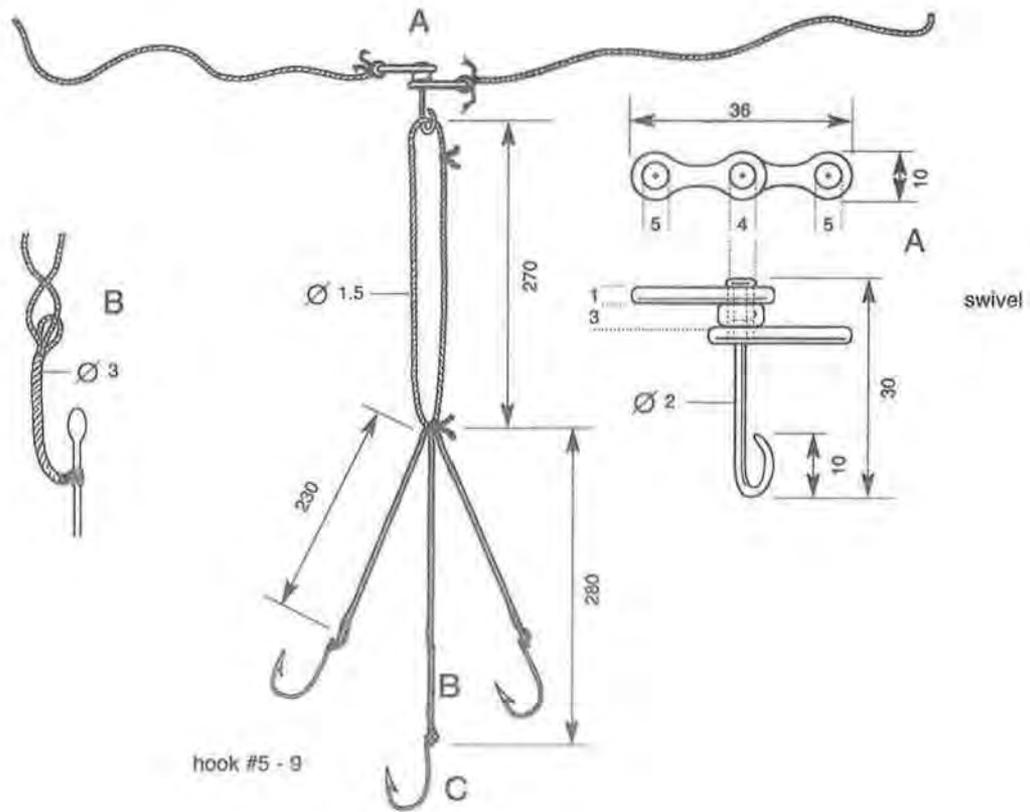
Target species

Snakehead (troy diep / troy chhdaor, *Channa micropeltes*)

Legal aspects

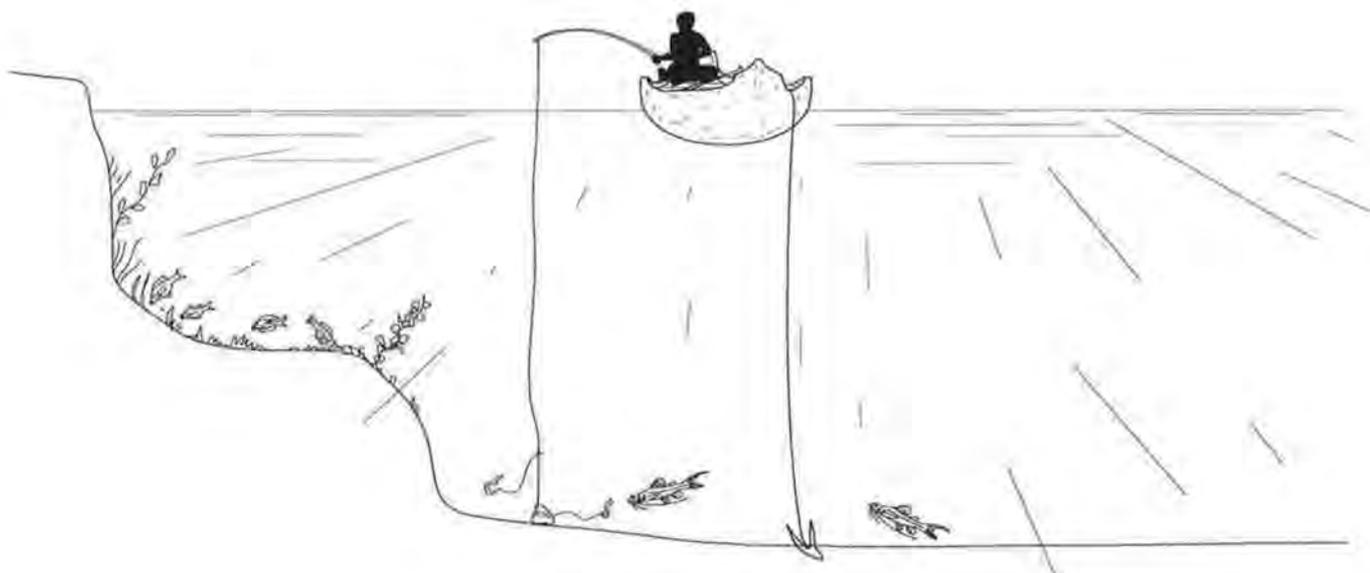
Not classified / no mentioned in the law.





Cast Hand Long Line

Santouch Bos

**Description**

The *santouch bos* long line is used as a bottom or mid-water long line, anchored on the bottom of a river and tied to a line holder on shore. The polyester branch line is about 25 m long, carrying up to 15 snoods with hooks evenly spaced at a distance of about 68 cm. The snoods are 20 cm long and the hook size is between #12 and #15. The end of the long line carries a heavy stone serving as cast weight as well as anchor. The line holder is a bended bamboo stick, which keeps the line under tension and allows it to dry after being used.

Other versions of *santouch bos* are double or triple hooked hand lines. While the first hook is directly attached to the branch line; the second or third hook is attached by means a snood. A lead or stone sinker is fixed to the branch line between the first and the second hook. Commonly in these versions of hand lines the branch line is wrapped up on the rod on a special device that permits winding up the line for storing and drying.

Cost

R. 1.000 to 1.500

Operation

The *santouch bos* long line is used in small rivers with weak currents at a depth of 2 to 3 m. The stone anchor at the end of the line is set out into the river as

far as possible, while the line holder is stuck into the bottom on the shore maintaining a certain tension on the line. Earthworms are commonly used as bait. The fisher hauls the line up once an hour in order to check the catch and re-bait the hooks if needed.

Cast hand long lines with only two or three hooks are mostly operated from boats.

Gender aspects

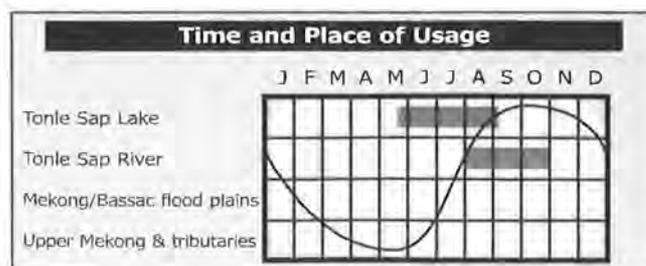
No gender discrimination is observed. Women and children are very much involved in this type of fishery.

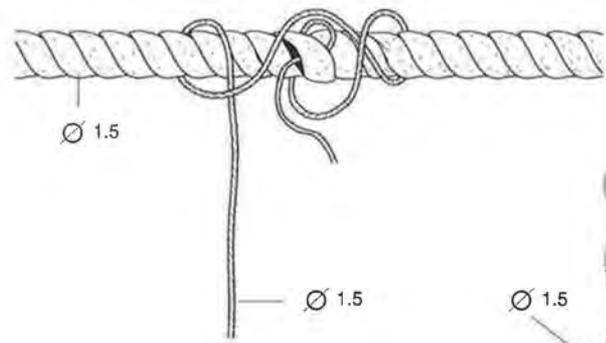
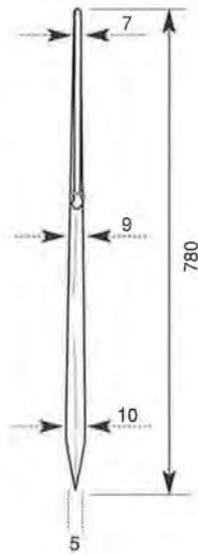
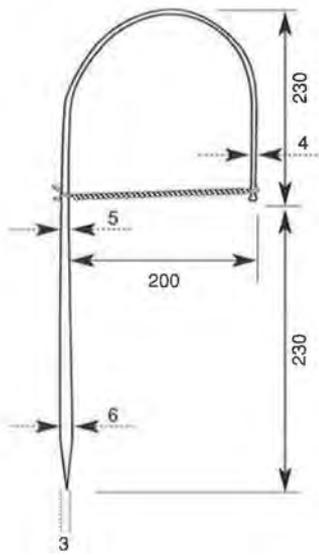
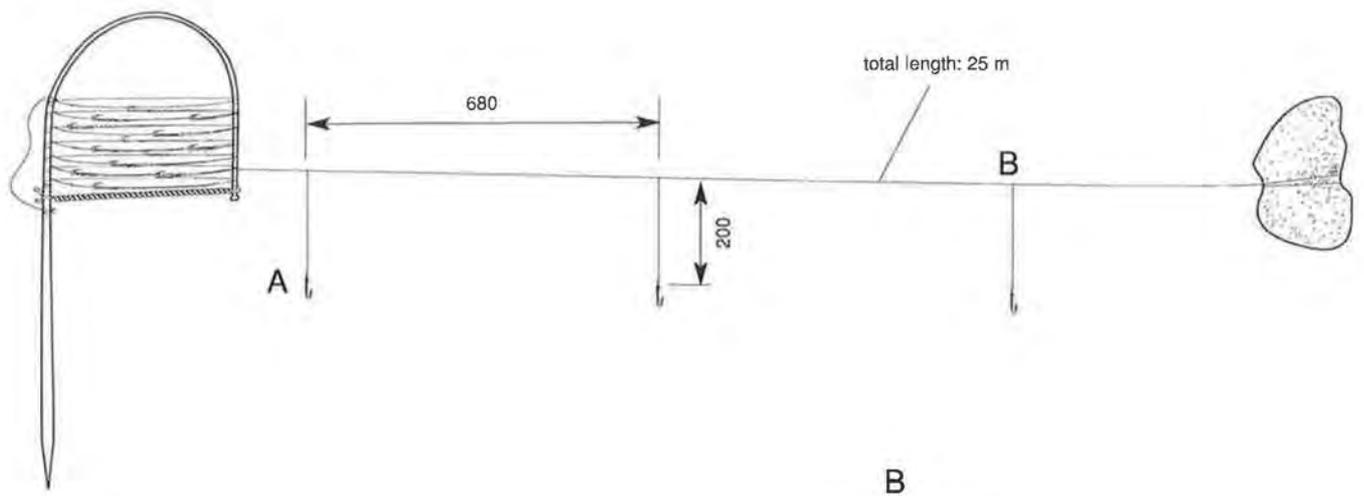
Target species

Bottom fish, like *trey chhlang*, *trey kanchoh*, *trey po*, *trey pra*.

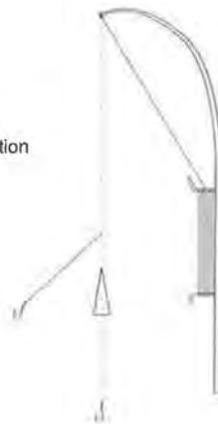
Legal aspects

Middle scale fishing gear (No. 028 KOR SOR KOR).

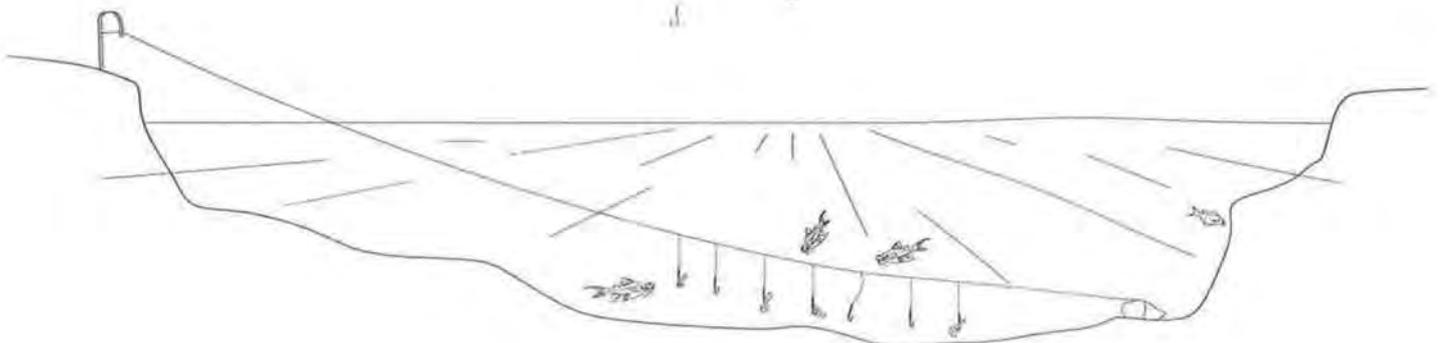




variation

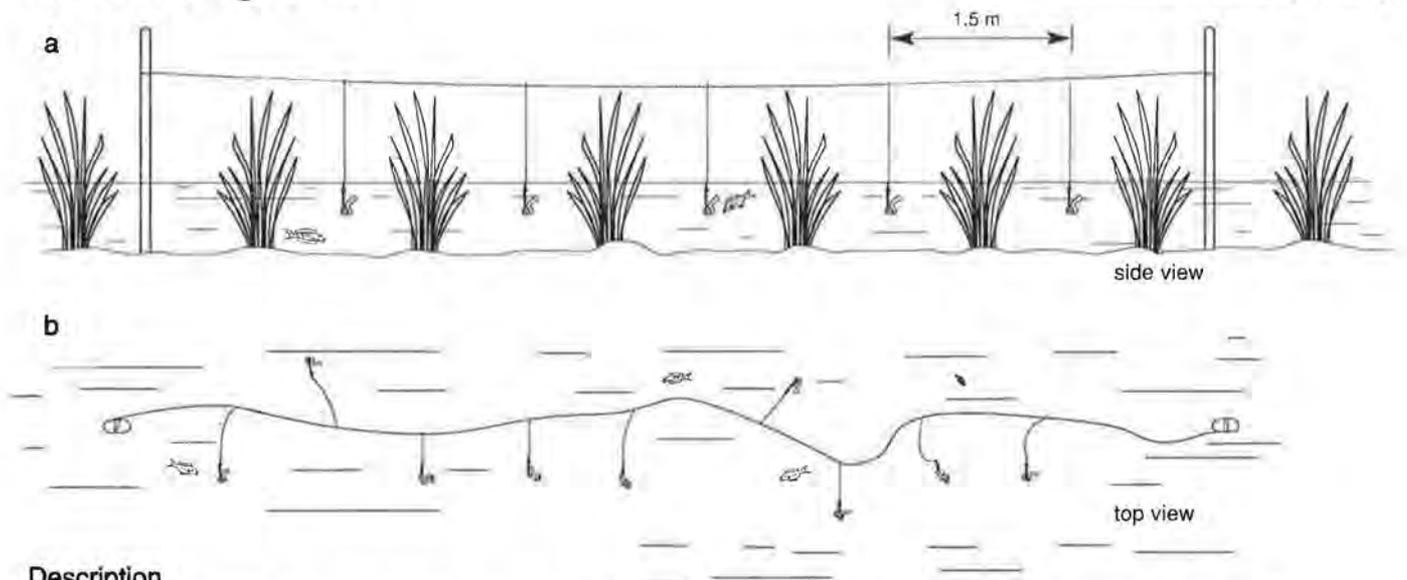


hook #12 - 15



Hook Long Line

Santouch Ronong (Sang)



Description

There is a huge variety of hook long lines, individually fabricated to match the fishing grounds where they are used, either as a bottom long line or as a surface long line. In any case the gear is composed by a long branch line carrying snoods (also called dropper-lines, leaders or gangions) at regular distances. The hooks are fixed at the end of the snoods. For bottom long lines the distance between the snoods is generally bigger than for surface long lines. The length of the snoods is generally longer for surface lines and shorter for bottom long lines. The bottom long line, in addition, is equipped with sinkers (mainly stones or bricks), anchors and floating markers. Commonly, a set long line has between 80 and 200 hooks. The longest bottom long lines are reported from the Great Lake Tonle Sap where they may have up to 2,500 hooks (Siem Reap). While surface lines are made entirely out of nylon fiber, the branch of the bottom long line is made of polyester and the snoods of nylon. Polyester fibers are commonly treated with resin or tar to increase their longevity.

Cost

R. 5.000 to 40.000 depending on the size and the materials used.

Operation

The hook long line is used during the whole year, although in the flood plains it is preferably operated during the rising flood.

a. Surface operation

The branch line is fixed above the water in a way that allows the baited hooks to only just submerge under the surface. In open rice fields especially installed sticks might be set up for this purpose. Where there are plants like grass, bushes or in flooded forests the branch line

can easily be fixed to the existing vegetation.

b. Bottom operation

The branch line is submerged by means of sinkers. The beginning and the end of the line are marked with poles in shallow waters and with floats in deeper water bodies. It is important to ascertain the right bait at the right time of the year for the specifically targeted fish. The usual long line fishing crew consists of 2 fishers, in general operating from a small boat.

Gender aspects

No gender discrimination is observed. Women and children are very much involved in this type of fishery.

Target species

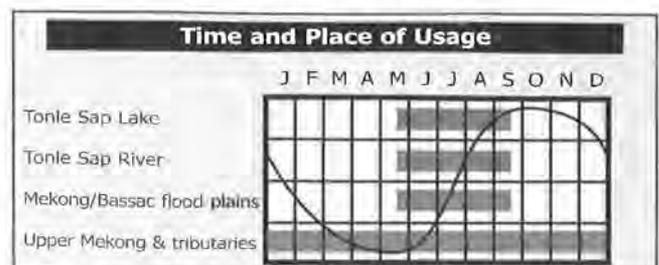
Depending on whether the long line is used as a surface line or as a bottom line.

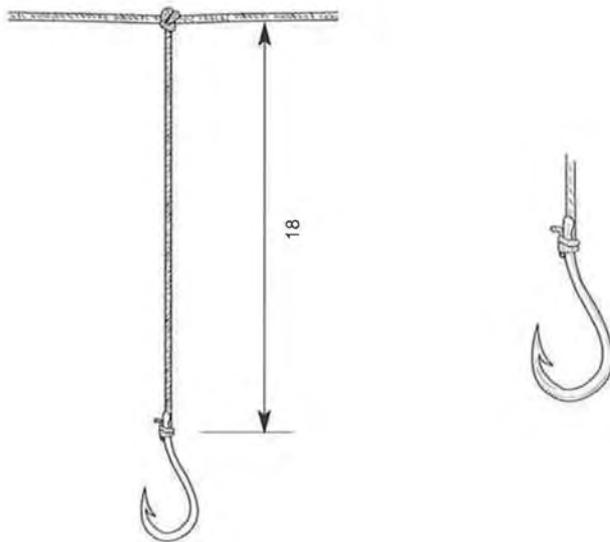
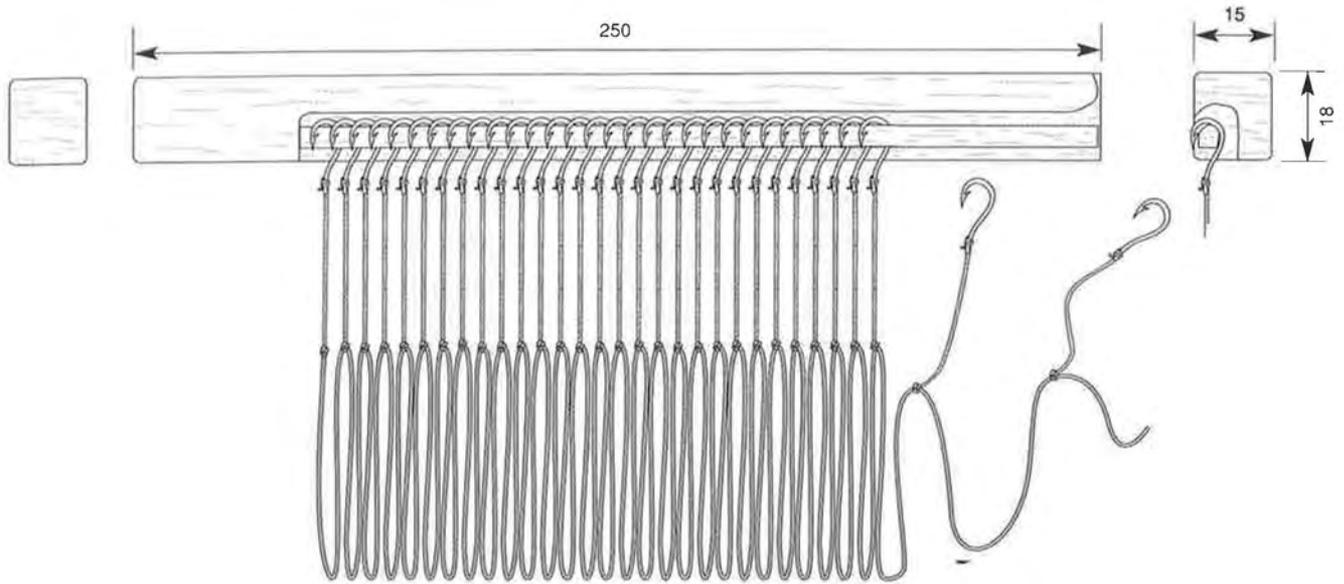
Surface line: trey phtouk / trey raws (*Channa striata*), trey kranh (*Anabas testudineus*), trey chhpin (*Barbonymus gonionotus*).

Bottom line: trey chhkak (*Cyclocheilichthys enaplos*), trey chhang (*Mystus nemurus*), trey kanchoh (*Mystus* spp.) and many other catfish species.

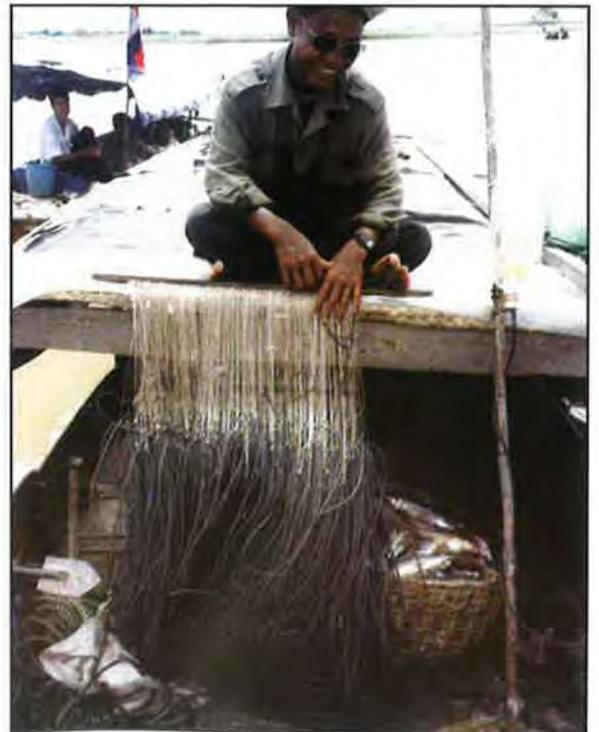
Legal aspects

Classified as middle-scale fishing gear (No. 028 KOR, SOR KOR).





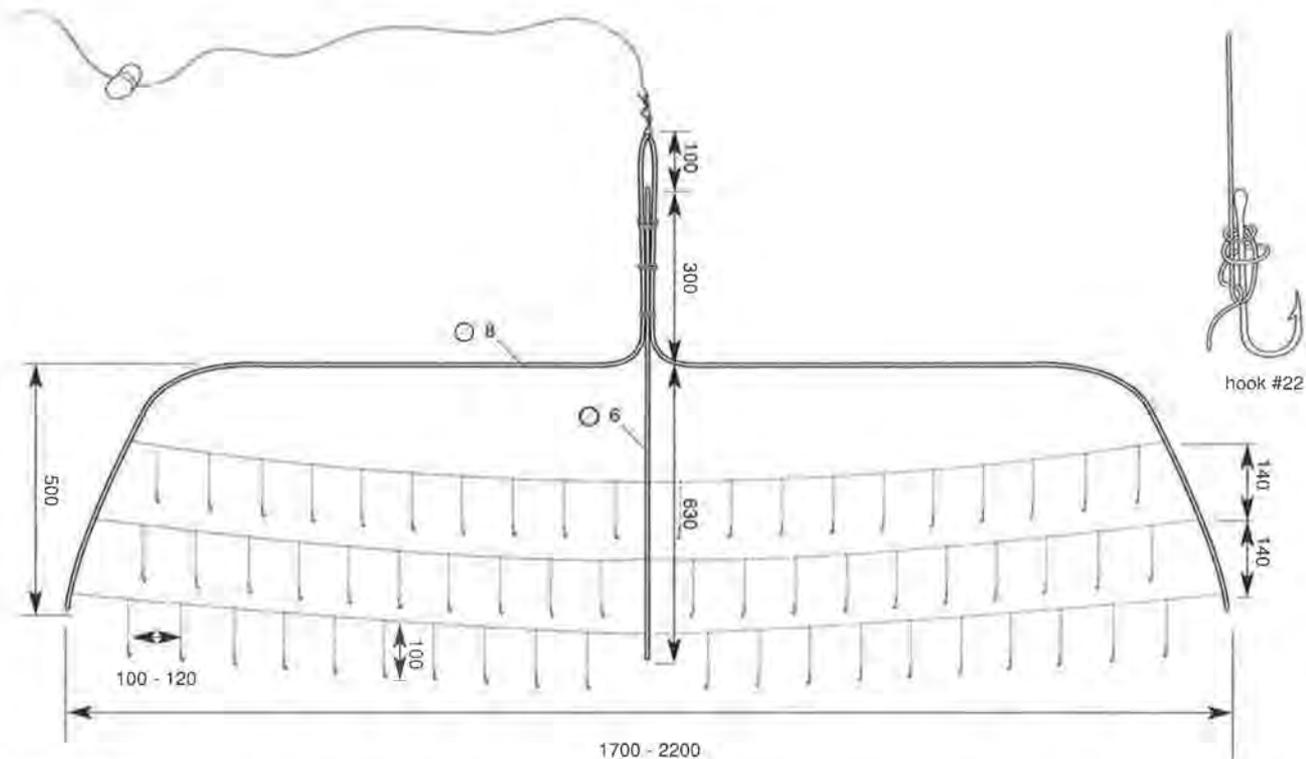
Baiting the hooks.



Sizes		
	Surface lines	Bottom lines
Hook size	10 - 14	12 - 14
Number of hooks	50 - 400	100 - 2500
Length of line	45 - 220 m	150 - 1000 m
Diameter of line	4 - 15 mm	4 - 15 mm
Length of snoods	39 - 90 cm	23 - 40 cm
Dist. between snoods	1 - 1.8 m	0.6 - 1.8 m

Hook frame for Catfish fingerlings

Santouch Koun Trey Pra



Description

This setline consists of an iron fork-like frame, which hosts between one and three branch lines. Each of the branch lines carries up to 20 short snoods with tiny hooks (#22), totaling up to 60 hooks per gear. The frame is attached to a nylon rope that carries a stone sinker of around 3 kg, located some 3 m above the frame.

Cost
R. 12.000

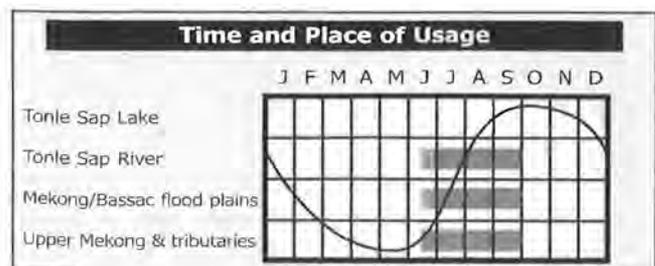
Operation
This type of setline is typically used in the Mekong river during the second half of the flooding season. One of the main fishing grounds is the Quatre Bras (Chaktomuk) near Phnom Penh. The setline is operated from a boat anchored at a distance of about 30 m from the shore. Each hook is baited with a red ant egg (purchased at R. 15.000 / kg) or sea worms (imported from Vietnam at USD 10 / kg) before the gear is carefully submerged to the bottom of the river. One boat crew uses four of these hook frames; two are set out left and right from the front part of the boat and the other two left and right from the stern. Once lifted, the catfish fingerlings are carefully removed from the hooks and kept alive in a small water container. The intervals of lifting the frame depend on the availability of fingerlings at the specific day and time. Ethnic Cham and Vietnamese fishers are very much

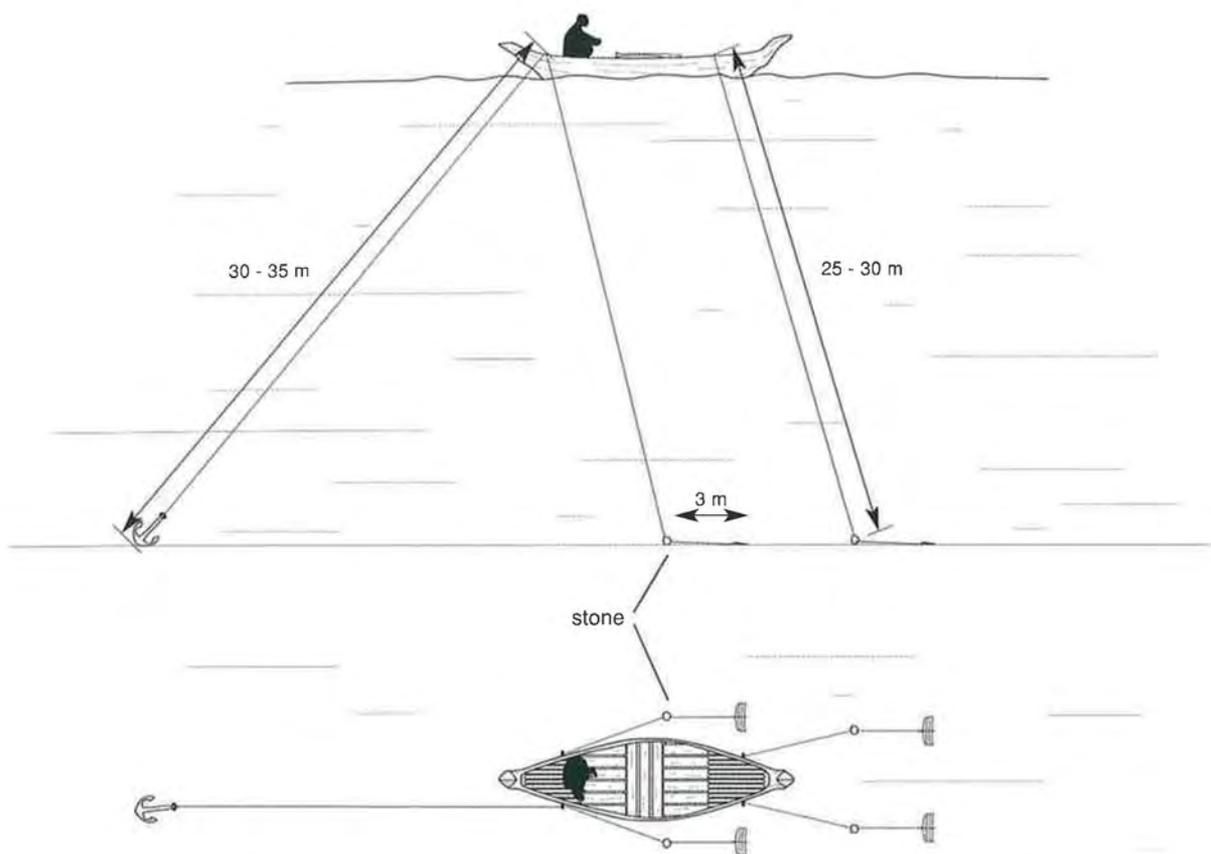
involved in this type of fishery. The fingerlings are sold alive for use in aquaculture farms.

Gender aspects
Frequently whole families operate these gears. Women and children are very much involved in this type of fishing.

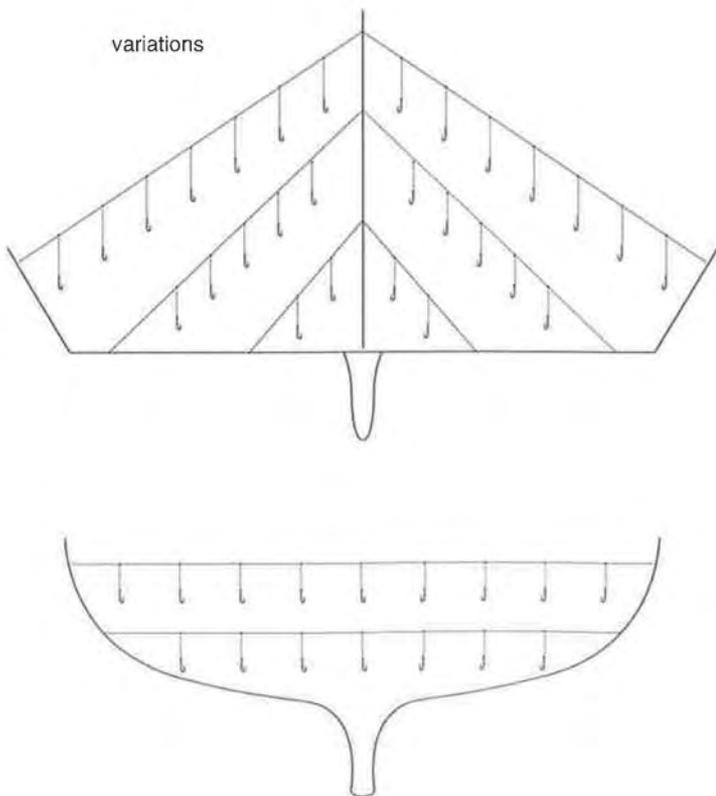
Target species
In Kratie province the four main species caught are trey pra khchau (*Pangasius bocourti*); trey keh (*Pan-gasius conchophilus*); trey chhlang (*Mystus mystectus*); and trey kaok (*Arius spp.*)
In Kandal province the following species composition was reported: trey pra khchau (*Pangasius bocourti*); trey keh (*Pangasius conchophilus*); trey chhlang (*Mys-tus mystectus*); trey kaok (*Arius spp.*) and trey po (*Pan-gasius larnaudiei*).

Legal aspects
Not classified / not mentioned in the law.





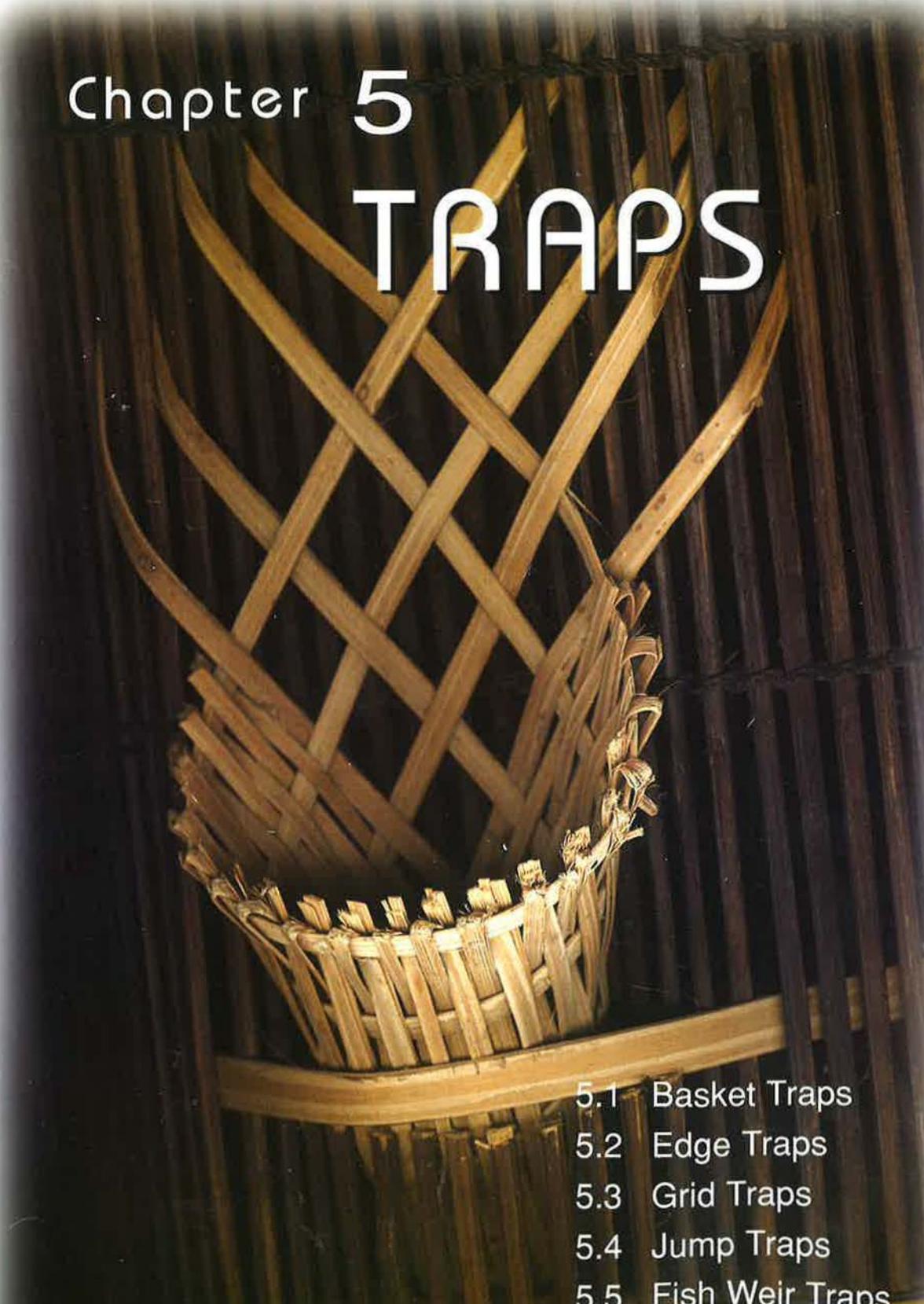
variations



Santouch koun trey pra, Kampong Cham

Chapter 5

TRAPS

- 
- 5.1 Basket Traps
 - 5.2 Edge Traps
 - 5.3 Grid Traps
 - 5.4 Jump Traps
 - 5.5 Fish Weir Traps

Big Bamboo Vertical Cylinder Trap

Saiyoeun

Description

The vertical cylinder trap is characterized by an opening slit as long as the trap itself. The traps vary in size depending on the habitat in which they are used. Like the *tru* and *lop* traps, the *saiyoeun* trap uses an inner stabilizing ring to which the outer bamboo slate wall is fixed with vines, fibers or nylon yarn. The total length of the trap varies from 1.3 m to 2.4 m and its diameter ranges from 53 cm to 120 cm. The outer wall of the trap has a gap of 15 cm width, which receives the entrance slit formed of two rows of 15 cm long spikes. The spike rows have an opening gap of 3 cm, but the spikes can easily be pressed apart by bigger fish entering the trap. In some variations only the bottom end is usually closed while the superior end may stay open. In Takeo a type of *saiyoeun* was observed where netting with a mesh size of 20 mm was used instead of bamboo slates. This type of gear does not have one continuous entrance slit, but instead three smaller, separated slit entrances, one above the other. Some recorded *saiyoeun* sizes in the provinces are:

Size & Cost			
Province	Height in mm	Diameter in mm	Cost in R.
Takeo	1300	580	40,000
Prey Veng	2400	530	-
Kandal	1500	600	40,000
Kg. Cham	1900	700	15 - 30,000
Kratie	1500	700	15,000
Stung Treng	2300	1200	20 - 25,000

In Stung Treng the trap size is generally larger than in other provinces. Also the entrance and mesh size are larger, as they target larger fish.

Operation

The *saiyoeun* is one of the main sub-types of cylinder basket traps used only in river environments of the Mekong and the Bassac (not in flood plains) and only in the period of rising water levels.

It is usually attached to one or two side wings made out of bamboo fencing guiding the fish both from downstream and upstream into the trap. In small streams with moderate water currents the *saiyoeun* basket trap may be inserted into a bamboo fence crossing the total width of the stream. All *saiyoeun* traps are fixed to one or two poles, which are firmly pushed into the underground in order to anchor the trap in the current. Due to its long vertical slit this



Vertical cylinder trap, Stung Treng province

trap captures fish from all water layers.

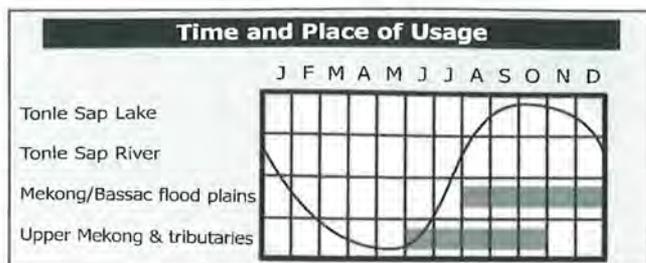
To harvest the catch, the fisher has to remove a big trap from its position and carry it onto land. Smaller traps are emptied into the boat. When the catch is good, the trap is emptied once a day, otherwise every second day.

Gender aspects

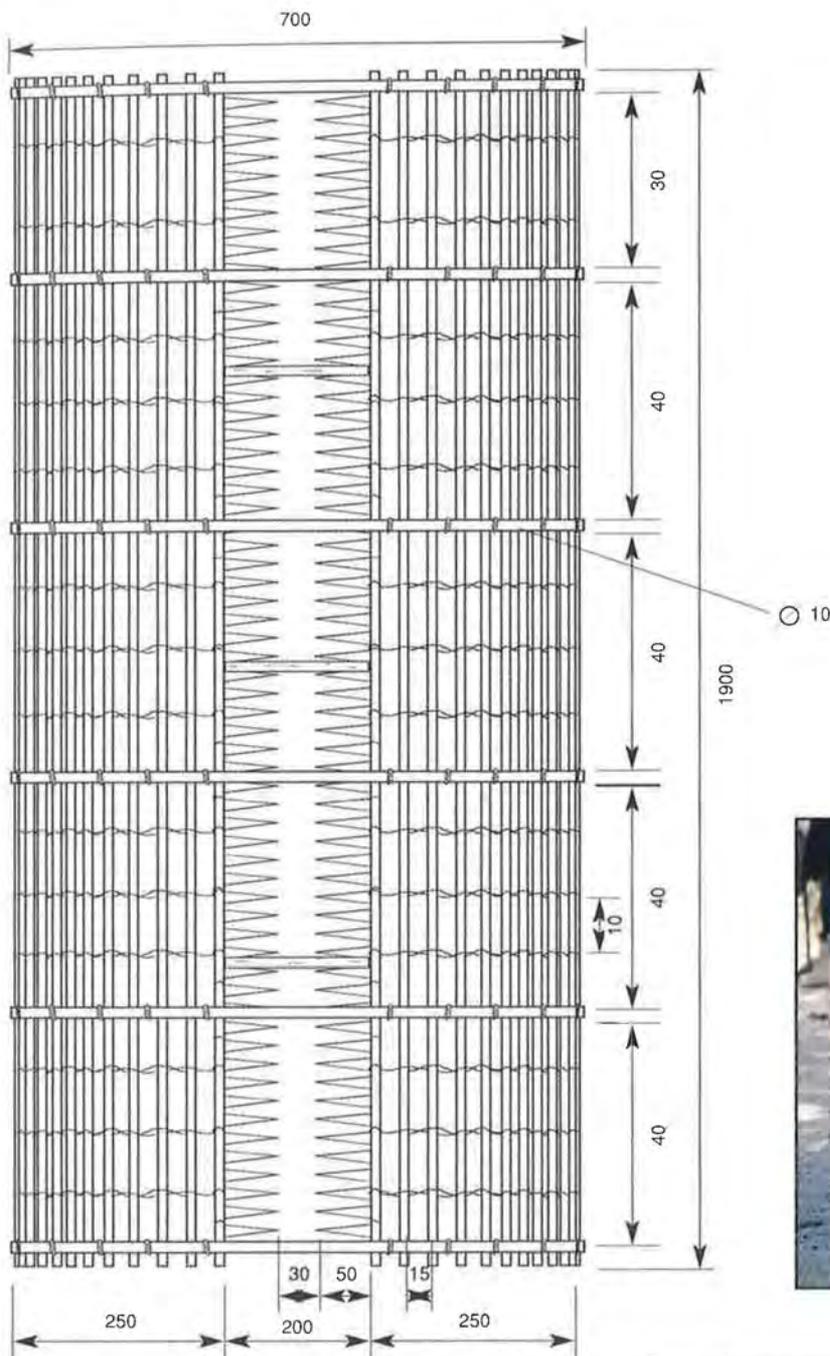
Commonly women participate in constructing this trap. The larger traps are mostly operated by male fishers.

Main target species

In most provinces: trey riel (*Henicorhynchus* spp.); trey achkok (*Dangila spilopleura*); trey sraka kdam (*Cyclocheilichthys apogon*); trey khnawng veng (*Dangila*



Saiyoen, front view



Saiyoen; inside view with top removed

lineata and *cuvieri*).

In Stung Treng: *trey chhkok* (*Cyclocheilichthys* spp.); *trey pra kchau* (*Pangasius bocourti*); *trey sandai* (*Wallago attu*); *trey pra* (*Pangasianodon hypophthalmus*), etc.

Legal aspects

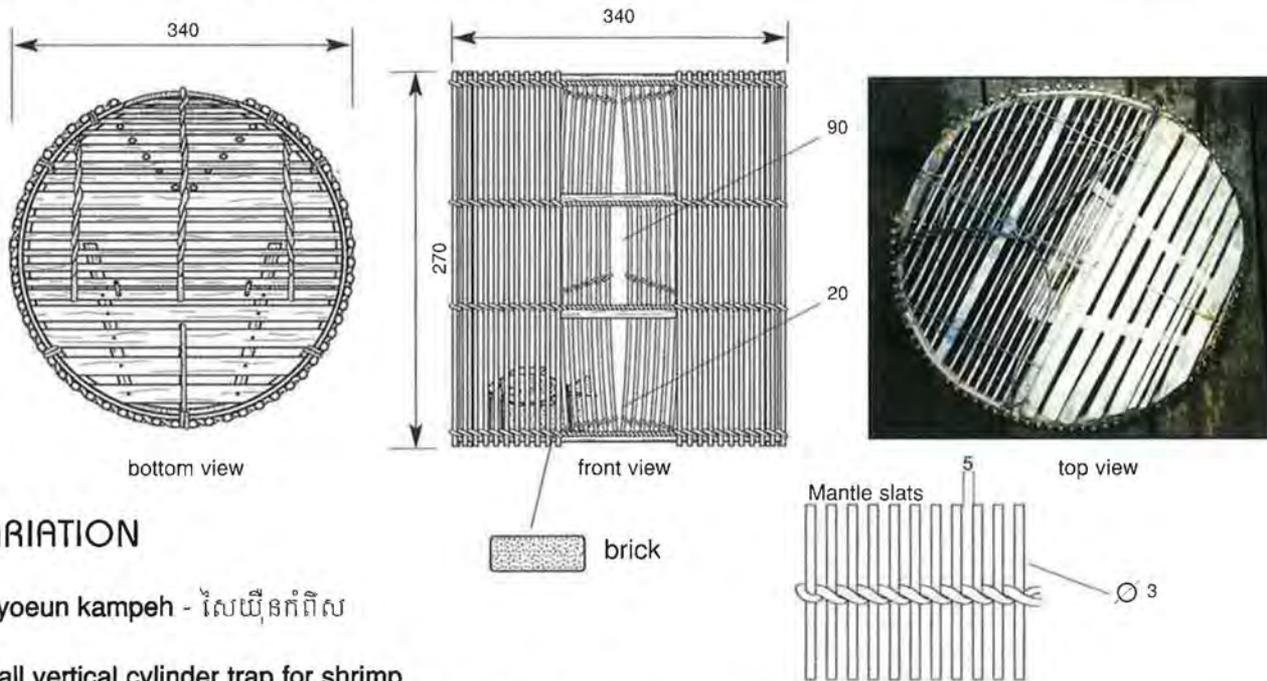
If the height is less than 80 cm and the diameter less than 30 cm and the trap is used without bamboo lead fence, it is considered a family fishing gear. If the trap is bigger than the indicated size and used with lead fences, it is considered as middle-scale gear (No. 028 KOR SOR KOR).



Stung Treng province

Big Bamboo Vertical Cylinder Trap (cont.)

Saiyoeun Kampeh



VARIATION

Saiyoeun kampeh - សែយ៉ែនកំពិស

Small vertical cylinder trap for shrimp

This small vertical cylinder trap is constructed in the same way as the large vertical cylinder trap, and thus has an opening slit as long as the trap itself. The shrimp trap is 34 cm wide and 27 cm high. The opening slit is 9 cm wide and the two entrance walls narrow the entrance down to a distance of 2 cm. The distance between the bamboo slats ($\text{Ø } 3 \text{ mm}$) is not more than 5 mm. On top of the trap the woven bamboo slats can be removed in order to collect the catch. Inside the trap a weight in the form of a stone or a brick is fixed on the bottom. Tied to the brick is spoiled fish serving as bait.



Traditional version



Modern version



Traps, marker poles and buoys



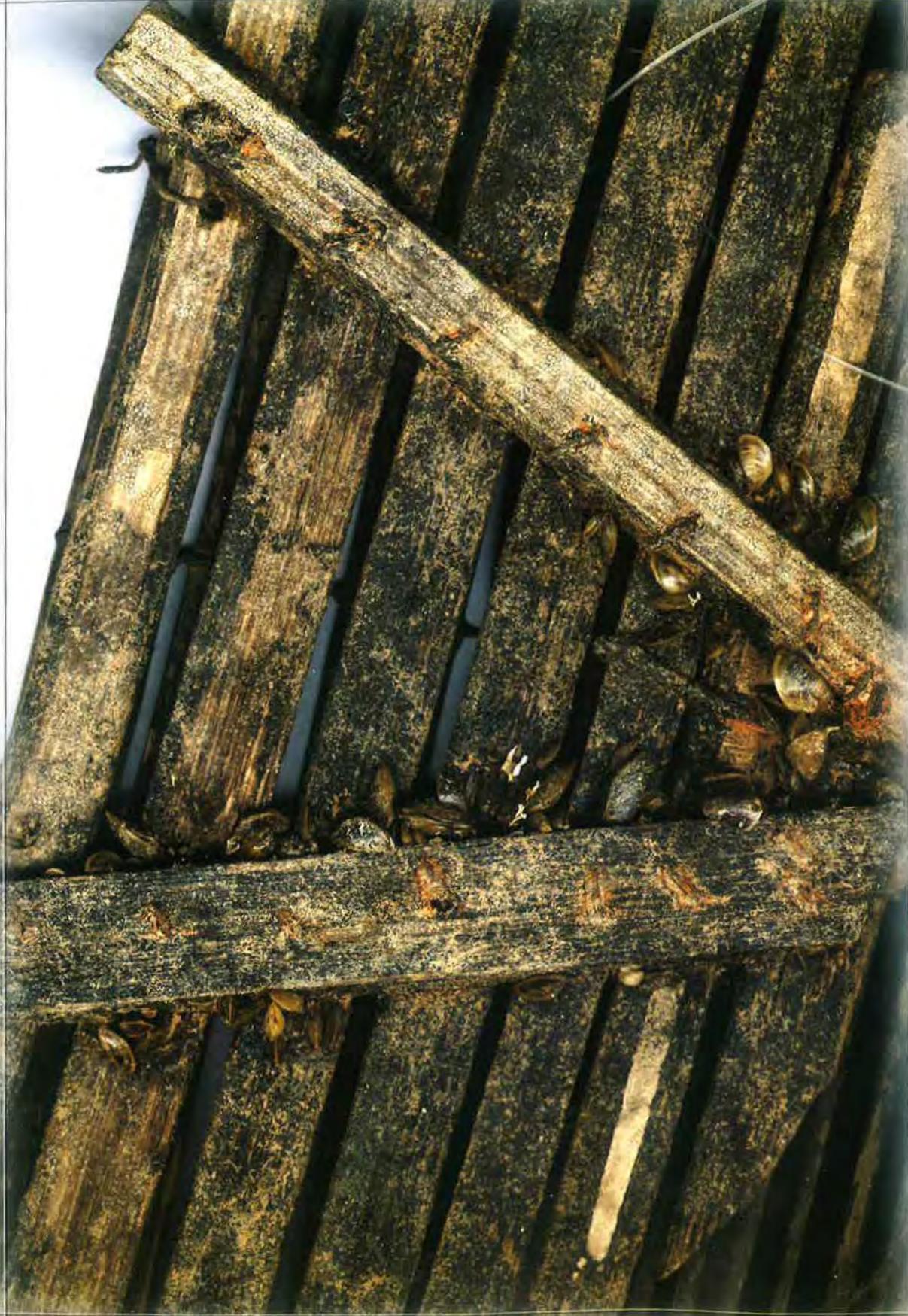
Fishing in the Great Lake

Size & Cost			
Province	Height in mm	Diameter in mm	Cost in R.
Kg. Chhnang	230	300	5.000
Pursat	280	300	5 - 7.000
Baatambang	280	340	4.000
Siem Reap	270	340	5.000
Kg. Thom	350	320	7.000

This shrimp trap is commonly used in the Great Lake and Tonle Sap river, but also in other lakes, mainly in the period from July to January. Both men and women operate these traps and one fisher may utilize from 30 up to 80 shrimp traps at a time. Frequently the traps are connected by a long line for easy relocation. The catch consists of 90 to 95% carid shrimp. This kind of trap is not mentioned in the fishery law.

In Siem Reap and Kampong Thom the frame is often made of iron and the bamboo cover is replaced by netting. This variation has also been introduced in Battambang in the year 2000.

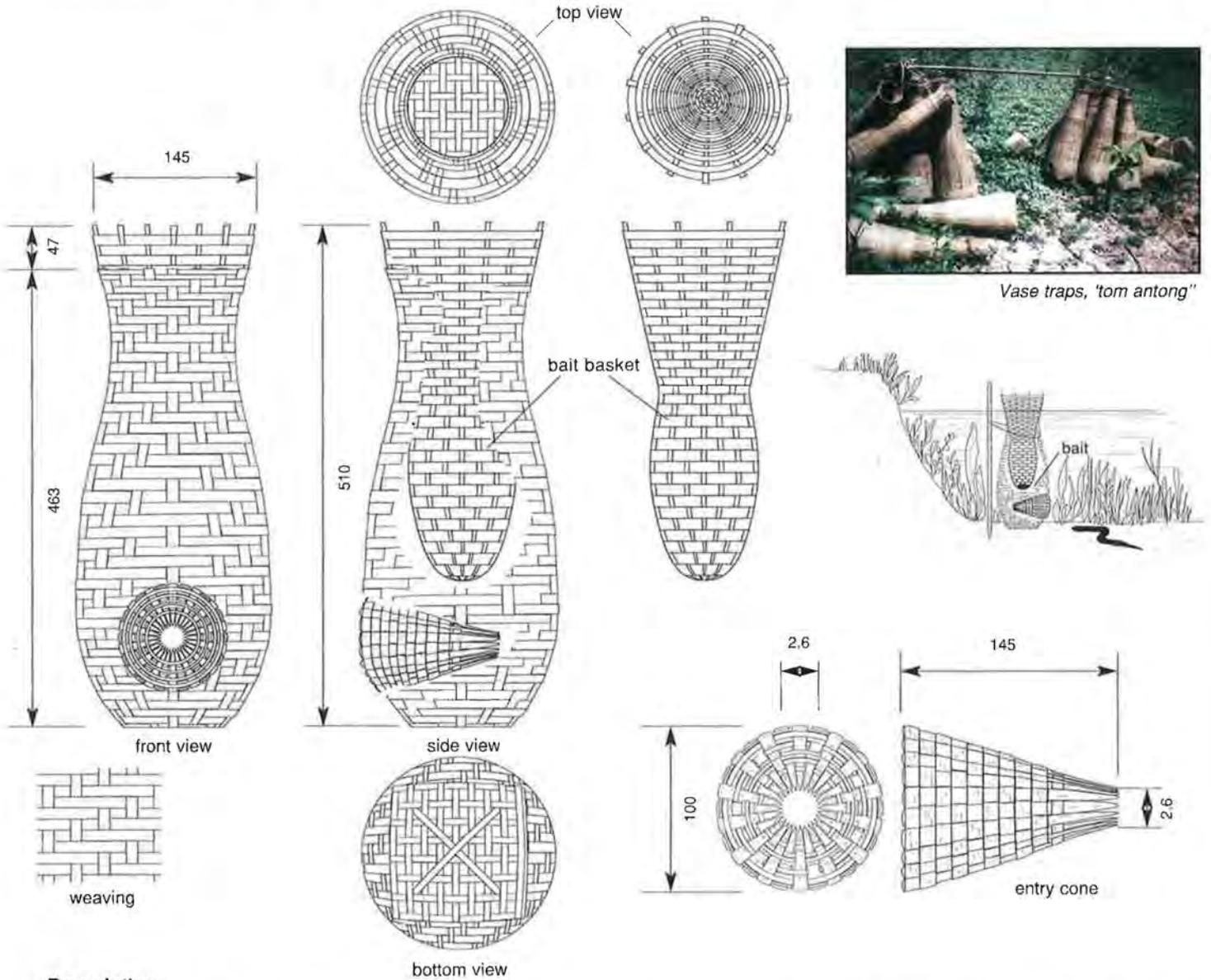
C L O S E - U P



Saiyoeun kampoh

Bamboo Vase Trap for Eel

Paong Antong / Chhu Antong / Tom Antong



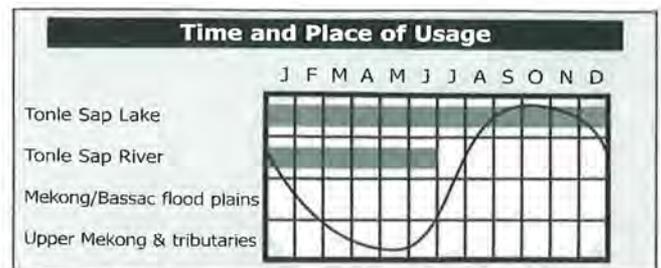
Description

The *paong antong* trap is a vertically positioned vase-shaped trap with an entrance cone on the side, near the base. Its total height is 35 to 62 cm and the widest diameter is 19 to 28 cm. The circular entry cone (Ø 5.5 to 10 cm) made out of very thin, 13 cm long bamboo spikes that are slimmed down to 3 cm near the entrance. A long woven bait-holder is part of the standard outfit of the trap. It is inserted into the neck of the bottle basket. There are a lot of small varieties of the same basic design carrying one of the above-mentioned Khmer names.

Operation

The vase-shaped trap is a very popular fishing gear. It is operated in the flood plains during the rainy season in preferably stagnant water less than 50 cm deep. In some areas around the Great Lake it was reported to be in use during the dry season in

recession lakes in the flood forests, marshlands, grasslands and swamps, in rice fields and particularly in areas with extended water hyacinth vegetation. The trap is tied to a wooden pole set next to it with the bottom standing on the ground and the upper part of the trap above the water surface. In settings with abundant vegetation the trap is also simply hung from branches, reeds or inserted into floating water hyacinth. A paste of rotten fish or snails and crabs,





Paong antong trap and bait holder

which produces a very strong smell, is used as bait. A report from Pursat mentions that burned fish meat is placed at the entrance to the trap. Though the trapped eels cannot access the bait directly, new bait has to be used for each fishing operation. In order to remove the catch from the trap the bait-holder must be removed first. Eel catches are better at night than during daytime.

A fisherman usually operates a bundle of traps (20 to 45) carrying them on a stick or by boat to the fishing ground in the afternoon and gathering them in the following morning. Their life span is 1 to 2 years.

Gender aspects

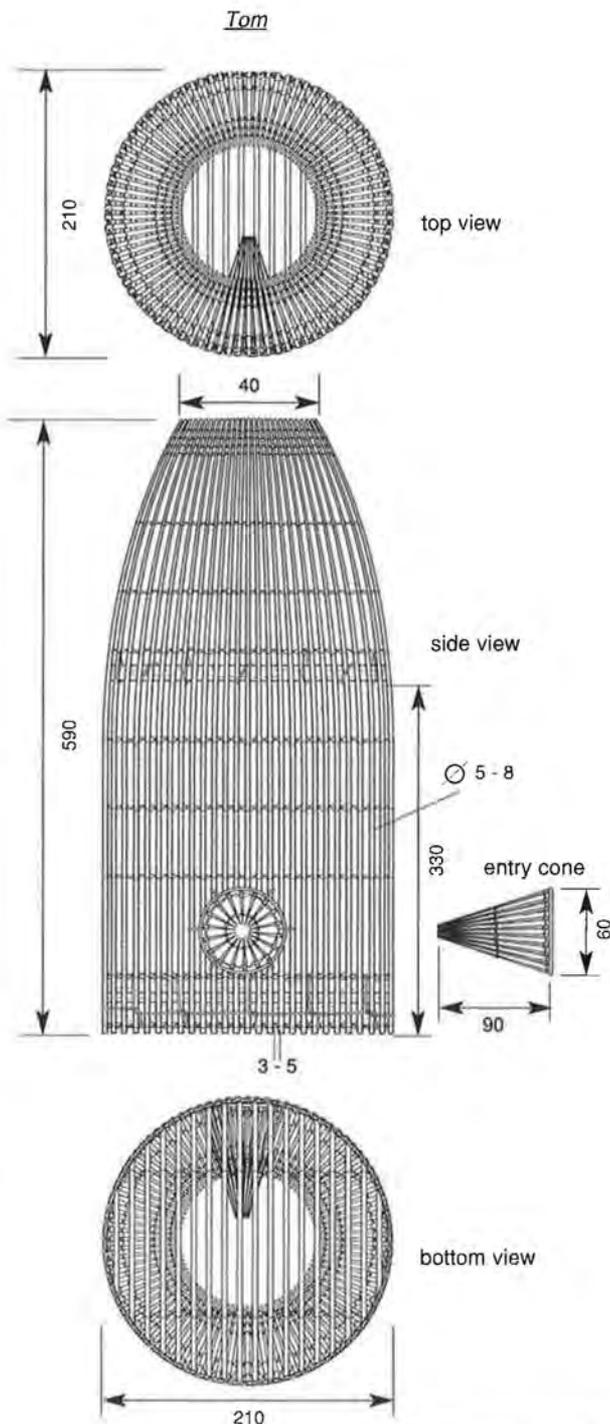
Men and women make and use this trap, though it is reported that mostly men use it.

Target species

Eels/trey antong (*Monopterus albus*).

Legal aspects

This specific gear is not mentioned in the fishery law, although Paong and Tom are classified as family fishing gears (No. 028 KOR SOR KOR).



Tom

Type, Size, Cost & Season							
Province	Local name	Height in mm	Diameter top in mm	Diameter belly in mm	Diameter entry in mm	Cost in R.	Season
Battambang	Chhu	620	100	200	60	3.500	Sep-Jan
Battambang	Tom	550	120	240	70	2.000	Dec-Mar
Siem Reap	Tom	600	90	210	60	2.000	Dec-Mar
Pursat	Chhu	600	140	280	100	3.000	Jul-Mar
Kg. Thom	Paong	350	150	190	-	4.000	Jan-Aug
Kg. Chhnang	Paong	600	120	200	60	3.500	Jan-Jun
Phnom Penh	Paong	380	120	210	55	5.000	Feb-Apr

Bamboo Vase Trap for Eel (cont.)

Paong Antong / Chhu Antong / Tom Antong

VARIATIONS

Paong chhronng / muol Trey chhlang / ប៊ែង ជ្រុង / មូល ត្រីឆ្កាំង

Vertical box shaped trap for catfish

Vertical bamboo basket trap looking like a waste paper basket with rectangular opening in the side of the basket near the bottom. Has a lid with two ears on top. A pole is passed through the ear and pushed into the ground to keep the basket in place. It can have a square or a round shape. The cost is R. 15,000 to 30,000.

Sometimes the trap is covered with dry grass to hide it. In Kampong Chhnang bait is made of red ant eggs mashed with rice bran. The traps are used in the period of rising waters, from May to October.

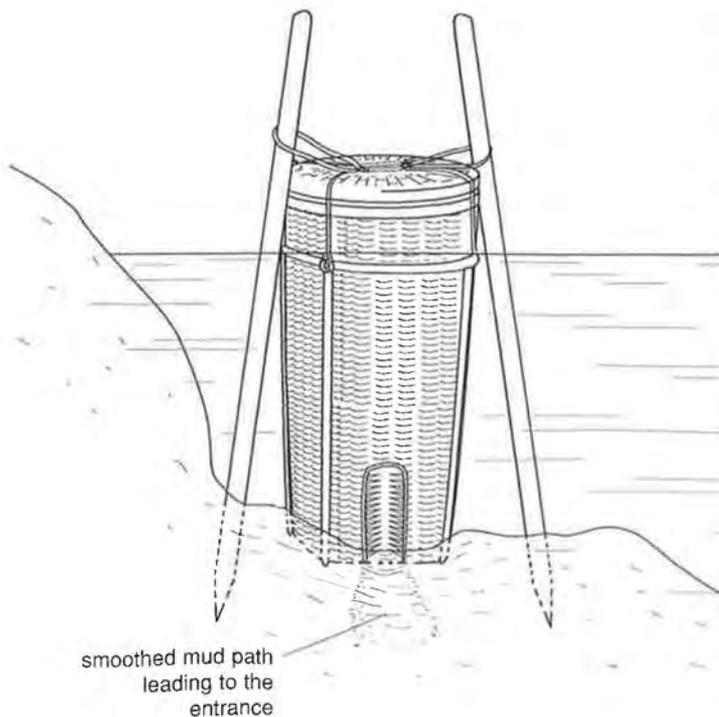
Target fish species are catfishes: troy chhlang (*Mystus nemurus*) and troy kanchos (small *Mystus* spp.)



Paong chhronng troy chhlang

Type & Size						
Province	Local name	Shape	Height in mm	Diameter top in mm	Diameter bottom in mm	Diameter entry in mm
Kg. Chhnang	Paong chhronng	Square	700	400	260	60
Prey Veng	Paong chhronng	Square	780	260	280	100
Kandal	Paong muol	Round	800	400	300	50
Takeo	Paong muol	Round	700	350	350	65

Paong Chhronng Trey Chhlang



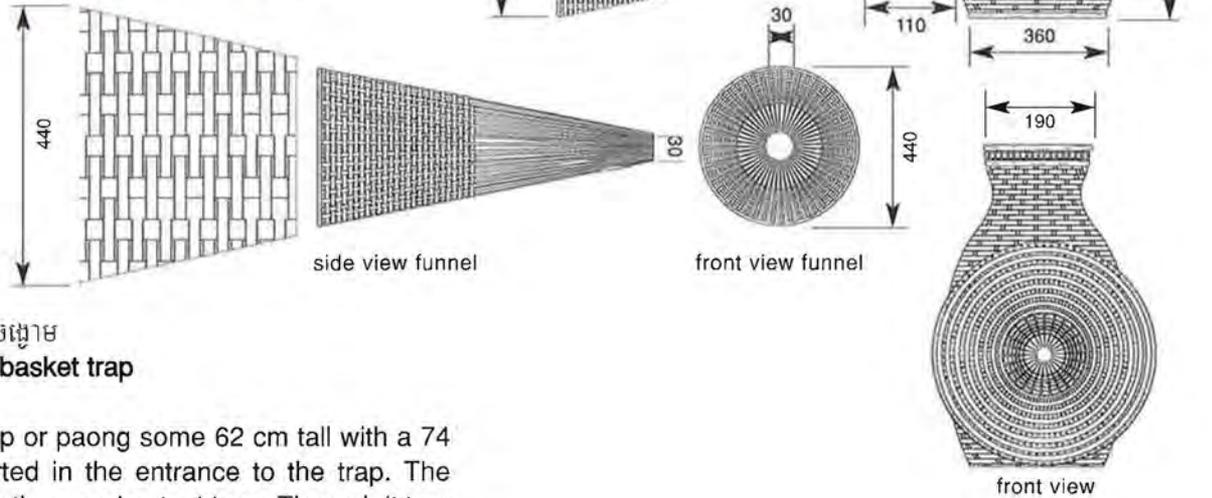
Paong chhronng troy chhlang, bottom view



Paong muol troy chhlang



Funnel trap, Battambang



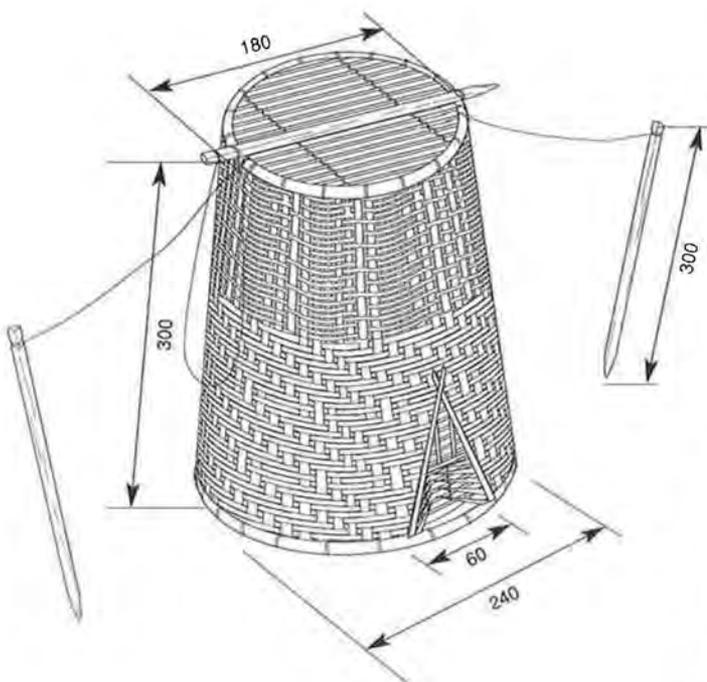
Chongnoum / ចង្ហោម
Bamboo funnel basket trap

Kind of vase trap or paong some 62 cm tall with a 74 cm funnel inserted in the entrance to the trap. The funnel increases the opening to 44 cm. Through it trey changva (*Rasbora* spp.), shrimp, crab and a number of other fish species enter the trap. This gear was more popular in the past and is now only reported from the Bavel district in Battambang.

The trap is placed in inundated grasslands and rice fields that are shallow enough to keep the top above the surface, mostly from September to February. The mouth of the funnel faces the current. No bait is used.

Tom trey riel / តុម ត្រីរឿល
Vertical vase trap for small fish

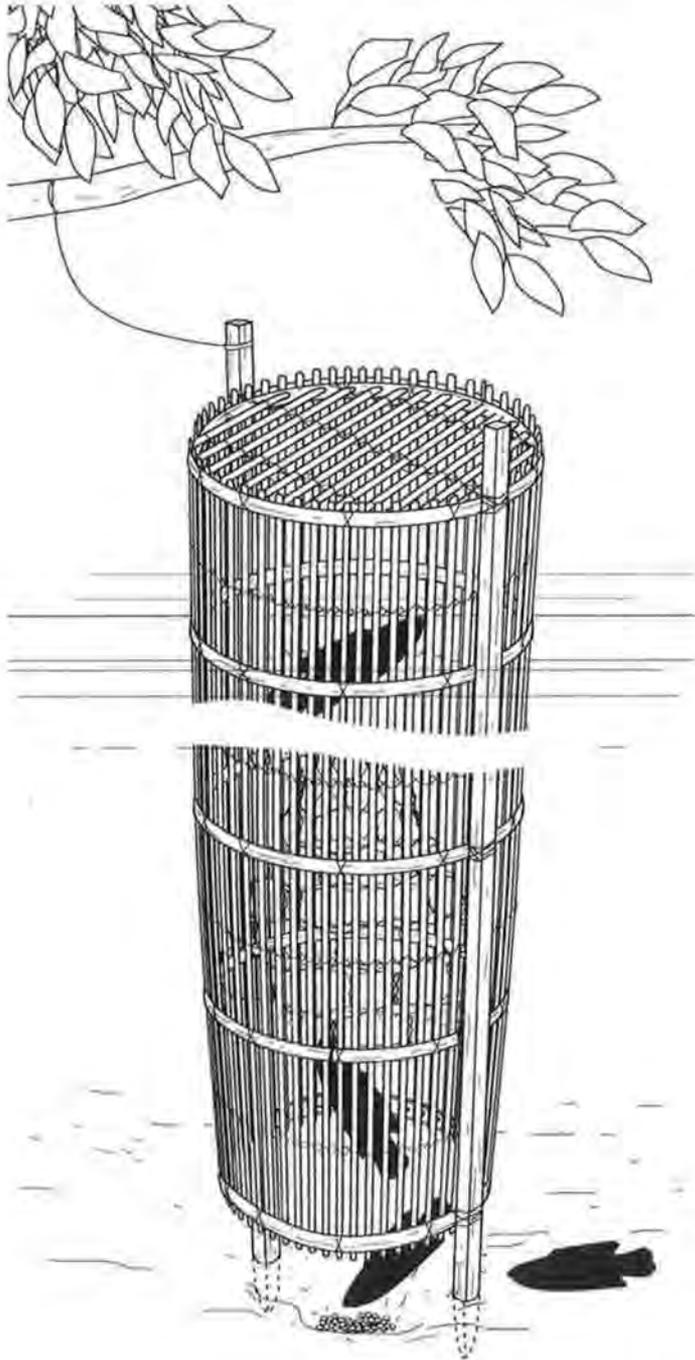
Small bamboo trap with a triangular opening on the side near the bottom. Only found in Stung Treng and Ratanakiri provinces, where it is used in river habitats from January to June. The traps are placed in the morning and removed in the evening. Rice bran is put inside to attract fish, which are mainly trey riel (*Heni-corynchus* spp.) and other small species.



Tom trey riel, Sesan River - Stung Treng

Vertical Cylinder Trap for Climbing Perch

Lop Trey Kranh



between the bamboo wall slats is 15 mm. Two longer wooden poles are fixed opposite each other. The poles exceed the trap in length, both on the top, along the trap and at the bottom by 15 to 20 cm. The trap is placed on the bottom and a hole is dug below the trap, providing space for the bait. The top end of the trap sticks out of the water and is tied to a nearby branch. The lifespan of the gear is 1 to 2 fishing seasons.

Cost

R. 15.000 to 35.000

Operation

The vertical cylinder trap is commonly used in the flood plains, but also on lakes and quiet rivers during the rainy season. The gear is specifically designed for targeting climbing perch (*trey kranh*), but also other species are caught. Climbing perch can take up oxygen directly from the air. The trap is baited with soaked or slightly cooked-up rice or corn, located in a small, artificial depression right under the trap. After eating, the fish goes up to breathe and thereby enters the trap. The trap is preferably installed around or next to some flooded vegetation, where currents are not too strong. On the part of the trap which protrudes above the water surface, the fisher may put some grass or water hyacinth to provide cooling shade, which forms an additional attraction for the fish. Once set out the trap is checked every 12 or 24 hours by a single fisherman operating from his boat.

Gender aspects

Usually men operate the trap, but women often prepare the bait and are also involved in its construction.

Target species

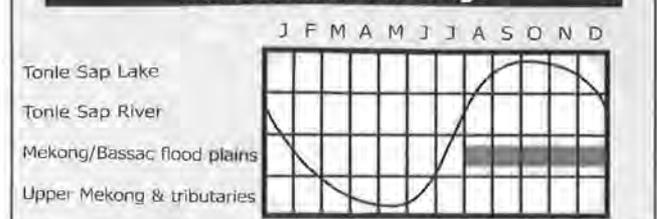
Climbing perch / trey kranh (*Anabas testudineus*).

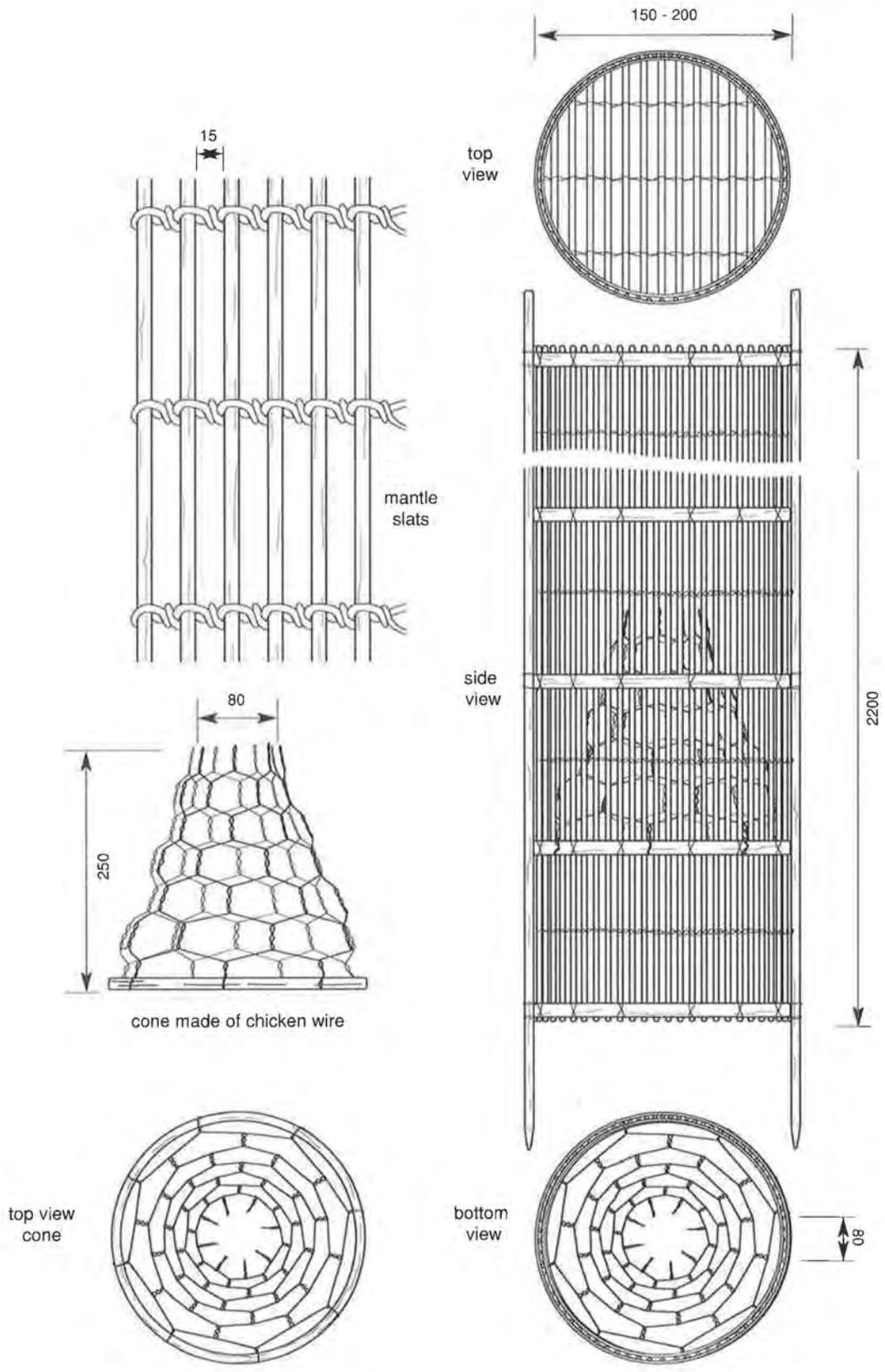
Legal aspects

Not mentioned in the fishery law.

Description

This fish trap is a long, vertically installed tube made of bamboo slats with an entry cone at the bottom. The total length of the tube is about 2 m and its diameter is between 15 to 20 cm. The entrance cone, made of chicken wire (hexagonal meshes) is fixed to the first or second of the 5 or 6 stabilizing rings of the trap. The entry of the cone is as large as the inner diameter of the trap (\varnothing 15 to 20 cm) and narrows down to 8 cm towards the entry proper. Contrary to entry cones made of bamboo spikes, the chicken wire is not flexible at all. The distance

Time and Place of Usage



Climbing perch / Trey kranh
(*Anabas testudineus*)

Vertical Cylinder Trap for Tinfoil Barb

Tom Trey Kahe



Tom Trey Kahe, Prey Veng

Trey kahe (*Barbonymus schwanenfeldii*)**Description:**

The relatively small trap some 72 cm tall and found only in Prey Veng. It has one side opening with spikes forming a cone leaving a gap of 67 mm. The three main frame sticks protrude some 20 cm beyond the bottom of the trap and serve as anchors. The life span is one season only.

Cost

R. 4.500

Operation

The trap is fixed to the bottom of a stream in water 1 to 2 m deep. The entrance faces away from the current in order to catch fish moving upstream. For bait the roasted seed of the cotton silk tree / *daum ko* (*Ceiba pentandra*) is mixed with clay to make it heavy. It is then placed on the bottom of the trap. Divers then place between 20 and 50 traps in a row, 1 to 2 m from each other and about 0.5 m from the bank. They remember the spot where the first trap is placed in order to find them again. If they leave a marker they have to guard the traps, which are usually left for 48 hours before being removed.

Target species

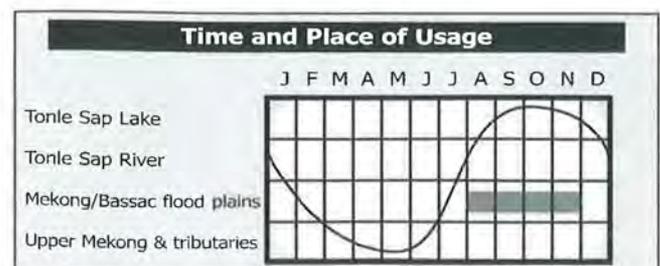
Mostly fingerlings of tinfoil barb / Trey Kahe Kroh Horm / Trey Kahe Loeng (*Barbonymus altus*, *Barbonymus schwanenfeldii*) are caught in this trap. They are sold as seed for aquaculture.

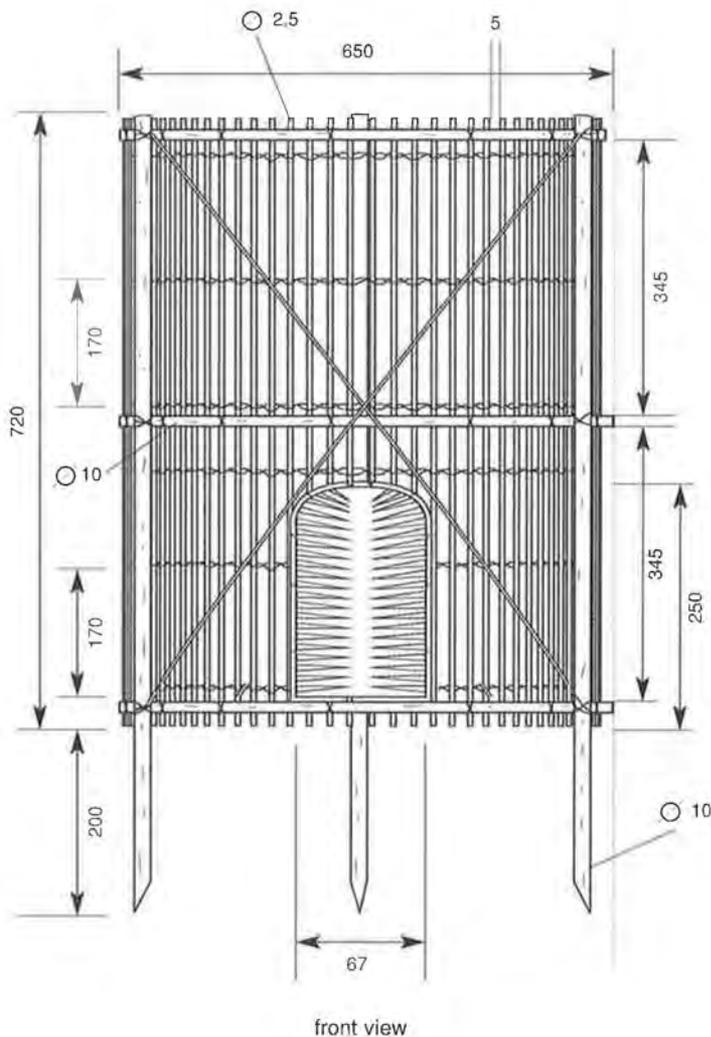
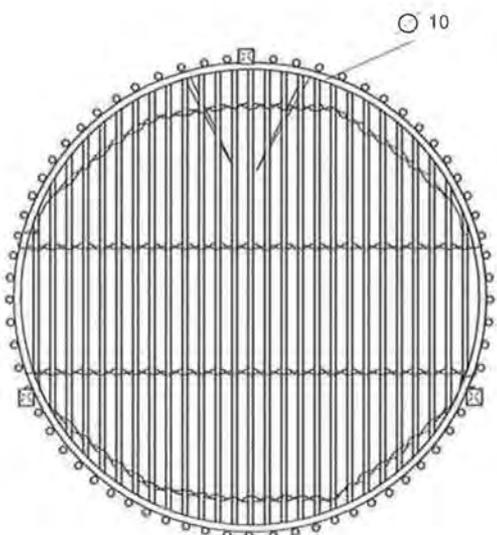
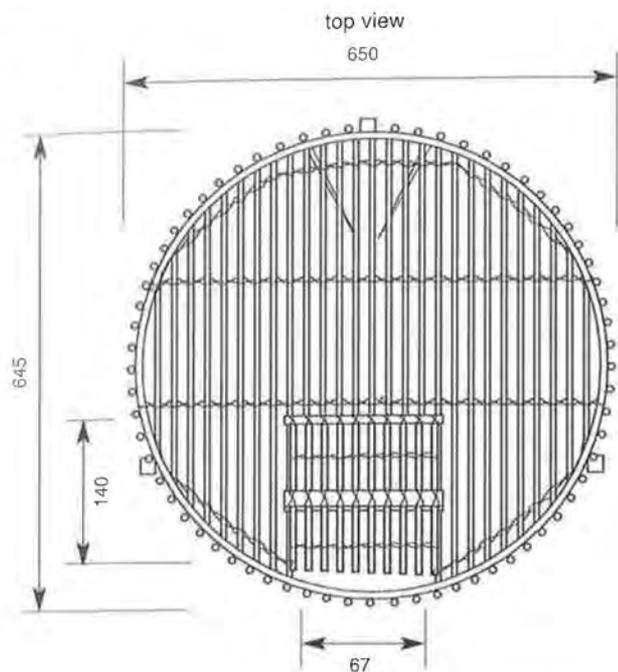
Gender aspects

Mostly men operate the traps. Old men helped by women and children build the traps and also prepare the bait.

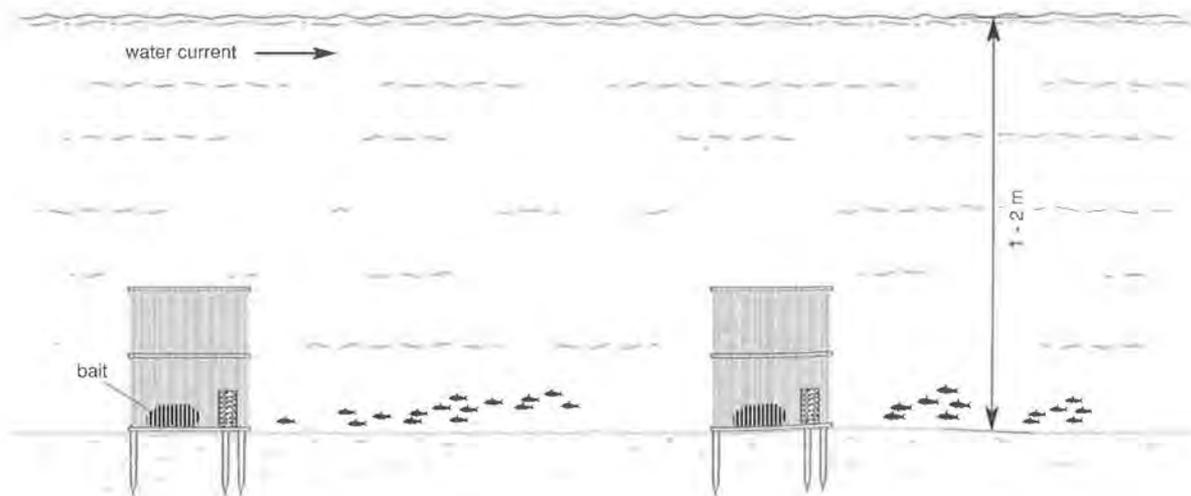
Legal aspects

Not in the law. A new gear introduced in Prey Veng in 1997.



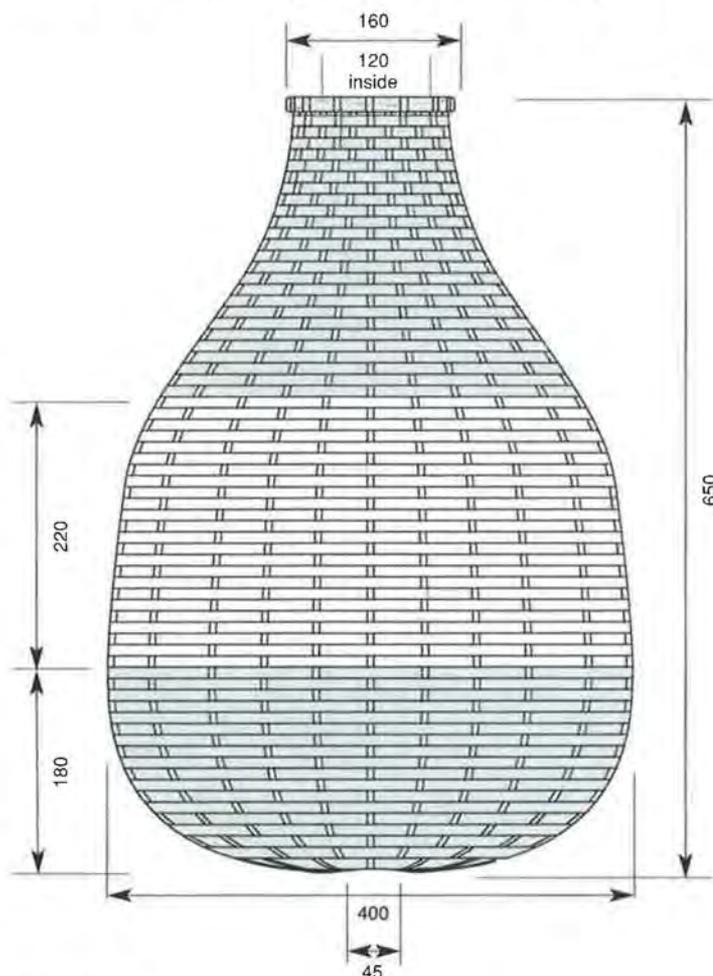


Tom trey kahe operational position



Vertical Hanging Vase Trap for Small Fish

Tom Trey La-et



Tom from Kampong Thom Province

Description

We have chosen the name *tom*, although in some provinces the name *paong* is used.

Medium to large sized vase trap, 50 to 120 cm tall and with a diameter of 40 to 55 cm, made of woven bamboo strips that are smoked before use and some stabilizing rings. Contrary to all other vase traps, this trap has a round entry at its bottom end, hence - being vertical - it needs to be hung in the water for fish to enter it from below. The cost is R. 2.000 to 5.000. Its durability is 1 to 2 years.

Operation

The trap is used mainly in the daytime. It is hung from a branch, reeds or a stick in clear still water up to its neck. The bait inside, such as roasted sesame seed,

rice bran, pieces of white ant nest and fish paste, attracts small fish.

Gender aspects

Men and women make and use this trap, though it is reported that mostly men use it.

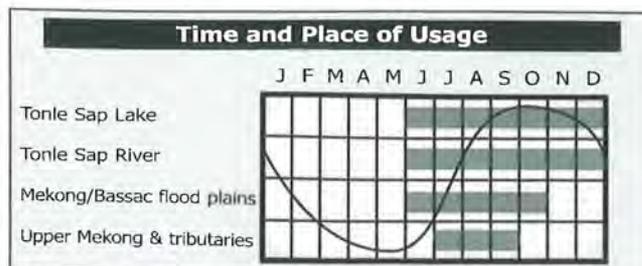
Main species caught

Trey changva (*Rasbora* spp.); trey lak russey (*Para-laubuca* spp.); gourami / trey kawmphleanh (*Tricho-gaster* spp.).

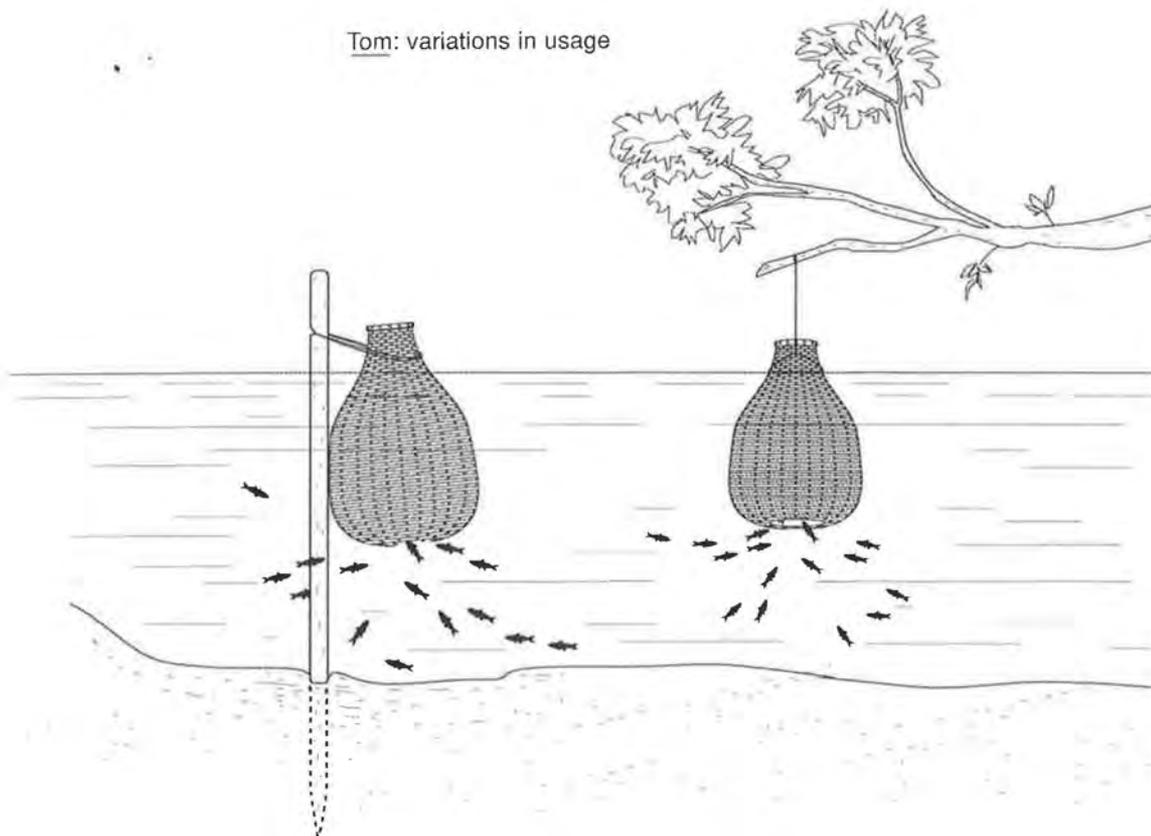
Legal aspect

Vase traps (*tom*) are classified in the law as a family fishing gear (No. 028 KOR SOR KOR), although this exact type is not described.

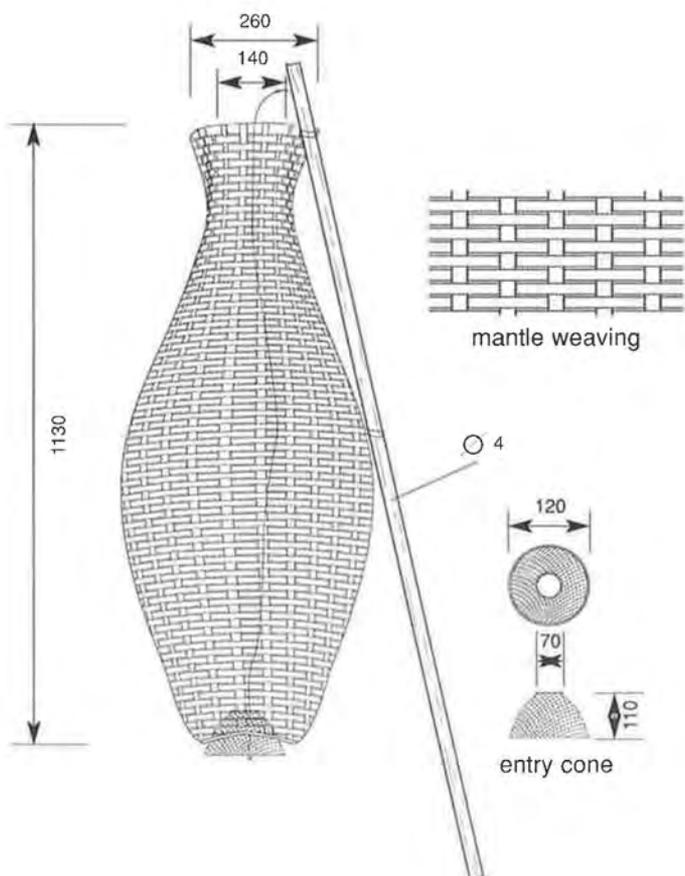
Type, Size, Cost & Season						
Province	Local name	Height mm	Diameter top in mm	Diameter belly in mm	Cost R.	Season
Kg. Thom	Tom	480	230	350	2.500	Jun-Dec
Kg. Chhnang	Paong	800	200	300	5.000	Sep-Dec
Kg. Cham	Tom	650	160	400	4.000	Jun-Oct
Kratie	Tom	1200	160	550	-	Jul-Sep
Stung Treng	Paong	1130	260	480	5.000	Jan-May



Tom: variations in usage



Paong, Stung Treng

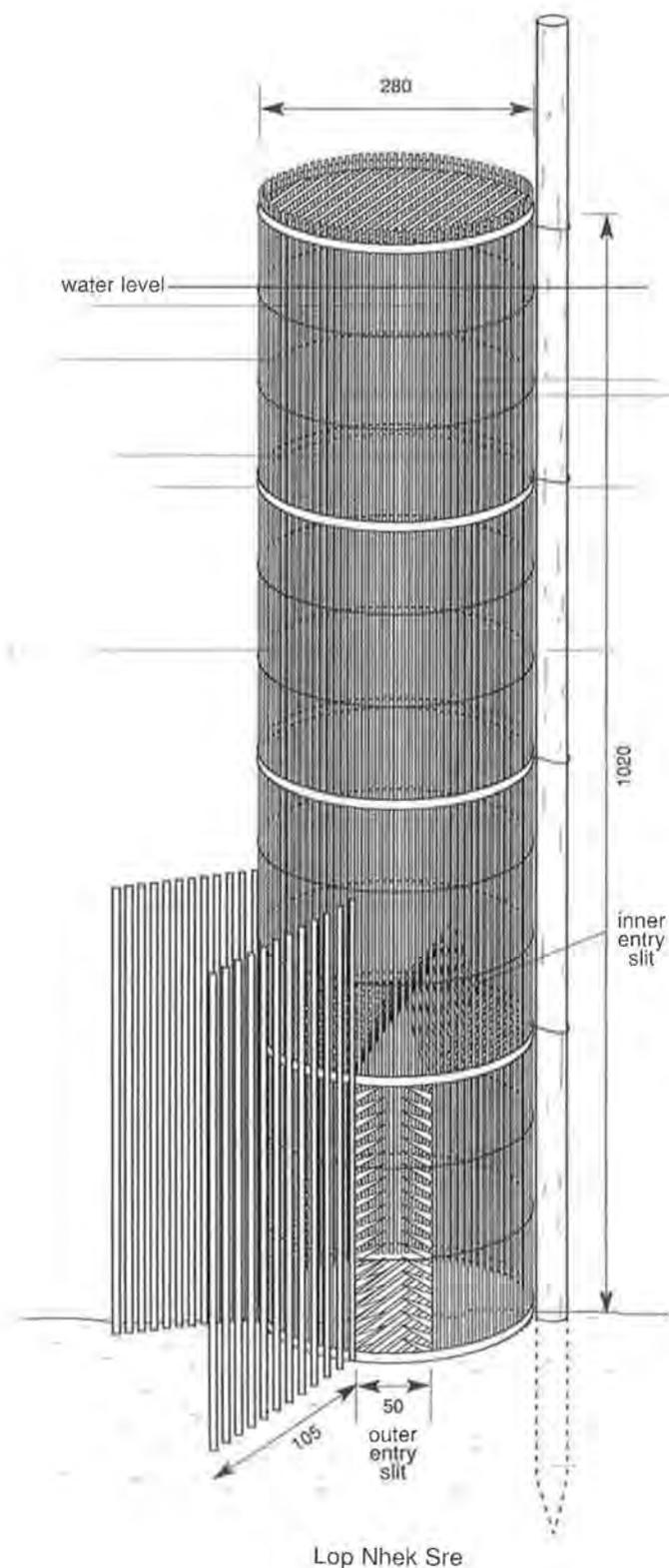


Operational use in Stung Treng



Vertical Rice Field Cylinder Trap

Lop Nhek Sre



Description

This type of vertical cylinder basket trap has been reported only from Battambang province. It is 1 m high and 28 cm in diameter. Stabilising rings are positioned every 25 cm along the trap. Between the first and second stabilizing rings there are two vertical V-shaped entrance slits parallel to each other and 15 cm apart. The entrance slits are 5 cm wide, and their two rows of 10 cm long spikes narrow down to 2 cm gaps. The spikes are flexible, allowing fish to pass into the pre-capture room. The second stabilizing ring carries a third entrance slit (known as the 'killing slit'), positioned horizontally at the top of the pre-capture room and across the width of the trap. Its spikes are 13 cm long and narrow to a gap of slightly less than 2 cm. There is a woven mat on top of the trap that can be partly removed in order to empty the trap. Attached to the lower part of the trap are two short wings that make the trap look like a rocket.

Cost

R. 15.000

Operation

The trap is used in canals in ricefields, where there is a little current, in water depths of about 1 m. The top of the trap sticks out above the water. The trap is anchored to the bottom with a pole. No bait is used.

Gender aspects

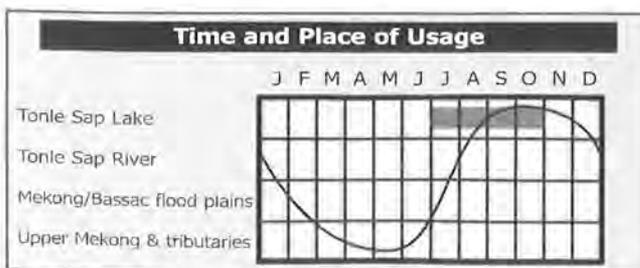
There is no gender discrimination with regard to the construction or its use. Frequently women and children empty the traps.

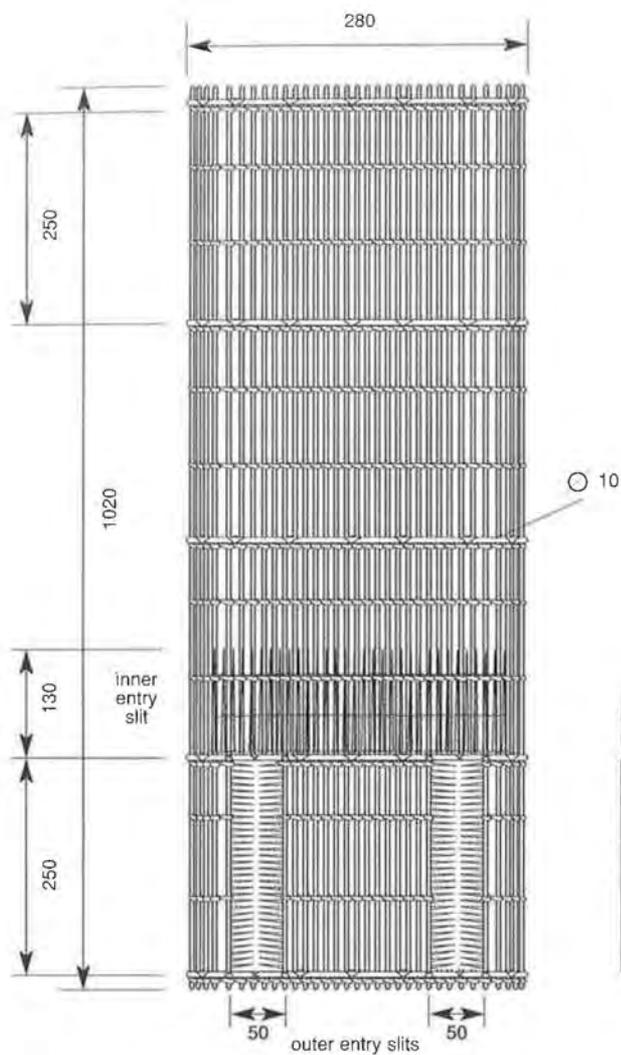
Target species

Rice field fish, including small shrimps.

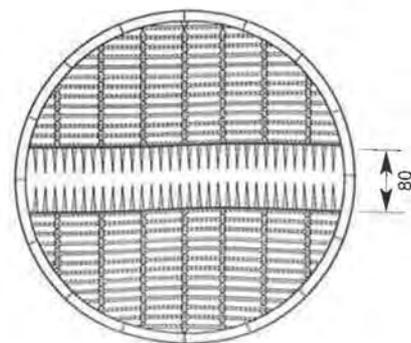
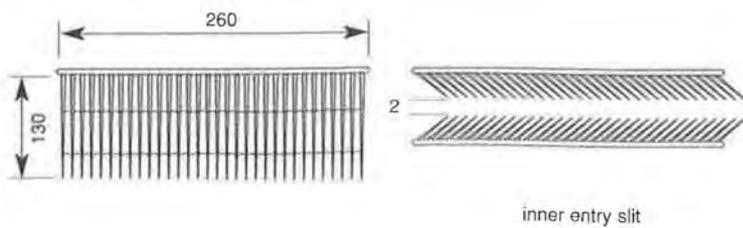
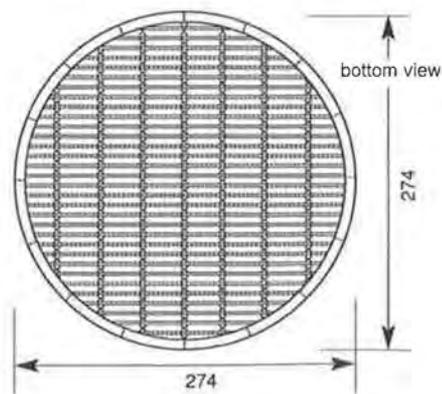
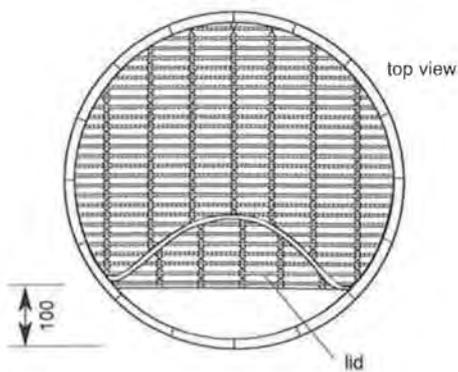
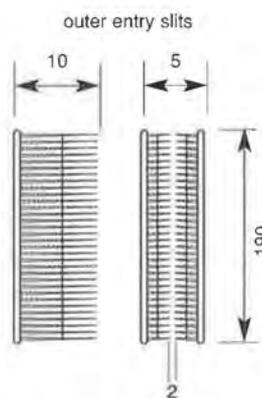
Legal aspect

If the height is less than 80 cm and the diameter less than 30 cm and the trap is used without bamboo lead fence, it is considered a family fishing gear. If the trap is bigger than the indicated size and used with lead fences, it is considered as middle-scale gear (No. 028 KOR SOR KOR).





Lop Nehk Sre, Battambang



Horizontal Cylinder Trap for Rice Fields

Tru



Tru kampeh

Description

The fish basket or 'fish pot' is one of the most popular gears in the country. As there are slight variations in shape of this passive gear, several names are used in the provinces, such as: *tru sre*, *tru prespee*, *tru korburch*, *tru kampeh* and *tru nhek*.

It is made with finely split bamboo sticks, fixed onto stabilizing rings in the interior of the trap. The rings, made out of *thmeng trey* (*Bridelia ovata* var. *curtisii*) branches, are dried and fire-hardened, as are the bamboo sticks. Commonly, the trap has one entry cone with a central opening of 1 cm or less. If the trap is equipped with two entry cones, these are arranged in more or less opposite directions for catching fish coming up- as well as down-stream. The ends of the traps are usually of a similar shape; one end has a lid for removing the fish. In Kampong Cham the ends differ from each other, with one end tied together as in a girl's ponytail while the other has a lid.

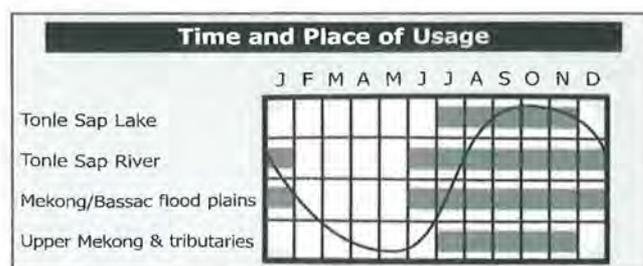
The total length of the trap can vary between 60 and 125 cm. Commonly, this fish trap is made at home, but it can also be bought ready-made in the market,

where it is for sale at the beginning of the rainy season. Traditionally, the slats were fixed with natural fibers, but nowadays nylon yarn or thin wire is increasingly used. The spaces between the slats in the *tru kampeh* or shrimp trap are smaller than in the fish traps. The lifespan of the trap is 2 to 3 fishing seasons.

Operation

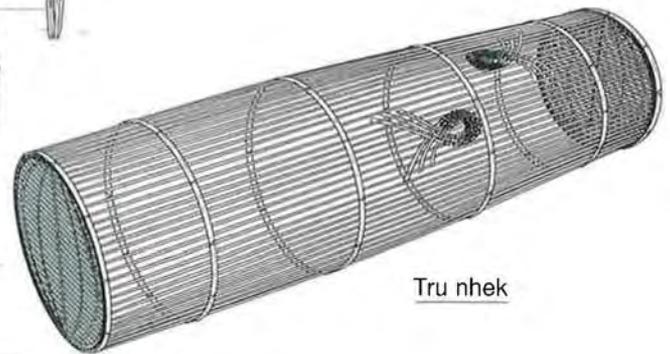
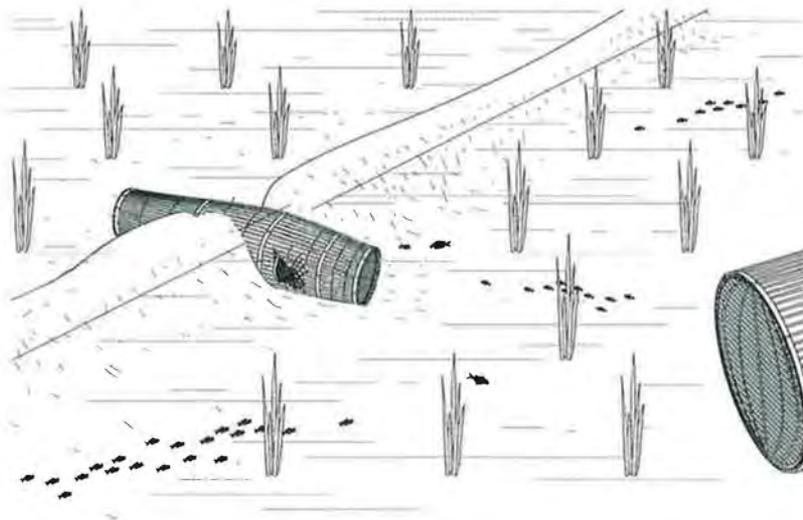
As the Khmer name suggests, the trap is predominantly used in or near rice fields or irrigation canals and also in small rivers with a mild current, as the trap needs to be secured by covering it partly with mud or anchoring it with small sticks. Frequently the trap is also covered with water hyacinth, tree branches or grass, offering the fish an additional attraction to enter the shady inner space of the trap. Bait is not used. The trap is set during the day or at night; the family shares the duty of checking on the catch. Typically, the gear is set during work in the rice fields, where it can easily be observed. The main seasons are at the beginning of the rainy season and in the middle of the recession period. Both are times when people are very busy in rice fields or with slash and burn practices (*chamkar*). The trap itself also serves as basket to transport the fish home.

Type, Size, Cost & Season					
Province	Local name	Length in mm	Diameter in mm	Cost in R.	Season
Battambang	Tru nhek	830	230	4.500	Jul-Oct
Pursat	Tru sre	800	200	7.000	Aug-Nov
Phnom Penh	Tru nhek	820	220	5.000	Jun-Dec.
Kandal	Tru kampeh	650	200	3.000	Nov-Jan
Takeo	Tru prespee	800	200	8.000	Jul-Jan
Prey Veng	Tru	1250	280	9.000	Jun-Dec
Kg. Cham	Tru korburch	600	140	3.500	Jun-Oct
Kratie	Tru sre	800	450	7.000	Jul-Nov





Tru korburch / prespee



Tru nhek

Gender aspects

Women and children are very much involved in constructing and operating these gears.

Main target species

Small fish species and juveniles, such as trey riel (*Henicorhynchus* spp.); trey kranh (*Anabas testudineus*); clarias catfish / trey andaing (*Clarias* spp.); trey kanchos (small *Mystus* spp.); trey ta aun (*Ompok* spp.); snakehead / trey phtuok / (*Channa striata* spp.); gourami / trey kawmpheanh (*Trichogaster* spp.); trey chhpin (*Barbodes gonionotus*); eel; crab; carid shrimp.

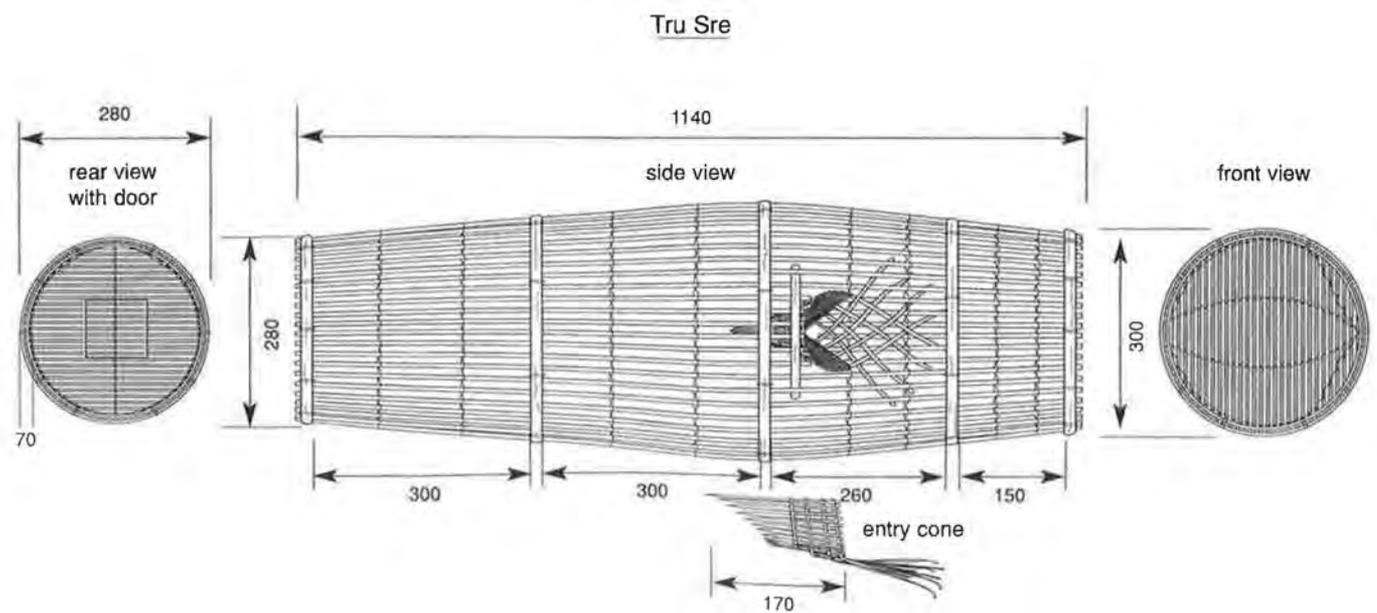
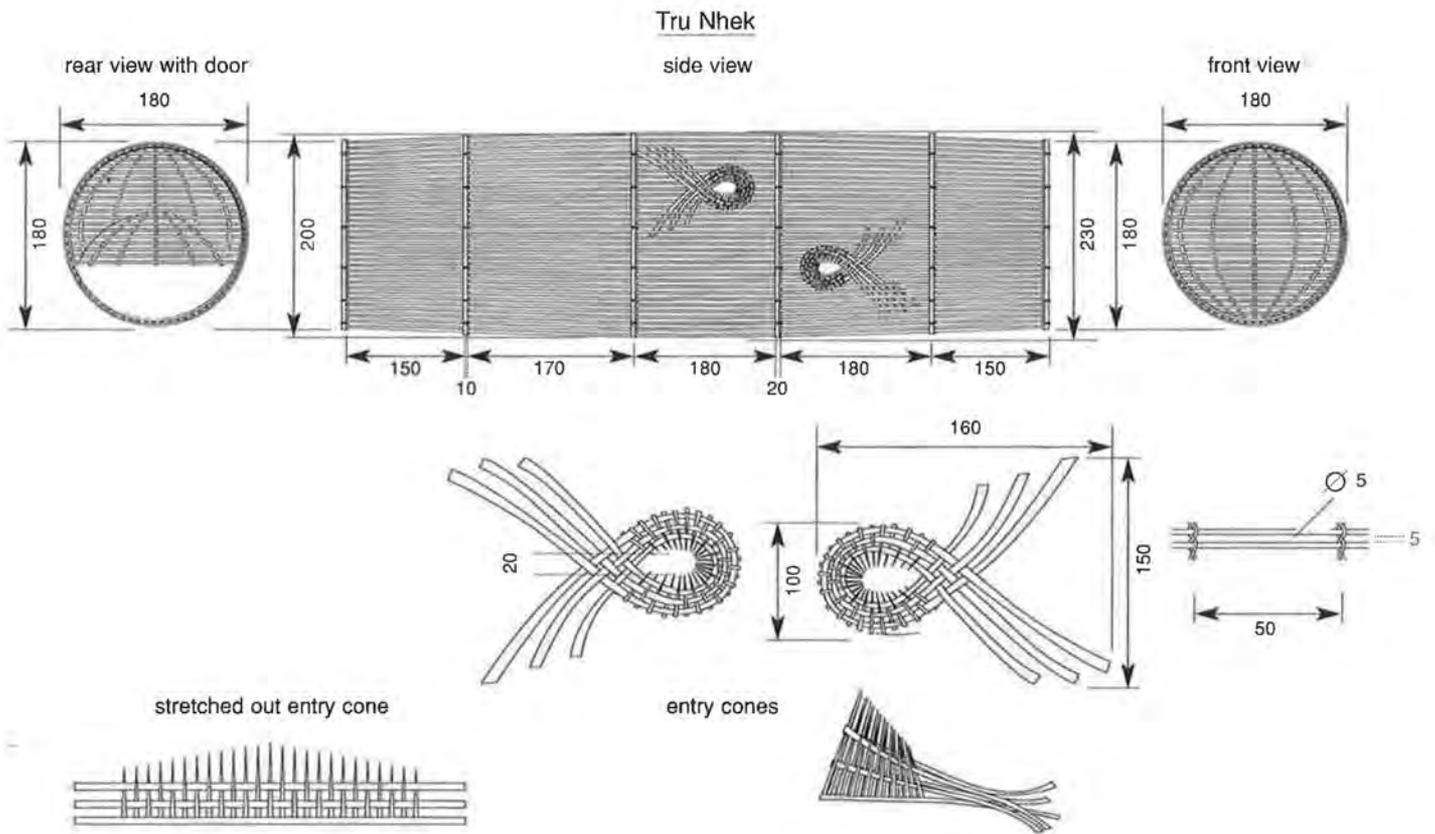
Legal aspects

Only the name *tru* is mentioned in the law. Table A of Proclamation No. 028 KOR SOR KOR (9/6/1987) permits the use of these traps and classifies them as middle-scale fishing gears, if higher than 0.8 m and with a diameter bigger than 0.3 m.



Horizontal Cylinder Trap for Rice Fields (cont.)

Tru





Tru kbal khla

VARIATIONS

Tru kbal khla / ទ្រូក្បាលខ្លា
Big bamboo cylinder trap for a barrage

Its use is only known from the provinces of Kampong Thom and Kampong Chhnang. The materials and way of construction are largely the same as for other *tru* traps. It is the biggest *tru* trap found in the flood plains; one observed in Kampong Thom had a total length of 2.70 m with one entry cone starting 25 cm from one end of the trap. The entry cone itself is 34 cm high and the base frame of the slit is 17 cm wide. However, given the construction design the spikes narrow the entry space down to a slit space, which is at its maximum 7 cm wide and some 20 cm long, thus, allowing the gear to capture bigger fish without letting smaller ones escape. The slats of the outer trap wall are 5 mm wide with a distance of 12 mm from each other, while the spikes of the entry cone are maximum 3 mm wide with the same distance from each other at the base frame. Its lifespan is two seasons. The trap is fixed to a bamboo fence of barrages crossing smaller rivers and streams (*preks*). Usually, several of these gears are inserted through holes in the barrage with the entry cone facing the current. They are inserted with some inclination at a distance of 2 m between each other with the entry cone placed 20 to 30 cm under the water surface and the other end of the trap sticking out of the water. The gear is



used both during the time of rising and receding floodwaters. The catch is mainly composed of pelagic fish species and is better during the dark moon periods. Men usually construct and operate these traps. Target fish species are *trek kes* (*Micronema* spp.) and *trek khang hai* (*Belodontichthys dinema*); a number of other species are caught as well.

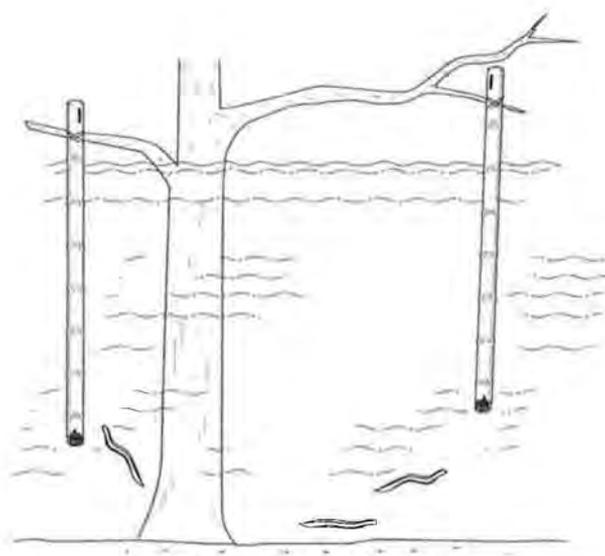
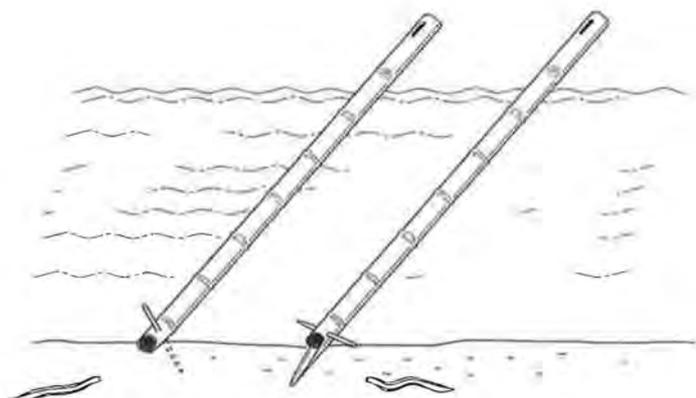
Province	Size			Season
	Length in mm	Diameter in mm	Cost in R.	
Kg. Thom	2670	640	60.000	Oct-Jan
Kg. Chhnang	3500	650	60.000	Jul-Aug, Oct-Dec

Tru kope / ទ្រូកប
Horizontal bamboo cylinder trap

Family fishing gear found only in Takeo. It has two entrances on its side. The cost is about R. 10.000 per gear. It is used in conjunction with a rice field dyke or a small barrage, where there is a weak current and a water depth of about 50 cm. Apparently, during rain the catch improves. Used from July to January.

Bamboo Tube Trap for Eel

Lawn Antong

**Description**

The *lawn antong* is made out of a large piece of bamboo with a diameter from 7.5 to 11 cm and between 1 and 2.5 m long. After cutting a bamboo stem to the desired length, the gear builder removes the inner diaphragms or cross walls located at each node to make one long space. At one end the diaphragm is maintained. At the open end an entry cone made out of fine bamboo spikes is introduced and fixed to the tube with a wooden nail crossing through the walls and the woven cone alike. This wooden nail is sometimes also used to anchor the trap to the bottom. Another variation has a strong spike carved out of the bamboo tube itself that serves as positioning anchor. Near to the closed end of the tube a 10 cm long and 1 cm wide air slit is carved, allowing any air inside the tube to escape. The lifespan is 2 to 3 years.

Cost

R. 2.000 to 8.000

Operation

The eel tube trap is a very popular fishing gear, which is operated in swampy places in the flood plains during the rainy season. Its use has been reported from nearly all provinces and in all months of the year.

The eel trap is anchored on the bottom of water bodies no deeper than 1 m, with the air slit sticking out of the water. Before operation the trap is baited with mashed snails, worms or rotten stinky fish in order to attract the eels. One trap may catch up to 3 or 4 eels at a time. Families usually have up to 10 tubes, while professional fishers may operate up to 50 or



sometimes more eel tube traps, placing the traps at a distance of 5 to 10 m from each other.

In the flooded forest areas the tubes are bound to the tree branches just above the water surface with the entry cone located mid water.

Gender aspects

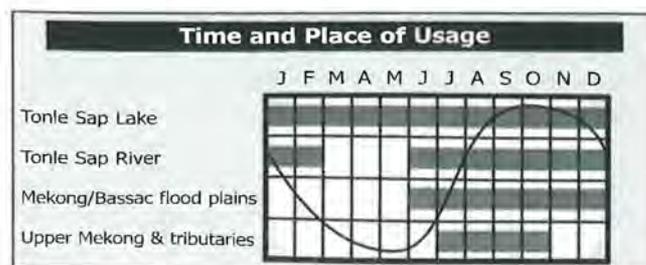
Men construct the eel tube traps and operate them, often accompanied by their children.

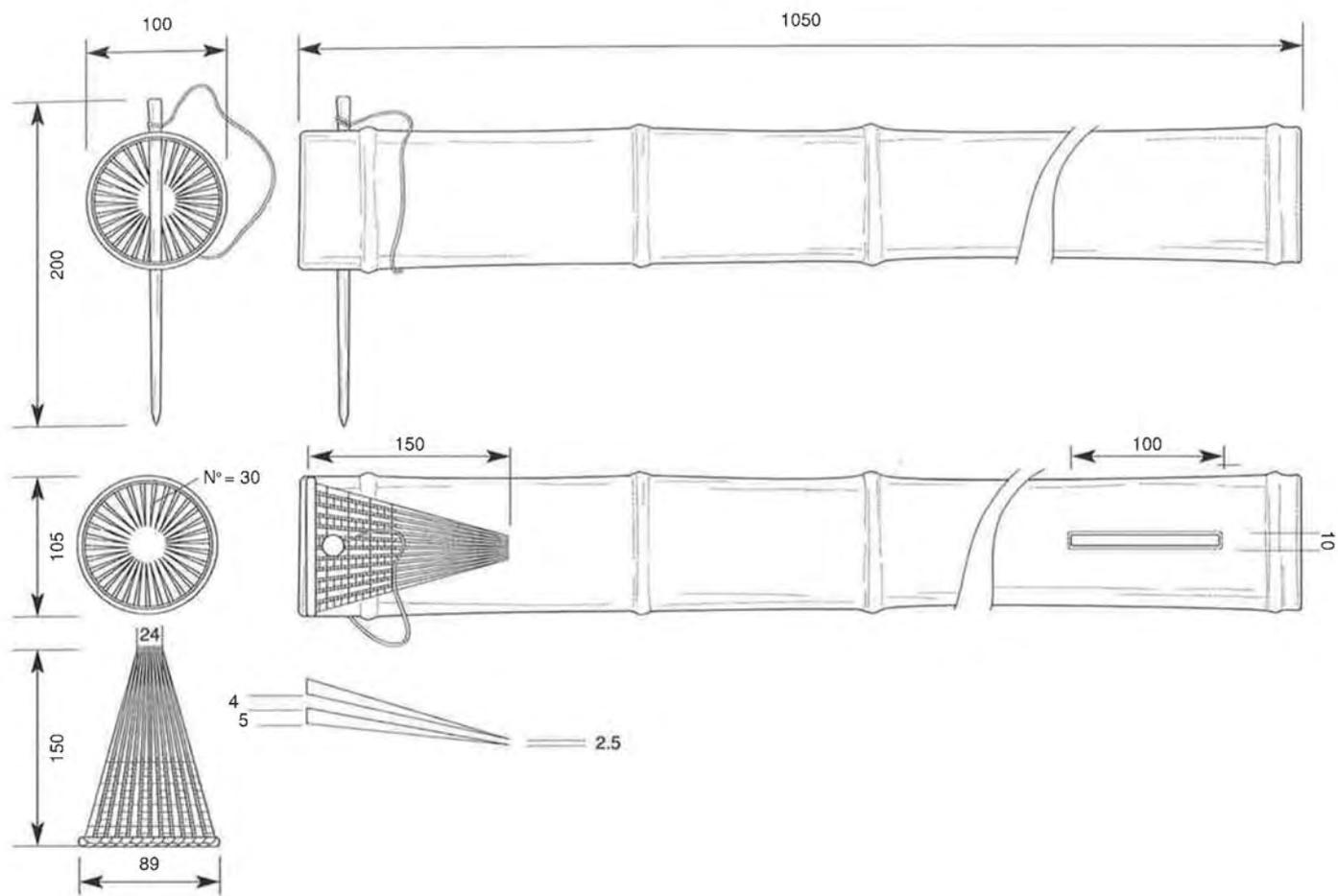
Target species

Only eels / trey antong (*Monopterus albus*) are caught.

Legal aspects

Family fishing gear (No. 028 KOR SOR KOR).



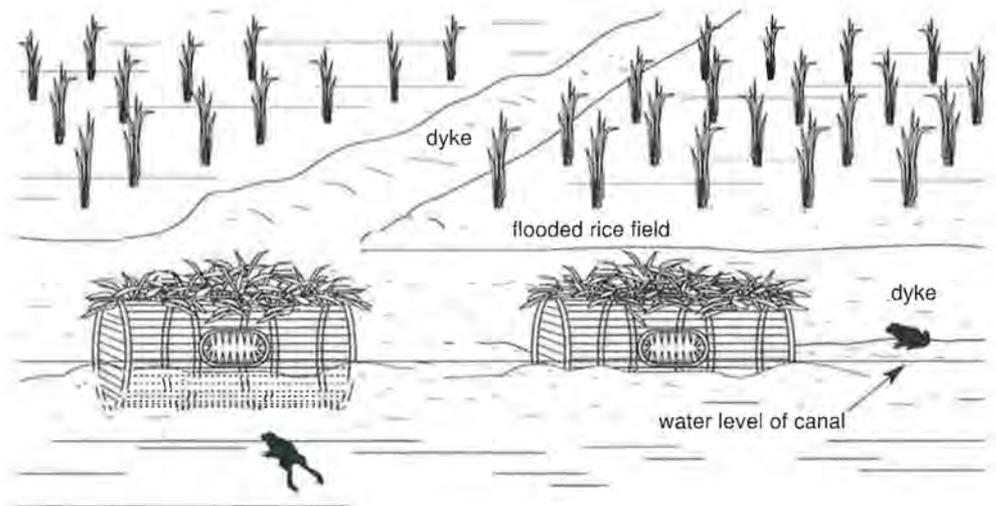


Installing an eel tube



Horizontal Cylinder Trap for Frogs

Lop Kongkaep

**Description**

The *lop kongkaep* is between 32 and 60 cm long and between 15 and 25 cm in diameter. Two different types of *lop kongkaep* have been observed in Takeo and in Battambang.

The Takeo type has two entry cones, one at the top and one at the bottom end of the cylinder leading the frogs into one shared capture room and with a small door opening at the center of the cylinder wall for removing the catch.

The Battambang type has one single entry cone at the center of the cylinder wall and the opening door is at one end of the trap. The outer wall is made out of a matt of bamboo slats and fixed on 4 wooden stabilizing rings with vines or nylon fibers at a distance of 8 to 12 cm from each other. The slats have a diameter of 5 mm and an open space of 7 mm between them. The entry cone is 6 cm wide and 10 cm long and its spikes narrow down to a flexible entrance of 3 cm high and 5 cm long.

Cost

R. 2.500 (Battambang); R. 3.000 (Takeo).

Operation of the gear:

In Takeo this gear is operated in very shallow waters (no deeper than 10 cm) of irrigation canals or in rice fields only at night time towards the end of the rainy season. The water is preferably stagnant. The trap is dug-in up to the entrance slit and covered by grass or branches. Live shrimp is used as bait.

In Battambang and Kampong Thom the gear is operated during the rainy season in irrigation canals or small rivers next to the rice fields. The basket trap is fixed to the bottom of the banks of the canal or river parallel to the current. Being half under water the entry cone is positioned exactly above the water surface so that the frogs can swim or climb straight into the trap. One single fisher generally positions numerous traps on the river or canal banks. Small fish (*trey changva*, *Rasbora* spp.) are used as bait.

Gender aspects

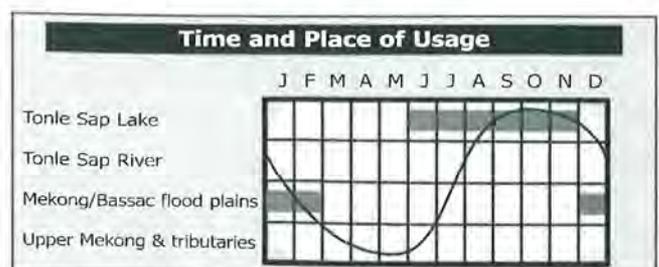
This kind of trap is generally constructed and operated by males and females. Often children are in charge of setting them out and collecting the frogs from them.

Target species

Frogs (*Hoplobatrachus rugulosus*)

Legal aspects

Not classified / not mentioned in the law.



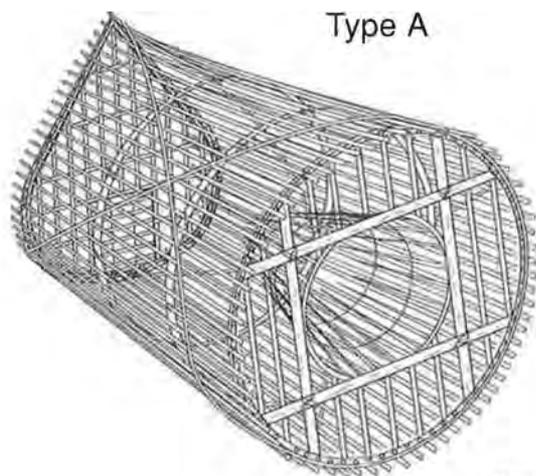
C L O S E - U P



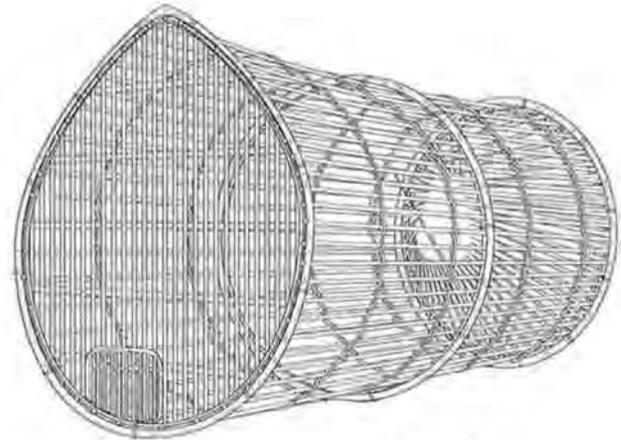
Entry for the Bamboo tube trap for eel

Horizontal Cylinder Trap for Freshwater Prawns

Lop Bongkong



Type A



Type C

Two types of prawn traps

Description

Three different types of *lop bongkong* were reported from Kandal, Kampong Chhnang, Prey Veng and Takeo provinces.

Type A

One has a round entry cone located in the middle of one end of the trap. It has only one entry cone and the bait is suspended behind it from the top of the trap. Found in Takeo, Kandal and Prey Veng. Only in Takeo it is called *lop phlong bongkong*.

Type B

Here one entire end of the trap is an entry cone, with a second one fitted right behind. The entry gap of the second cone is narrower than that of the first one. The bait is placed on the bottom of the trap in the capture chamber. Found in Takeo.

Type C

This one is like type B, but has only one entry cone from which a spike rises up to the center of the trap, on which the bait is fixed. Found in Kampong Chhnang.

The opposite end of all these traps holds the opening door for removing the catch. At this end the bottom part forms a half circle and the top part a peak. A weight, often a stone, is placed inside the trap to hold it down and in the right position.

The traps are roughly 0.8 to 1.2 m long with a central diameter of 42 to 75 cm. The round gap in the entry

cone has a diameter of 20 to 30 cm. The outer trap wall is made out of bamboo slats (\varnothing 5 mm). The distance between the slats is 13 mm (Prey Veng) to 20 mm (Kandal and Kampong Chhnang).

Cost

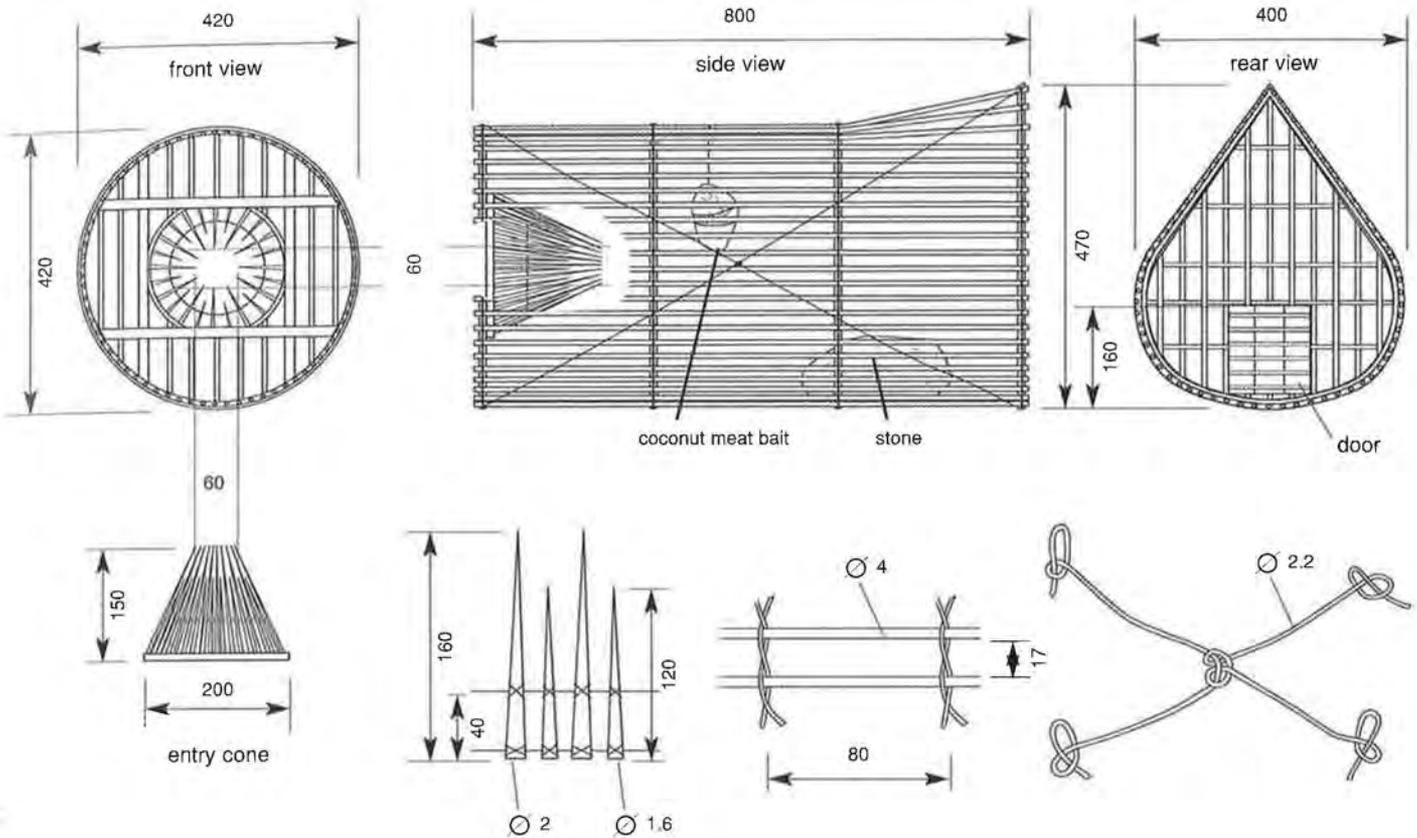
R. 4.500 to 20.000

Operation

This prawn trap is operated in rivers with a good current in a depth of between 0.5 and 8 m mainly during the rainy season, i.e. during the rise of the floodwaters and during the recession. The gear is used in the flooded forest areas, rivers and lakes preferably near inundated forest or other aquatic vegetation where there is some current. A lead fence (which does not need to be too high) crossing the bottom of the river frequently complements the trap installation. Freshwater prawns following the current encounter the lead fence and eventually enter through the trap opening, lured by the bait. Burned coconut meat has traditionally been the most popular bait used in this trap. Fishers in Prey Veng province report that coconut and green grasshoppers are the best bait when the water is murky, but crab is when the water is clear.

The traps are installed in carefully selected spots with the entry facing downstream. They are generally left there until water level changes require the traps to be relocated. Usually, they are harvested once a

Type A



day. Catches at full moon are better than at dark moon.

In Kandal province the lobster traps are put out in a series attached to each other by a long line. The usual distance between the traps is 3 to 5 m and there are a number of traps attached to one line. The long line is marked with an identification float on the surface, while the bottom long line is anchored at the first and at the last trap.

For its operation usually two fishers with a boat are required. One fisher dives for the traps while the other operates the boat and assists his colleague in receiving the traps and emptying the catch into the boat. In Takeo province a stick with a hook is used to lift the trap out of the water.



Type A traps

Gender aspects

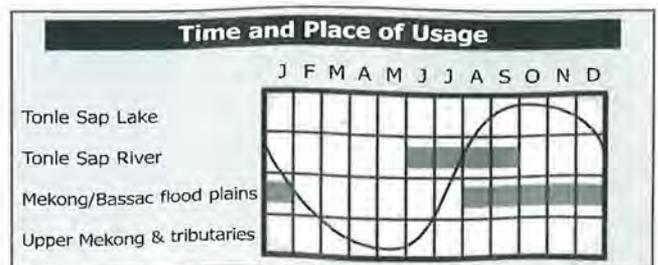
Commonly men operate this trap since diving is frequently involved.

Target species

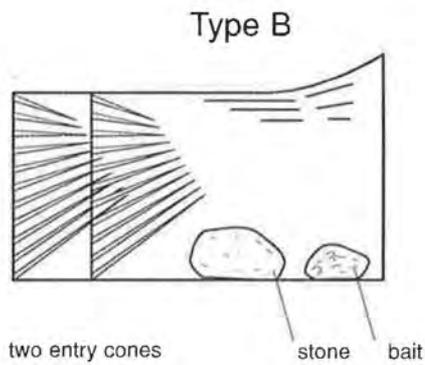
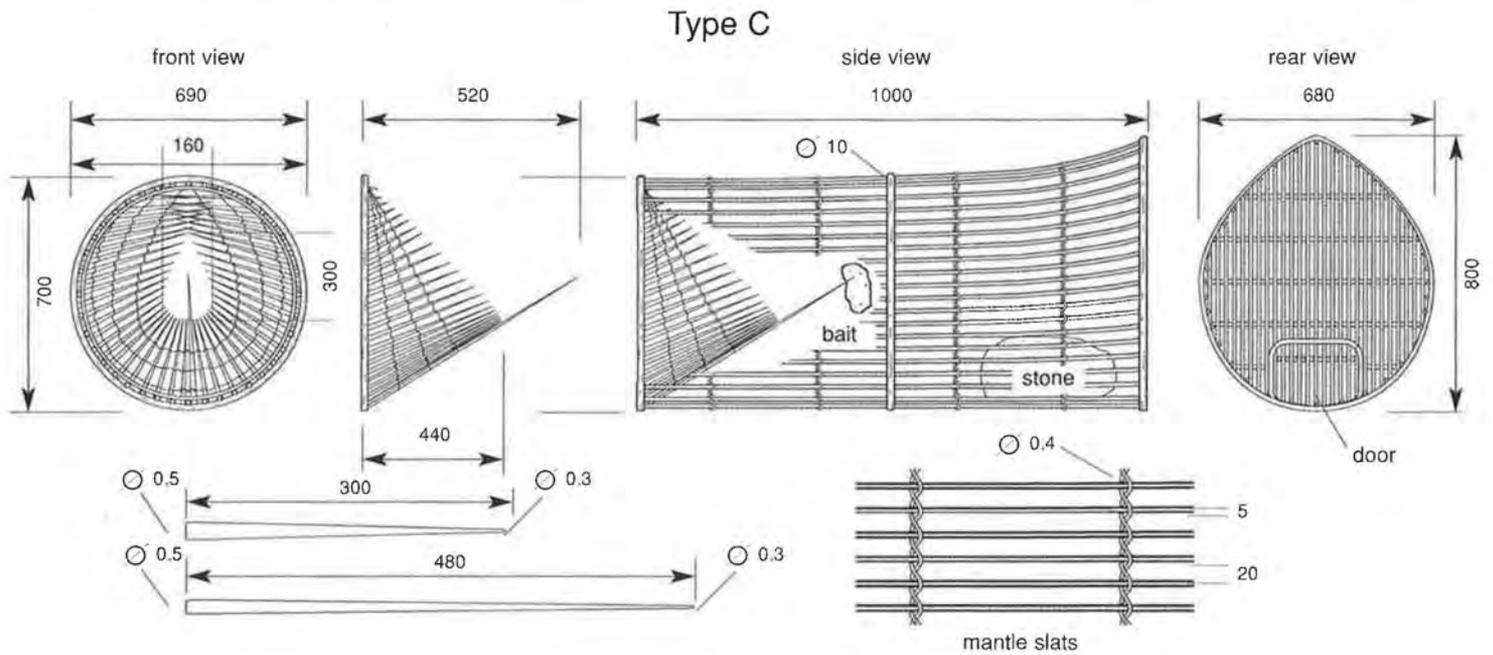
River prawn / bongkong (*Macrobrachium rosenbergii*).

Legal aspects

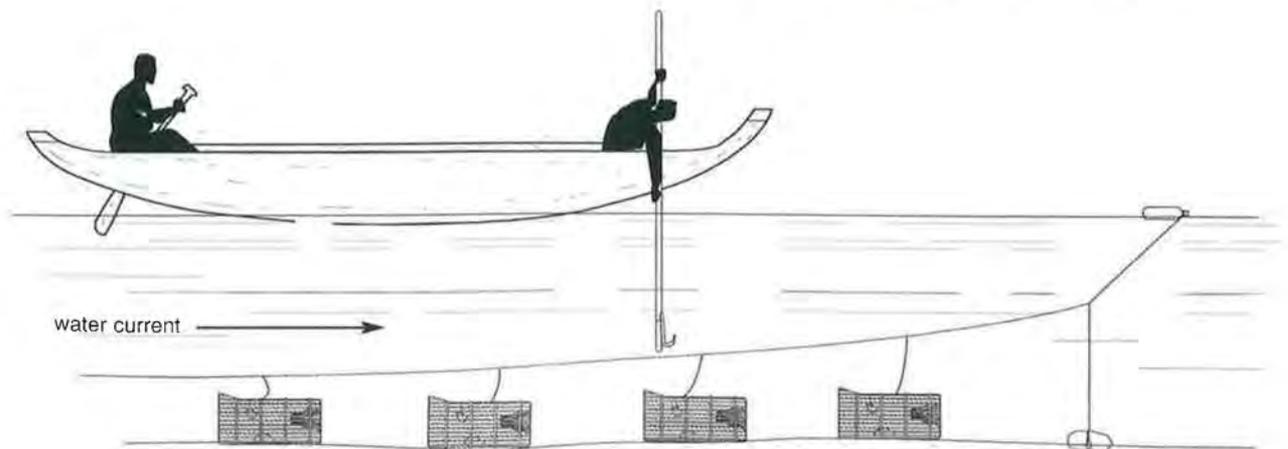
Not classified / not mentioned in the law.



Horizontal Cylinder Trap for freshwater Prawns (cont.) Lop Bongkong



Freshwater prawn (*Macrobrachium rosenbergii*)



Type A traps: checking for captured prawns. The back-sides of the traps face the current.

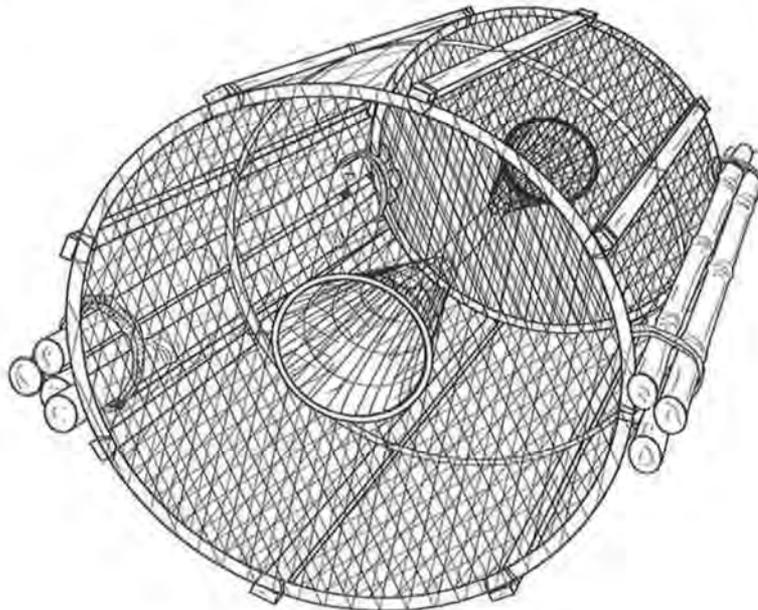
C L O S E - U P



Horizontal cylinder trap; detail

Horizontal Cylinder Trap for Gourami

Lae Trey Kawmpheanh

**Description**

This small-sized trap is very popular and can be found in many variations. Its total length is between 42 and 60 cm with a diameter of 30 to 45 cm. It consists of a cylinder-shaped framework of bamboo or wooden slats, or - more commonly nowadays - thick wire and thin iron bars. The trap walls might be made of thin bamboo slats (\varnothing 5 mm, with a 5 mm gap between each) or netting with a 10 to 20 mm mesh size. In Pursat the entry cone is made of chicken wire with a 14 mm maximum distance within the hexagonal. Most *lae Trey Kawmpheanh* use a combination of materials. At both ends there are circular entry cones that narrow down to a gap of 8 by 3 cm. The ends of both entry cones are tightened by means of two thin strings connecting the cones. In Kampong Thom the *lae* trap is equipped with two wooden floats at each side slightly above the middle line, allowing the trap to float at the water surface while keeping the entry cone just below it. In this case the trap has an open slit on the top side as long as the trap itself, and 21.5 cm wide. This opening serves to easily introduce bait or remove the captured fish.

Operation

The trap is placed in the submerged vegetation in the inundated forests or alongside streams frequented by gourami, in water of about 0.3 to 1 m or more. The top one-third of the trap remains above the water, covered with plants. The entry cones are submerged. Bait in the form of a thick smelly rotten fish paste is poured into the trap; also fish oil is used. Then it is covered with water plants or tree branches. The catch is checked twice a day or even every 2 to 3 hours, and bait is added. In Pursat and Kampong Thom the captured gourami are used as bait themselves on hooks for catching snakeheads (*Channa* spp.), or as feed in cage culture. In Prey Veng 5 to 30 traps may be operated by a single fisher.

Gender aspects

Both women and men construct and operate these traps.

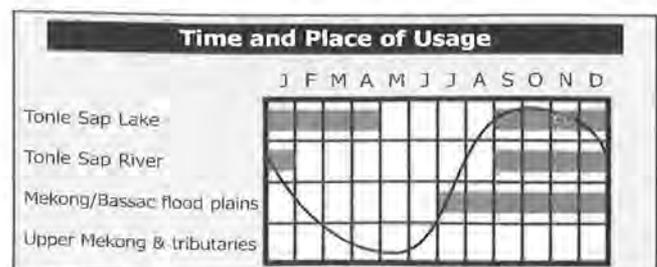
Target species

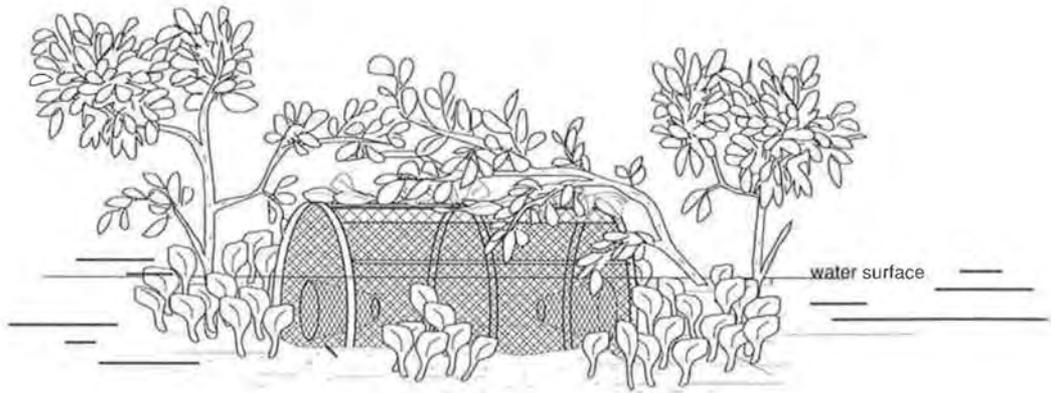
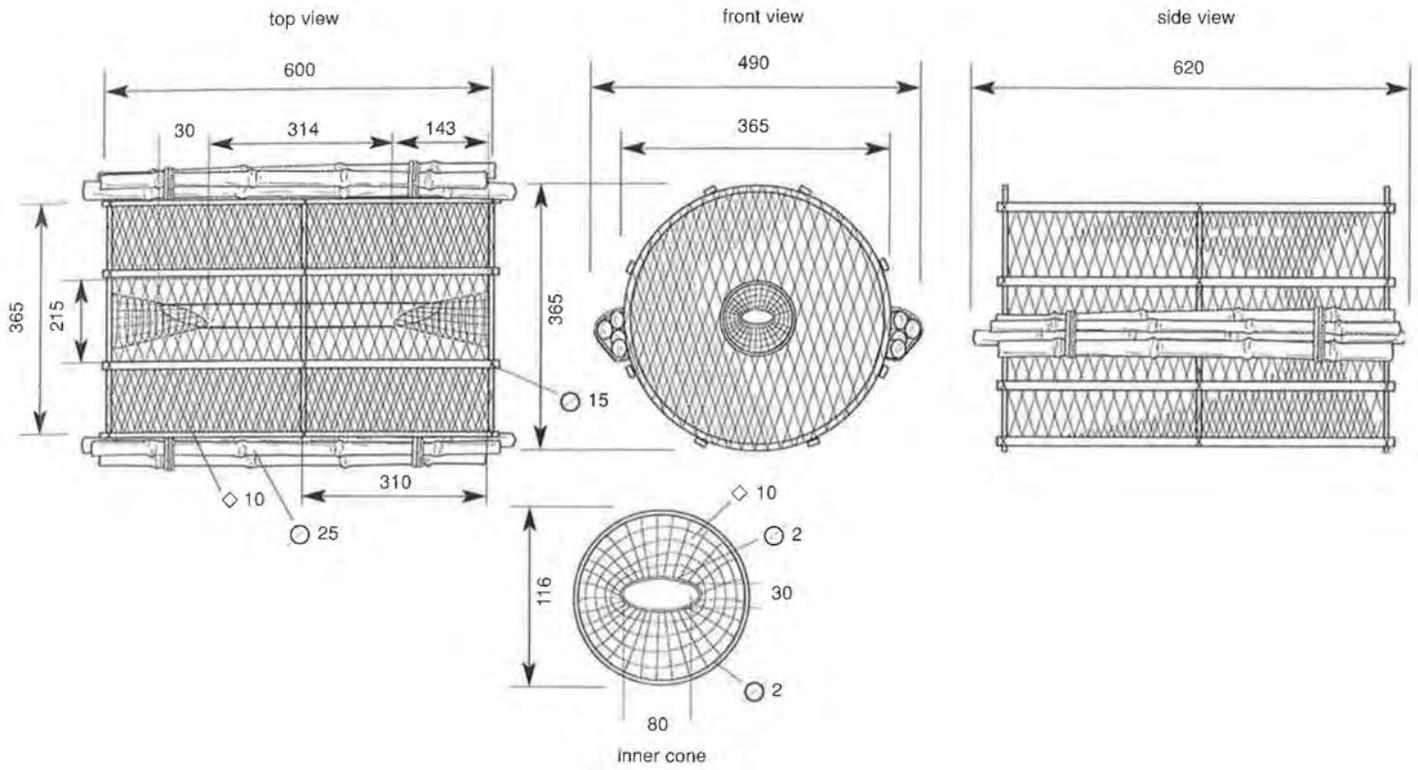
Gourami / *Trey Kawmpheanh* (*Trichogaster* spp.).

Legal aspects

Family fishing gear (No. 028 KOR SOR KOR).

Size, Cost & Season					
Province	Length in mm	Diameter trap in mm	Diameter entry in mm	Cost in R.	Season
Battambang	600	450	70	12,000	Oct-Feb
Pursat	500	300	100	4,000	Nov-Apr
Kg. Thom	600	365	115	15,000	Aug-Dec
Kg. Chhnang	600	400	70	7,000	Aug-Jan
Prey Veng	580	380	110	15,000	Jul-Dec
Takeo	420	350	60	10,000	Jul-Oct





Positioning of the trap

The 'Lae Trey Kawmpheanh' traps are open on top for easy replenishing of the bait and removing captured fish



Trap with wooden floats



Trap made of netting, wire and iron bars

catches are low. The trap is set out in the late afternoon and retrieved early in the morning. No bait is used. The operational water depth is between 0.5 and 1.5 m. One fisherman may operate several traps at a time, each trap marked with a thin pole for easy relocation and for fixing it in position.

For its operation usually two fishers with a boat are required: one operates a long handled gaff to lift the trap while the other operates the boat and assists his colleague in receiving the traps and emptying the catch into the boat.

It is also used inserted into the bunds between the rice fields, in such a way that the entry slit faces water flowing out of a higher located ricefield into a lower field. The trap is anchored in its position with mud and usually covered with grass or other vegetation in order to provide attractive shade for the fish. All the water passes through the trap and every fish is filtered out.

Gender aspects

Commonly men construct and operate this trap.

Main species caught

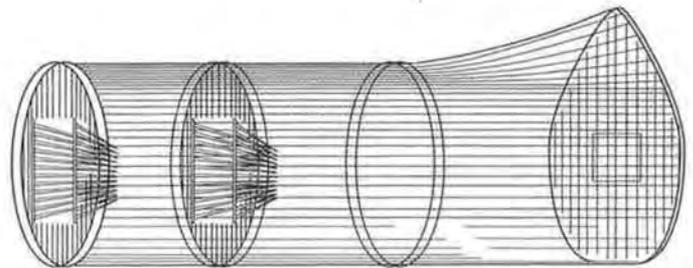
Small fish; trey andaing / catfishes (*Clarias* spp.); trey kranh (*Anabas testudineus*); snakehead / trey phtuok / trey raws (*Channa striata* spp.); trey chpin (*Barbonymus gonionotus*); gourami / trey kawmphleanh (*Trichogaster* spp.); trey changva (*Rasbora* spp.); shrimp.

Legal aspects

In the fishery law there is mention of a lop, which is classified as a middle-scale fishing gear, if higher than 0.8 m and with a diameter bigger than 0.3 m (No. 028 KOR SOR KOR).



Trap placed in dyke, breached to allow water to flow from the right to the field on the left.



Variation in Pursat



Lop prueh saiyoen, Pursat

Horizontal Cylinder Trap for Catfish

Bong Trey Chhlang / Lop Trey Kanchos

Description

This medium-sized trap is made of bamboo that has been fire-hardened. The distance between the slats of the mantle is commonly 10 to 12 mm. The entrance is designed especially for capturing catfish, but there are regional differences. The name *bong Trey chhlang* is used in the Mekong and Bassac floodplains, while the name *lop Trey kanchos* is used around the Great Lake and the Tonle Sap River. Within the regions there are further differences. The traps have two entry slits placed right behind each other. The various types of slits are shown in the drawing. These traps can last for 2 to 3 years, if properly cared for.

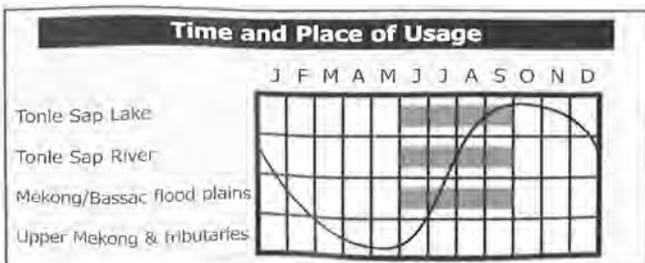
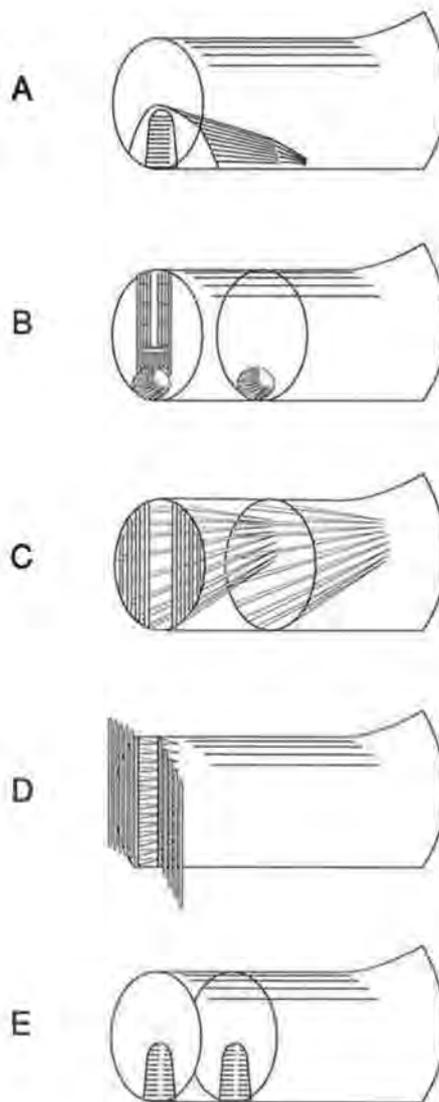
Type A has one narrow entry slit located at the bottom of the front side, leading the fish directly into a funnel with the second slit. This construction with the first slit sitting within the funnel holding the second slit is called 'kop'. In Battambang the traps are often placed inside the spacious capture rooms of arrow-shaped fence traps, with the purpose to collect fish swimming around in these pen-like structures. These traps have short fences to guide the fish to the entry slit.

Type B is found in Kandal province. It has two first entry slits above each other. The lower entry slit is for *chhlang* (*Mystus nemurus*) and the top entry slit for *trey linh* (*Thynnichthys thynnoides*). Behind these two is one common slit leading into the capture chamber.

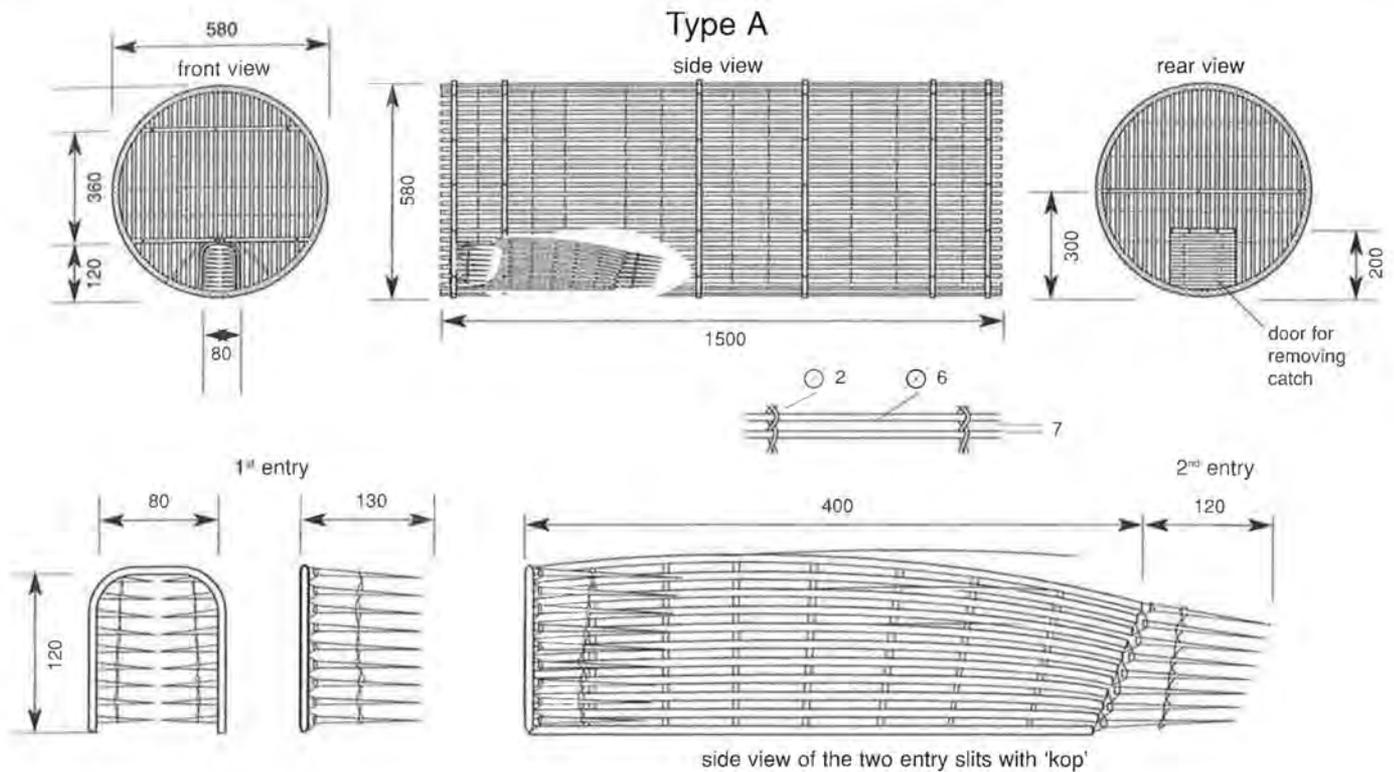
Type C is reported from Kampong Thom. It shows the usual two cones of a *lop* trap, but here the entry slit is as large as the entire face of the trap and set in a cone. It is also called *robang Trey kanchos*.

Type D. In Pursat the trap is called *rav Trey kanchos*. It is like Type C, but has only one vertical slit in the face of the trap, which is framed by two doors.

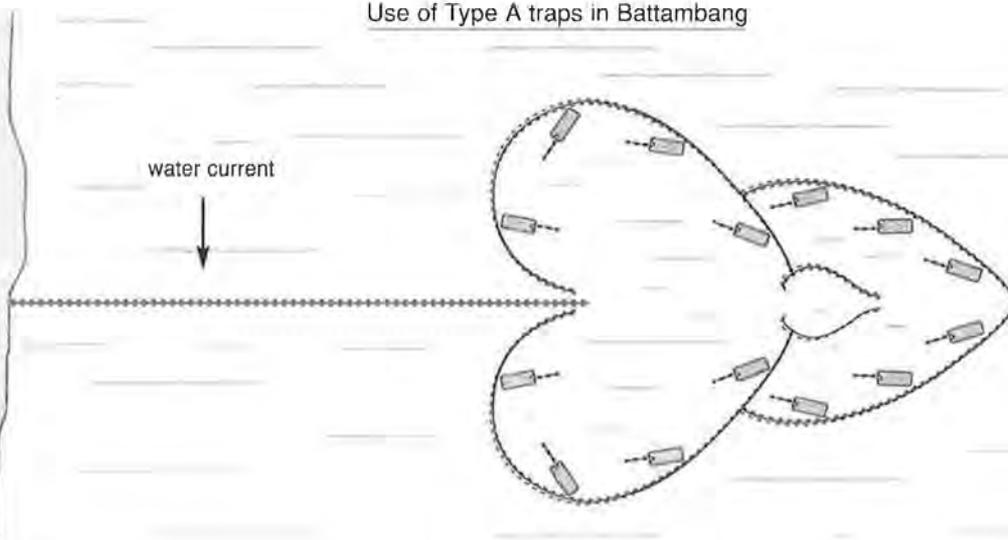
Type E. Found in Takeo. It has two narrow entry slits located behind each other at the bottom of the front side.



Type, Size, Cost & Season						
Province	Type	Length in cm	Diameter trap in cm	Diameter entry in cm	Cost in R.	Season
Battambang	A	122	65	12	45,000	Oct-May
Pursat	D	180	80	18	15,000	Jun-Aug
Kg. Thom	C	160	75	10	58,000	May-Jul
Kg. Chhnang	A	160	70	10	35,000	Jun-Aug
Prey Veng	A	107	58	7	30,000	Jun-Aug
Kandal	B	120	56	6	8,000	Jun-Sep
Takeo	A	150	60	8	10,000	Jun-Sep
Takeo	E	220	52	6	20,000	Jun-Sep



Use of Type A traps in Battambang



Operation

The traps are placed in small streams and canals at depths of 0.3 to 3 m with the entrance facing the current. Most effective during the period of rising water, but also used when the water is receding. Four to six *bongs* are placed together in a barrage across the stream. No bait is used. Around the Great Lake this trap is generally operated in combination with an - often arrow shaped - lead fence or a barrage. The reported operational water depth is from 0.7 m to 8 m. In Battambang the traps are operated during the whole recession period as well as the dry season, while in other provinces it is operated from the end of the dry season until the water floods the land and clear streams and currents are no longer available.

Catches during full moon are reported to be higher than during dark moon periods.

Gender aspects

Men exclusively operate this gear; women can be involved during the construction process.

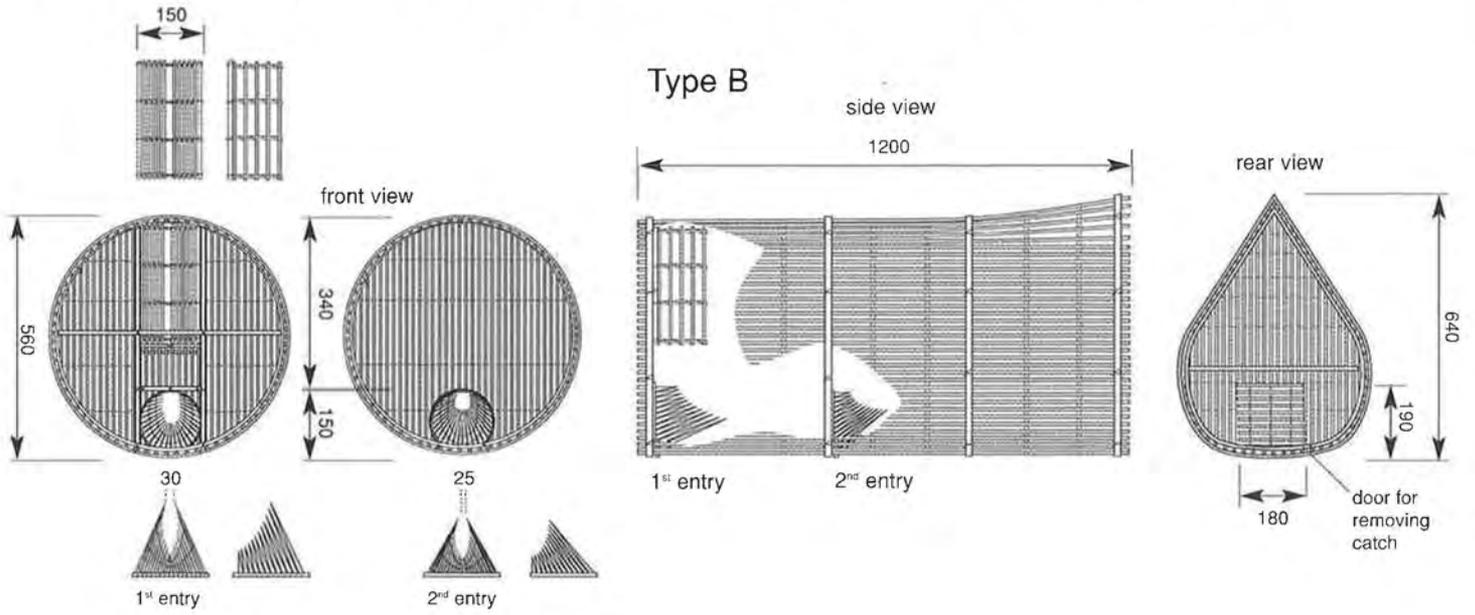
Target species

Trey chhlang (*Mystus nemurus*); trey kanchos (small *Mystus* spp.); trey kes (*Micronema* spp.); trey khlang hai (*Belodontichthys dinema*).

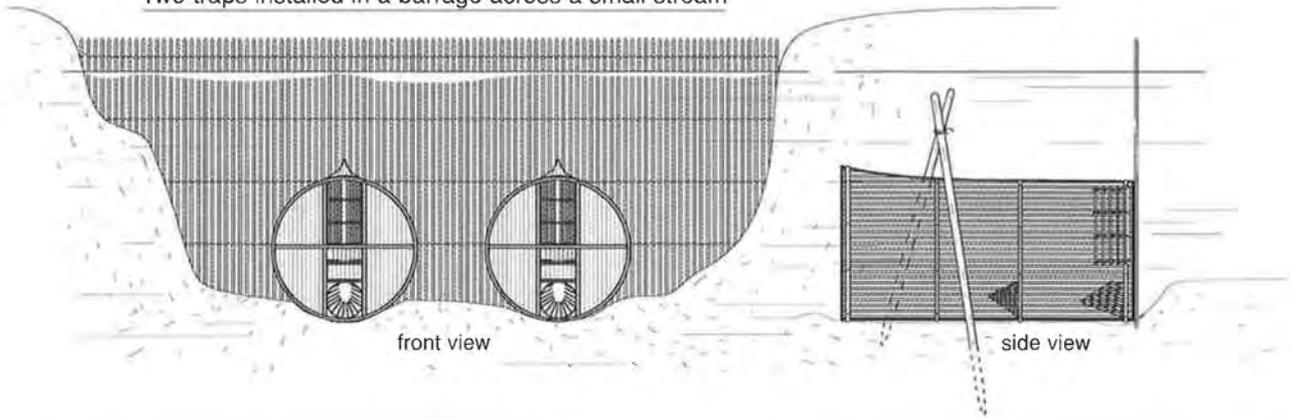
Legal aspects

Not classified / not mentioned in the law.

Horizontal Cylinder Trap for Catfish (cont) Bong Trey Chhlang / Lop Trey Kanchos



Two traps installed in a barrage across a small stream



Front view Type A with 'kop' from Prey Veng



Front view Type B traps as found in Kandal

VARIATIONS

The following traps show minor variations from the basic type. They are made to attract particular species. The differences are variations in the shape of the entrance and in the positioning of the trap in the water and the habitat. The differences are often quite subtle.

Lop dort / លបព័ទ្ធភាត

Horizontal cylinder trap for small fish

This small sized *lop* trap is made of thin bamboo slats (\varnothing 7 mm) with a space of 10 mm between them. The total length of the trap is 1 m with a diameter of the cylinder body of 0.5 m, though the rear part is flattened to an oval shape ending in a point in its superior part. This *lop* trap is characterized by two different types of cones, arranged one behind the other. The opening of the entry cone is a small triangle or sub-triangle at the bottom of one side with a spike funnel (*kop*). The 15 cm long spikes are narrowed down to an opening of 3 cm wide and 15 cm high, but it can easily be pushed open by bigger fish entering the pre-capture room. At the second stabilizing ring a conventional cone is fixed covering the whole circle area with the inward facing spikes narrowing down to a 2 cm wide oval, flexible slit. At the flattened, oval like rear part the opening door is incorporated, allowing removal of the fish. No bait is used. This trap is only known from Kampong Chhnang. It costs R. 25.000.

At the front end of the trap are two small slightly pointed sticks right and left beside the entry funnel, which serve to firmly anchor it in the bottom, and this is what the word '*dort*' refers to. It is not used in connection with a barage across a stream. The traps are placed in canals near dykes of islands and in streams (*preks*) when water is rising. The main season for use is from July to December.

Lop trey slat / លបត្រីស្លាត

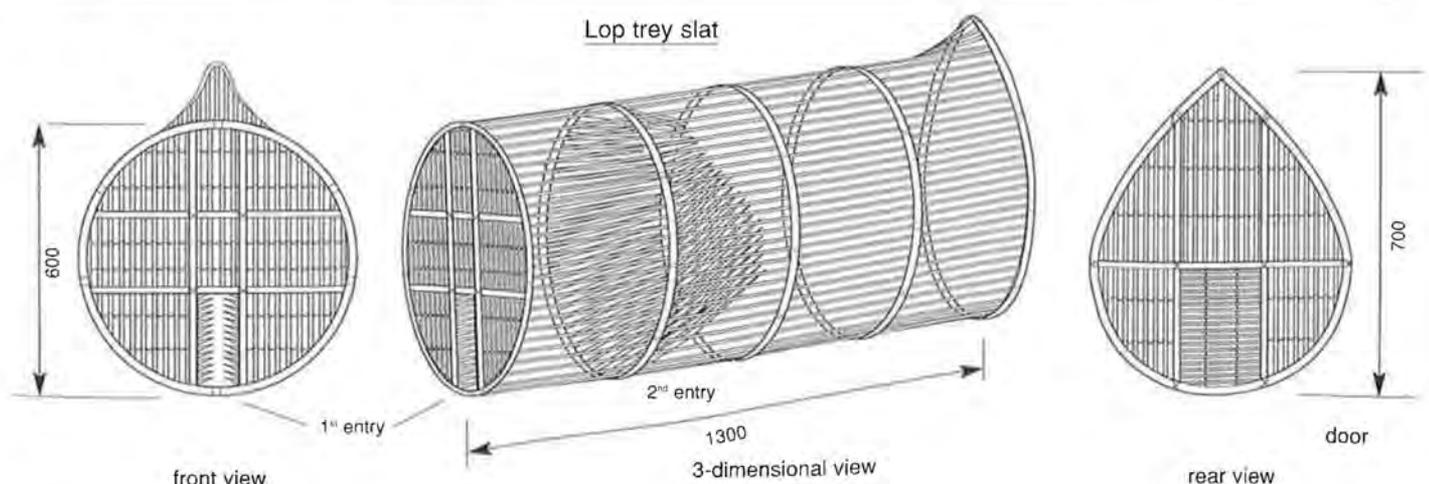
Horizontal cylinder trap for catching featherback / trey slat (*Notopterus notopterus*)

The *lop trey slat* is almost exactly the same trap as the *lop dort*, but it has a specific entrance suitable for the target fish species. In addition, the trap is placed at the water depth the fish is moving in. No bait is used. Another difference is that its total length is 1.3 m with a diameter of the cylinder body of 0.6 m. The weaving structure of the trap mantle, the entry-funnel and the 'killing' cone are exactly the same as in the previous trap. However, it does not have the two anchor sticks at the front side like the previous trap. It is used from August to December.

This gear is exclusively operated by men, although women can be involved during the construction process.

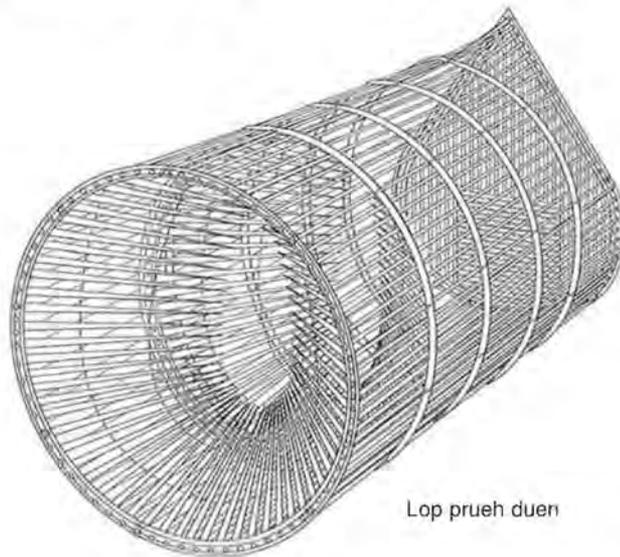


Lop dort



Big Horizontal Cylinder Trap

Lop Prueh Duen



Lop prueh duen



Sticks help to keep the trap in shape



Mekong River at Stung Treng

Description

Large traps; 1.3 to 2.7 m long with a diameter of 44 to 96 cm at the fish entry side and 60 to 126 cm at the peaked side, where the opening door for removing the catch is located. One entire end of the trap is an entry cone, with a second one fitted right behind. The oval gap in the (first) round entry cone is wider and higher than in the second entry cone (see table below). The outer trap wall is made of bamboo slats (Ø 5 to 12 mm) with between them a distance of 10 to 22 mm. Its lifespan is 2 to 3 years.

traps are also used with fences in the same way as in Siem Reap, but instead of one trap two are used back to back, as the word *chul* suggests.

If the trap is not used with a fence, it is placed facing the current along the bank of a stream. It is then suspended off the bottom between three poles in such a way that part of its top emerges above the surface. Two of the poles are placed on each side of the fish entrance and one at the peaked end. The *lop bongkop* in Battambang is hung from a tree in the flooded forest.

Generally, the traps are not baited.

Type, Size, Cost & Season							
Province	Local name	Length in cm	Diameter trap in cm	Diameter entry 1 in cm	Diameter entry 2 in cm	Cost in R.	Season
Battambang	Duen	130	44	7	5	15.500	Jun-Feb
Battambang	Bongkop	180	76	11	7	15.500	Dec-Jan/Jan-Jul
Pursat	Lop pruel	270	96	9	4	60.000	Aug-Jan
Siem Reap	Preang	157	62	3 - 5	2 - 4	12.500	Dec-Feb
Phnom Penh	Duen	150	80	10	5	25.000	Jul-Nov
Kg. Cham	Prohchul	132	58	3	1	15.500	Jun-Aug/Oct-Mar
Kratie	Duen	156	87	10	4	45.500	Jun-Oct
Stung Treng	Duen	220	70	10	2	7.500	May-Sep

Target species

Medium to big sized fish.

Gender aspects

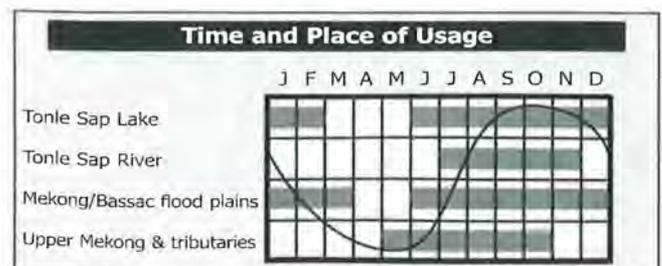
Commonly men construct and operate this trap.

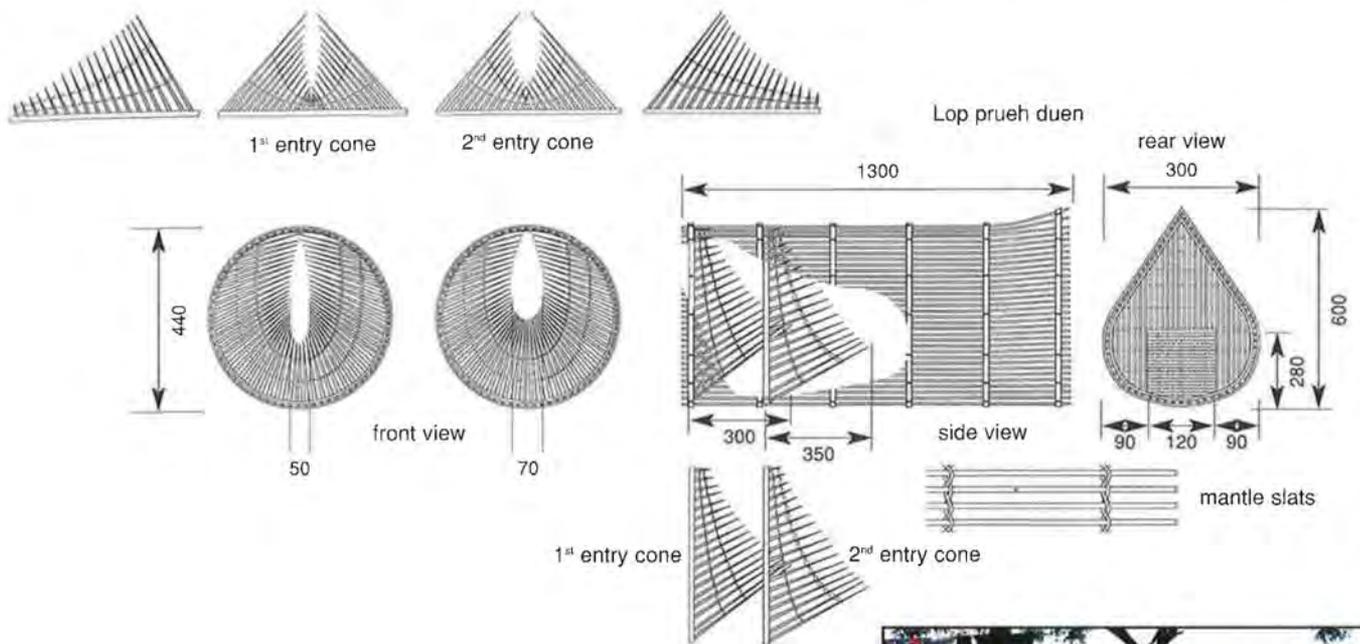
Legal aspects

In the fishery law there is mention of a "lop" which is classified as a middle-scale fishing gear, if higher than 0.8 m and with a diameter bigger than 0.3 m (No. 028 KOR SOR KOR).

Operation

Used in flowing muddy waters 1 to 5 m deep, mainly in lakes, streams or rivers. If several traps are used, they are placed at 50 m intervals, often in combination with a fence blocking a stream. In Siem Reap this trap is called *lop preang*. It is used in the flooded forest between two fences in such a way that the fence ends cuts through the middle of the trap opening, allowing fish to enter from both sides of the fence. In Kampong Cham the names *lop lao* or *lop prohchul* are used. The





VARIATIONS

The following traps show minor variations from the basic type. They are made to attract particular species. The differences are variations in entrance shape and in positioning of the trap in the water and the habitat. The differences are often quite subtle.

Lop sach uon / លបសាច់អួន Horizontal cylinder trap with netting

Essentially the same trap as above, but instead of a bamboo body it has netting, although the frame is made of bamboo or iron bars. The mesh size of the netting was reported to be 20 to 30 mm in Prey Veng, but there is also mention of much finer netting being used (1 mm square). The trap is then called *lop sbai mong*.

Lop Trey Kes / លបត្រីកេស Lop Trey Khlang Hai / ត្រីក្លាំងហាយ Horizontal cylinder trap for sheatfishes (Siluridae)

The *lop Trey kes* and *lop Trey khlang hai* are very similar. They are between 60 and 250 cm long and between 80 and 120 cm in diameter. The trap consists of a cylindrical body with two successively arranged cones. The entry cone leads the fish into the pre-capture room and the 'killing' cone into the final capture room or 'killing' room. Both cones are slightly expandable. The entry slit is 7 mm at its widest point and 35 mm long. The slit of the killing cone is maximum 5 mm wide and 30 mm long. The end located opposite the entry cone is slightly higher, its



Lop sach uon, Takeo



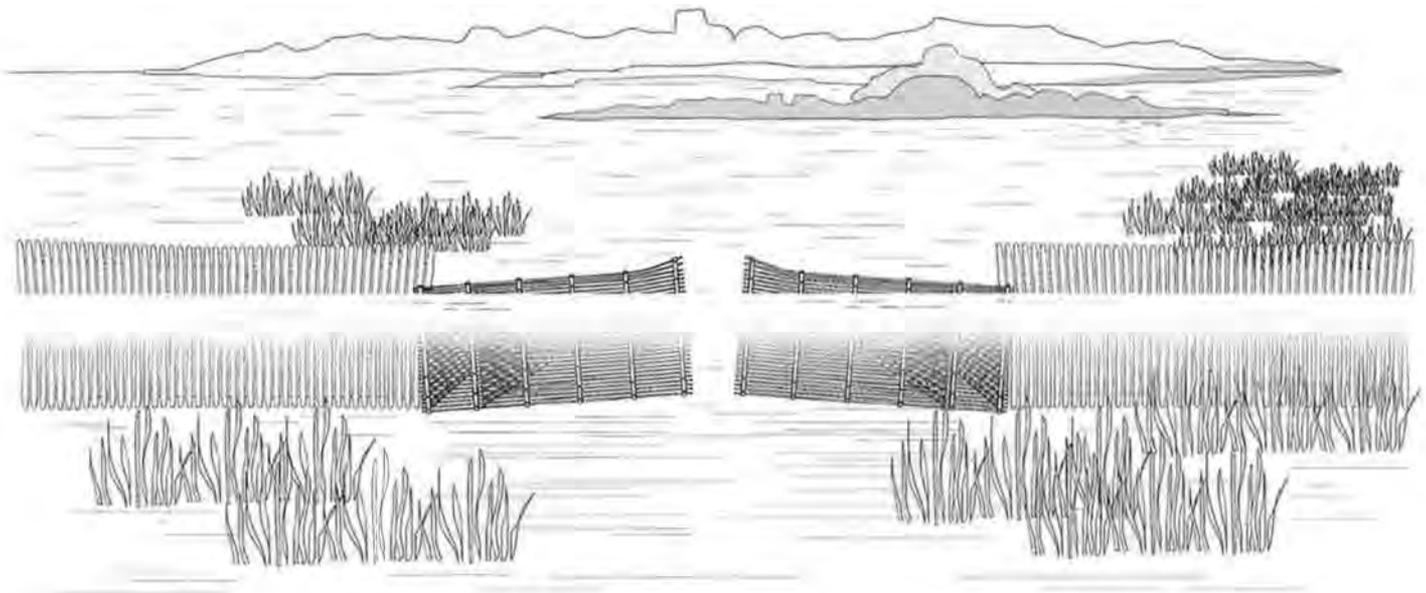
Construction and maintenance shack for lop sach uon



Separate entrance cone is placed in front of the 'Lop Trey kes'. Note the netting on the trap.

Big Horizontal Cylinder Trap (cont.)

Lop Prueh Duen



Lop prohchul: back-to-back usage in connection with fences

upper part forming a triangle. The lower part has a small door through which the catch can be removed. The outer wall can be made of bamboo slats or alternatively of netting with a mesh size of 5 cm. The trap may have a life span from 2 to 3 years, depending on the quality of the construction and the maintenance and care given to the gear. Prices recorded for traps of different sizes vary from R. 20.000 to 60.000.

distance between the traps can be 15 to 100 m depending on the local situation. Usually fish are harvested once a day.

Gender aspects

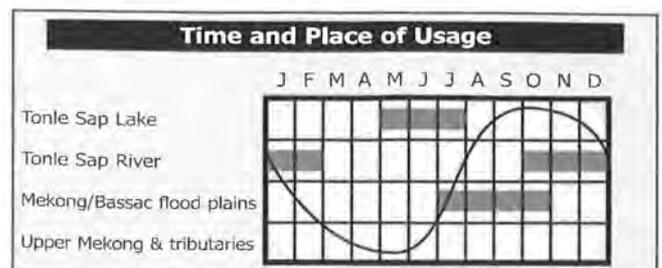
There is no gender discrimination in gear construction or fishing. While women prepare the raw materials for construction, the construction itself, the installation of the traps and its leader fences and the harvesting of fish from the traps is generally done by adult men, sometimes with the help of women or even children.

Target species

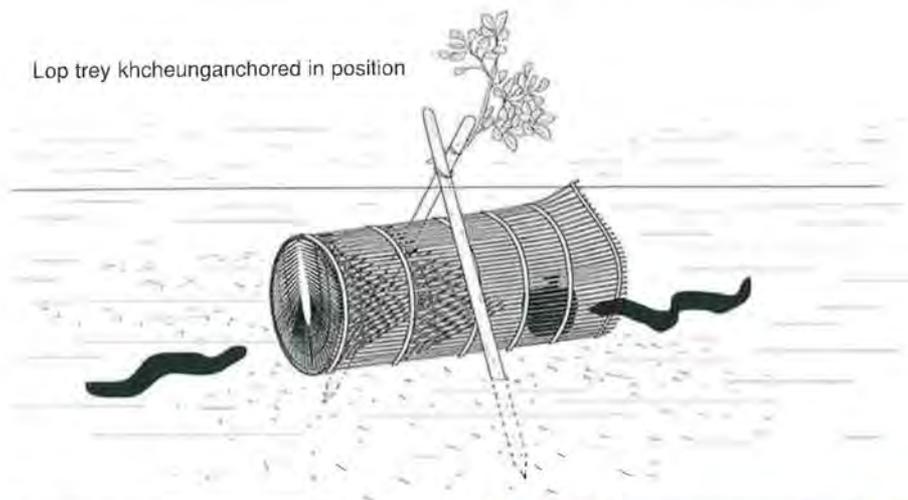
Trey kes (*Micronema* spp.); trey khang hai (*Belodontichthys dinema*); trey kamplieu (*Kryptopterus* spp.); trey ta aun (*Ompok* spp.); trey chhlang (*Mystus nemurus*); trey kanchos (small *Mystus* spp.).

Size & Season							
Province	Length in cm	Diameter trap in cm	Width entry 1 in cm	Length entry 1 in cm	Width entry 2 in cm	Length entry 2 in cm	Season
Battambang	210	100	7	35	5	30	May-Jul
Kg. Chhnang	170	80	14	40	9	30	Oct-Feb
Prey Veng	220	100	21		7		Jul-Oct
Takeo	250	120					Jul-Oct

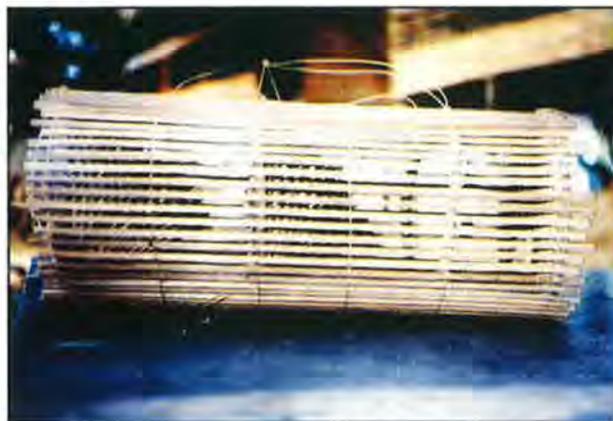
This trap can be operated in different ways, depending on location, season and the preference of the fisher. The gear is used in the flooded forest areas and in rivers and lakes, preferably near inundated forests or other aquatic vegetation in combination with some current movement. The traps are placed at both ends of a fence in such a way that fish can enter the traps from both sides of the fence. Bait is not used. The water depth should be between 1 and 5 m. The



Lop Trey khcheung anchored in position



Lop Trey khcheung, Prey Veng



Lop Trey chhlonh, Prey Veng

Lop Trey khcheung / Trey chhlonh / លបត្រីខ្ចីអង្គុយ
Horizontal cylinder trap for spiny eel

These are small traps, especially the *lop Trey chhlonh*. The length to height ratio observed in different provinces is roughly 2:1. Dimensions are given in the table below. The shape of the trap is otherwise the same as the *duen*. The first entry cone is fixed to the first stabilizing ring and leads the eel into a 20 cm deep pre-capture room from where the 'killing' cone, fixed to the second stabilizing ring, guides the eel into the capture room. In the capture room a bait holder with a mixture of clay and mashed worm, crab and snail is located. This gear is commonly constructed at home and not sold in markets. The life span of the gear is 2 to 3 years. The cost varies from R. 6.000 to 10.000.

The trap is widely used in the Mekong-Bassac flood plains, ricefields, lakes and streams with weak currents. However, it was not reported from the other main areas. The trap is partly dug into the mud or it is inserted into the bunds between ricefields, and covered with water hyacinth or grass. Catches are generally higher at night than during the day. Catches are low during strong rains. The trap is set out late in the afternoon and checked early in the morning. Water depth is between 0.5 and 1.5 m. A brick or a stone is placed in the trap in order to keep it in position. One fisherman may operate several traps at a time. Each trap is marked with a thin pole or a float.

For its operation usually two fishers with a boat are required: one operates a long handled gaff to lift the trap while the other operates the boat and assists his colleague in receiving the traps and emptying the catch into the boat.

The target fish species are *trey khcheung* and *trey chhlonh* (*Macrogathus* spp.). This gear targets the larger specimens of spiny eel rather than the small ones, which are targeted with rakes and fish combs (see section 3.3).

Type, Size & Season						
Province	Local name	Length in cm	Diameter trap in cm	Width entry 1 in cm	Width entry 2 in cm	Season
Kandal	chhlonh	36	14	3	1.2	Aug-Sep
Prey Veng	chhlonh	29	10	1.7	1.3	Apr-Jun
Kandal	khcheung	80	30	6	3	Aug-Oct
Prey Veng	khcheung	60	30	5	3	Aug-Dec
Takeo	khcheung	73	37			May-Nov

Big Horizontal Cylinder Trap (cont.)

Lop Prueh Duen



Lop trey damrey, Kampong Thom

Lop trey kanchrouk / លប ត្រីកំ ក្រាវក
Horizontal cylinder trap for *Botia* spp.

This gear is only found in Prey Veng. It is a small trap with two cones: length 66 cm, diameter 25 cm, width of the first entry 3 cm and of the second 2.2 cm. Cost: R. 5000. The traps are placed in rocky areas of the river Tonle Touch or under bridges crossing it. A dead crab is put inside the trap as bait. The *lop trey kanchrouk* is used from October to November.

Lop trey damrey / លប ត្រីដំរី
Horizontal cylinder trap for sand goby

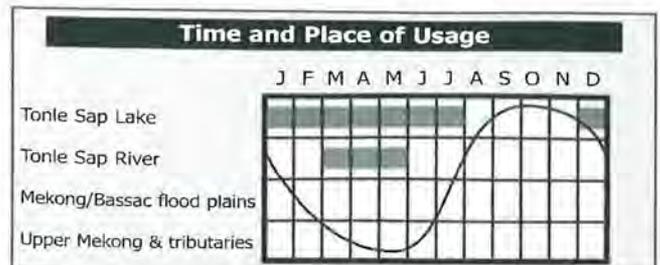
This middle- to large-sized horizontal cylinder basket trap occurs in slightly different sizes (see table below). At some locations the outer wall of the trap shows a rough fabrication (Kg. Thom), in others it is made of finer bamboo slats. The distance between the bamboo slats is between 2 and 3 cm. There are different types of *lop trey damrey*, some have two successive cones in one side, others have only one entry cone. All of them have a back door, which allows for removal of the fish. The variation from Kampong Thom has only one cone, featuring separation wall of some sort, made out of slats

dividing the entry cone into a left and a right half. This wall is combined with the lead fence guiding the fish into the trap. In Pursat and Battambang the traps are located perpendicular to the lead fences at each side of the trap. The cost of the gear is between R. 20.000 and 50.000.

The *lop trey damrey* is a specialized fishing trap for the highly valued sand goby fish, also called marbled sleeper / *trey damrey* (*Oxyeleotris marmorata*). Fishing lot operators around the Great Lake Tonle Sap, but also individual fishers, frequently use this trap in lakes and rivers, where the water currents are not too strong and in shady places. Boeung Tonle Chhmar in Kampong Thom is allegedly one of the most productive fishing grounds for this fish. The preferred food of *trey damrey* is shrimp and to attract them cut-off root systems of a few small trees are placed near the trap entrance.

The suitable water depth is less than 5 m, preferably between 1 and 3 m. Two to three fishers are needed to set the trap out from a boat and pick it up again. Commonly the trap, which does not contain bait, remains on the fishing ground for up to three days before the catch is gathered. A thin stick or pole marks the location of the trap on the ground.

Size & Season						
Province	No of entry cones	Length in cm	Diameter trap in cm	Width entry 1 in cm	Width entry 2 in cm	Season
Battambang	2	195	90	10	5	Jan-Jun
Pursat	2	180	80	8.5	5	Mar-Jun
Kg. Thom	1	146	60	6.5	no	Dec-Jul
Kg. Chhnang	2	153	80	11	5 - 6	Mar-May





Lop tonle, Mekong River, Kampong Cham

Lop rumphsom pruel / Lop tonle / លបរុមសមប្រួល/លបតន្លេ
Horizontal cylinder trap with bamboo fences

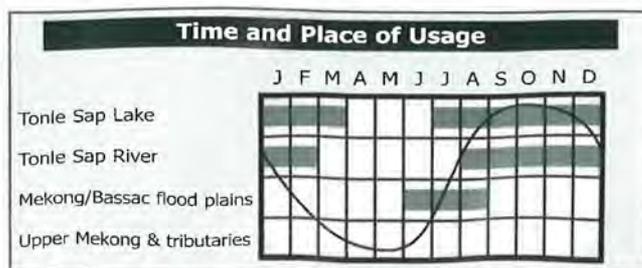
When a *lop* is used with a lead fence - and this is normally the case - it is called *lop rumphsom pruel*. When it is used in bigger rivers, this trap is called *lop tonle*. It is a middle-sized *lop* trap with its characteristic two entry cones. Usually the entry cones are fixed to the first and second stabilizing ring. In Kampong Cham a variety was observed where the cones are fixed at the second and third ring. Commonly the length to diameter ratio is around 2:1, however, in Battambang province a ratio of 3.3:1 was reported. The distance between the bamboo slats of the trap wall is between 12 and 15 mm. The cost of the gear is R. 25.000 to 30.000.

case the topside of the trap isn't submerged during its operation it is covered with water lily or grass, providing attracting shade. In larger irrigation canals the basket trap is operated in conjunction with a lead fence, spanning from one side of the canal to the other, the trap being located closer to one of the shores, outside the main current. In rivers or lakes the operational water depth is between 1.5 to 2 m. Commonly, the trap and the corresponding fence are set up next to some vegetation in the water or where a tree may provide shade over the water at a certain time of the day. Bait is not used.

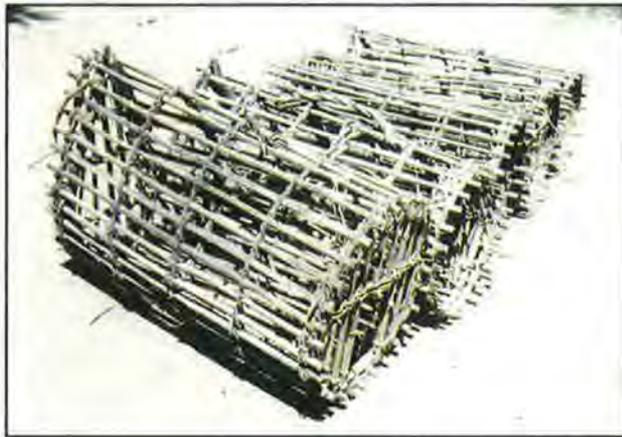
Main fish species caught: *trey chhpin* (*Barbonymus gonionotus*); *trey kahe* (*Barbonymus altus*, *Barbonymus schwanenfeldii*); *trey kaek* (*Morulius chryso-phekadion*); *trey riel* (*Henicorhynchus* spp.); *trey pruel* (*Cirrhinus microlepis*), and several other species.

Size & Season					
Province	Length in cm	Diameter trap in cm	Width entry 1 in cm	Width entry 2 in cm	Season
Battambang	100	30	7	5	Jul-Mar
Kg. Chhnang	200	90	10	6	Aug-Feb
Kg. Cham	150	80	10	6	Jun-Aug

This trap is operated in rivers, lakes, ricefields and canals, where there are water currents, both during the rising flood and during the recession period. The thinner version from Battambang is used in irrigation canals next to rice fields, where it is inserted into the bunds. In



Horizontal Cylinder Trap for Snakehead Lop Luong / Lop Trey Raws / Lop Cheab



Lop luong , Kampong Thom



Lop luong , Battambang

Description

The *lop luong* is a rather robust basket trap being between 0.6 and 1.5 m long with a diameter between 30 and 90 cm. The distance between the bamboo slats (\varnothing 6 to 10 mm) forming the cylinder mantle is between 2 and 3 cm. The trap is divided into a pre-capture and a capture (or 'killing') room, each of which is accessed through an entry cone. The entry cones are made of bamboo spikes, which are fixed with thin nylon yarn at a distance of 2 cm from each other, forming a funnel entrance. The funnel spikes of the entry cone are shorter (17 cm) and are slightly looser rigged than the longer (20 cm) spikes of the 'killing cone'. The tension of the spikes is manipulated with a string running to the mantle slat just above the entry cone. Sometimes fixed entry cones are used instead of suspended spike cones. The life span of the gear is up to 2 years.

luong is also used in combination with lead fences. In that case a 3 to 5 m long and 1 m high lead fence links the entrance cones of two traps, one at each end of the fence. One fisher may operate 20 to 60 *lop* traps, depending on the size of the *lop luong* and the boat used to transport them. The intervals of harvesting the catch from the traps depend on the availability of fish.

Target species

snakehead / trey raws (*Channa striata*). A lot of fishing is done during the period of the rising waters, June to August, when spawning is at a peak. Hence ripe males and females are being caught. The eggs are highly priced for a special soup or as a salted delicacy. However, this is also the time of the official closed season. Turtles are occasionally caught as by-catch.

Type, Size, Cost & Season							
Province	Local name	Type of entry	Length in cm	Diameter trap (cm)	Diameter entry(cm)	Cost in R.	Season
Battambang	Luong	2	105	40	10	10.000	Mar-May
Pursat	Luong	1	80	40	10	10.000	Jun-Oct
Siem Reap	Luong	2	117	38	8	4.000	Feb-Jun
Kg. Thom	Trey raws	1	62	30	8	15.000	Jun-Aug
Kg. Chhnang	Cheap	3	100	40	9	30.000	Aug-Feb
Takeo	Trey raws	3	120	57	8	10.000	Oct-Dec

Gender aspects

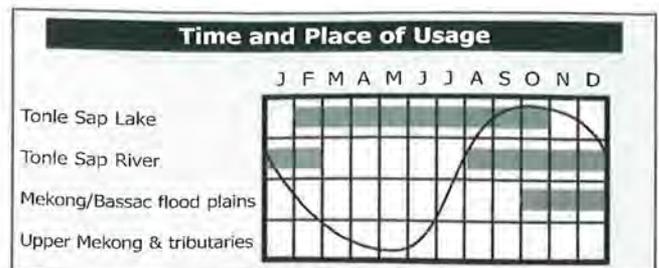
Commonly men operate this trap, women and children assist.

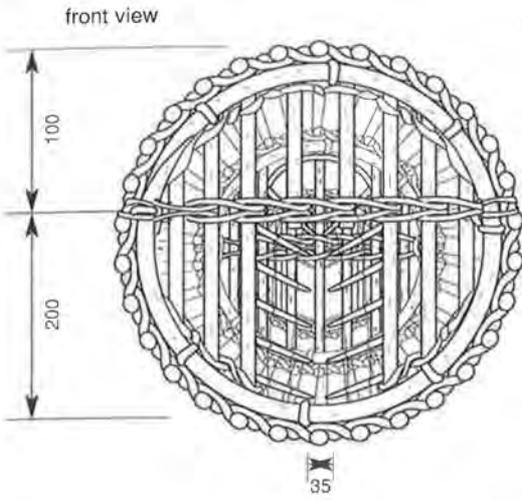
Legal aspects

If the length of the *lop* trap exceeds 0.8 m with a diameter of more than 0.3 m it is middle scale gear. Smaller sizes are family fishing gear (No. 028 KOR SOR KOR). However, this particular gear is not mentioned in the law.

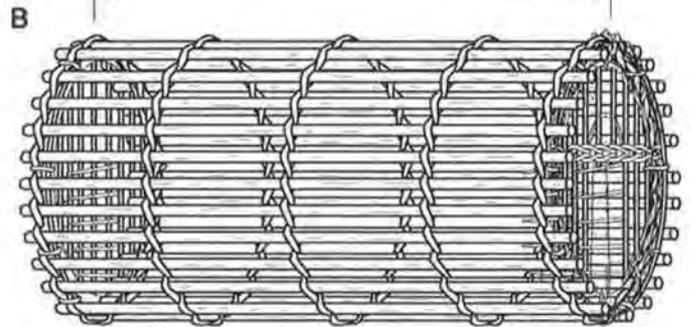
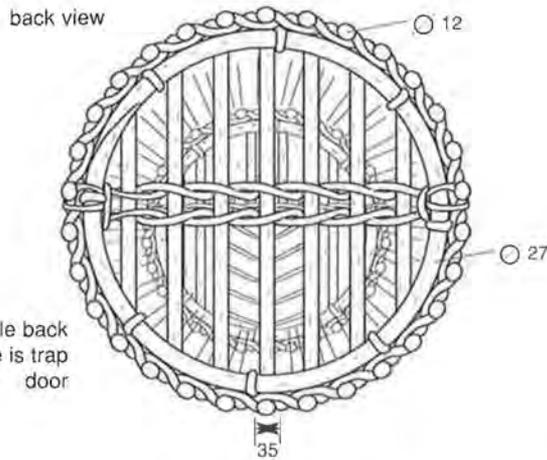
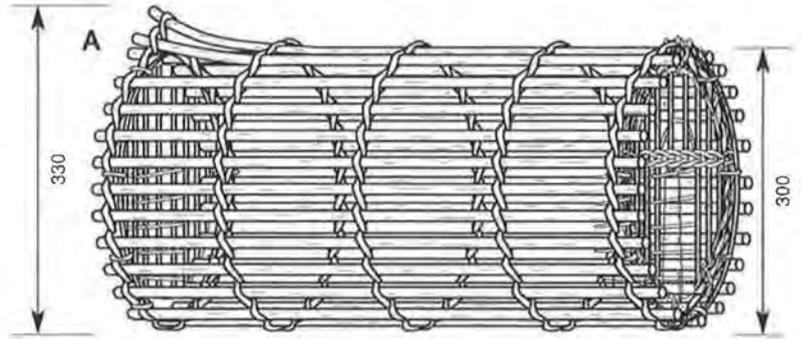
Operation

The *lop luong* is mainly used in the floodplains, both in times of rising floods and during the recession, in slow water current situations. The trap is set partly submerged near the shore. The top of the trap is covered with foliage. The fish, attracted by the shade, squeeze through the entry cones into the *lop*. The location of the traps must be adjusted to the level of the water, generally once a week. The *lop*

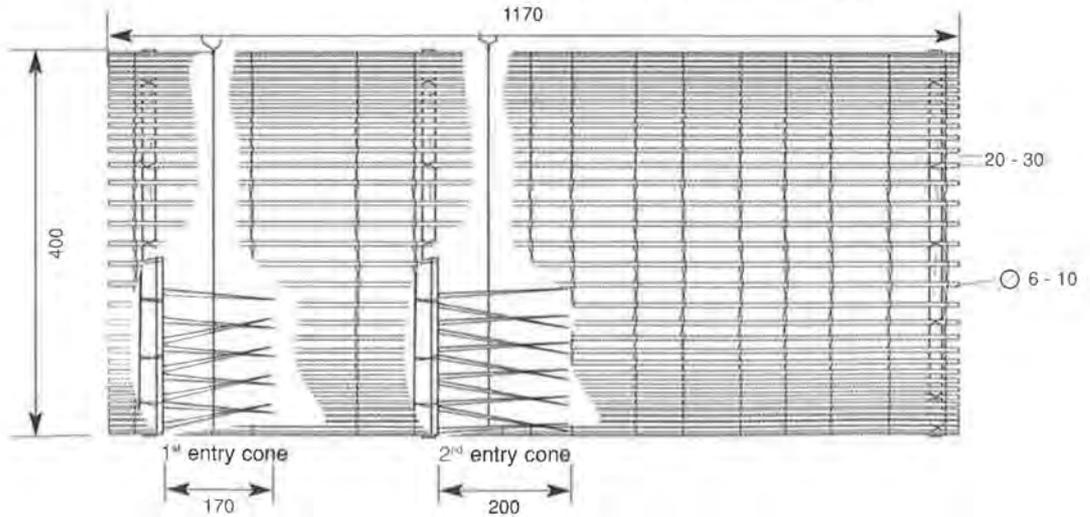




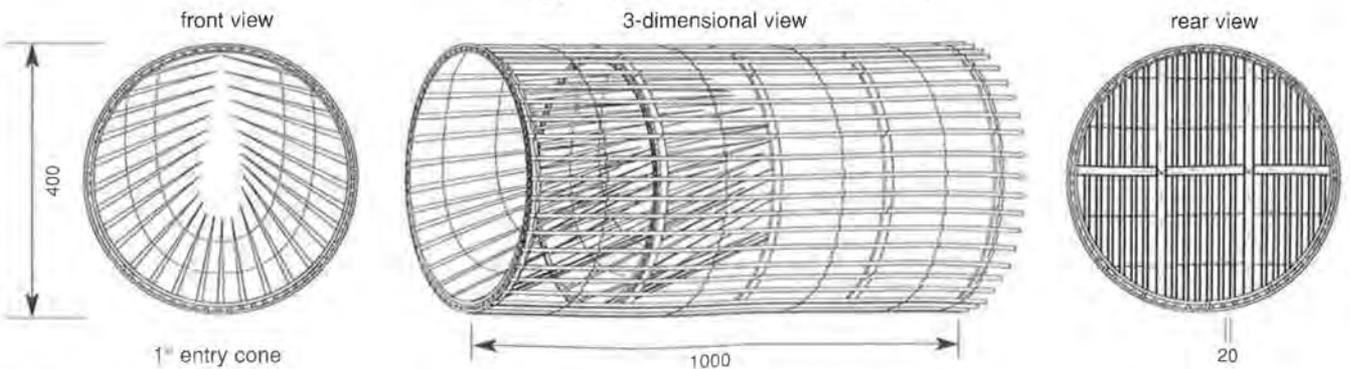
Type 1 Two variations (A and B), Kampong Thom / 3-dimensional views



Type 2 Lop luong, Siem Reap / side view

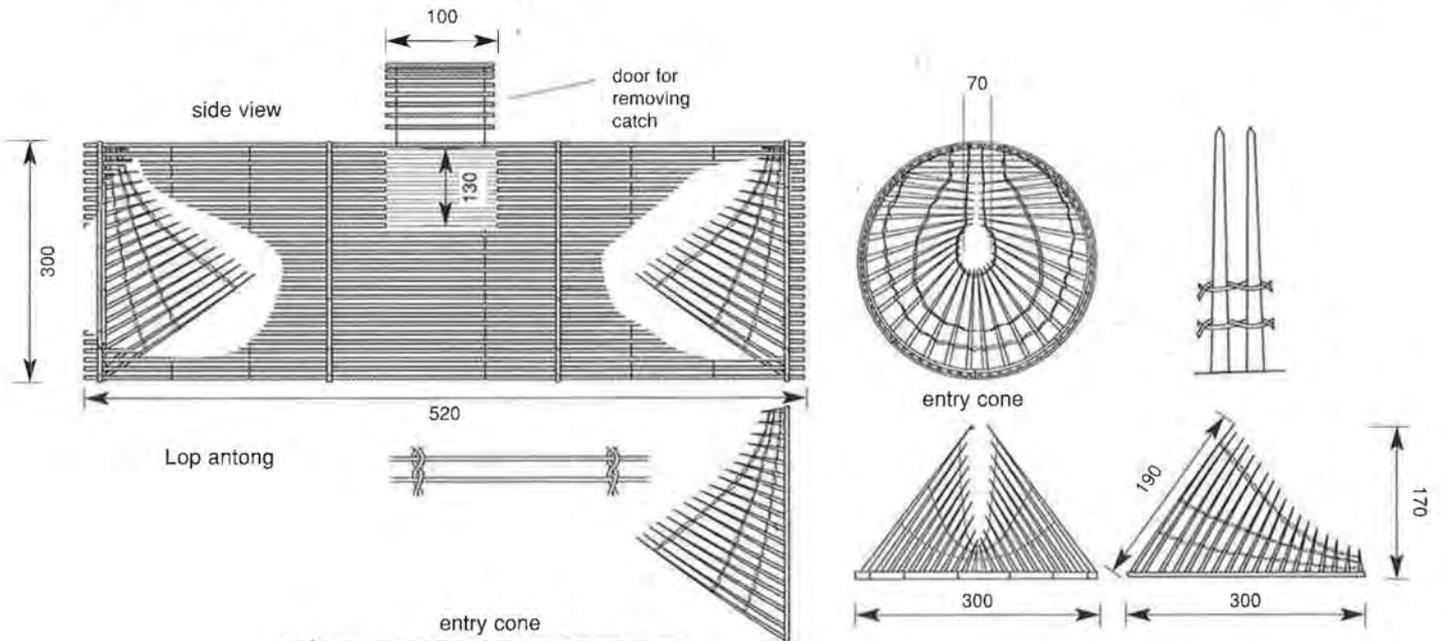


Type 3 Lop cheab, Kampong Chhnang



Horizontal Cylinder Trap for Eel

Lop Antong



Description

This small to middle-sized horizontal cylinder basket trap is straight, unlike most other lops that have a peak at one end. In addition, it has an entry cone at each end, leading directly into the capture room. The trap is between 50 and 60 cm long with a diameter of around 30 cm. The outer wall of the trap is made of fine bamboo slats, no more than 5 mm broad and with a gap of maximum 10 mm between them. The opening door (13 x 21 cm) is located on top of the cylinder mantle and serves to remove the catch from the trap.

depths of 25 cm to 1.5 m. The distance between the traps is 10 to 20 m. Blood of a cat is applied to the entry cones. Bait in the form of either spoiled or burned fish is put inside. The trap is fixed to the bottom with a stick.

Gender aspects

Mostly men operate this gear. Women and children assist with construction.

Target species

Eel / trey antong (*Monopterus albus*)

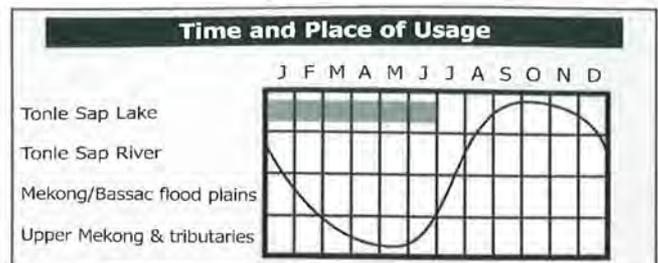
Legal aspects

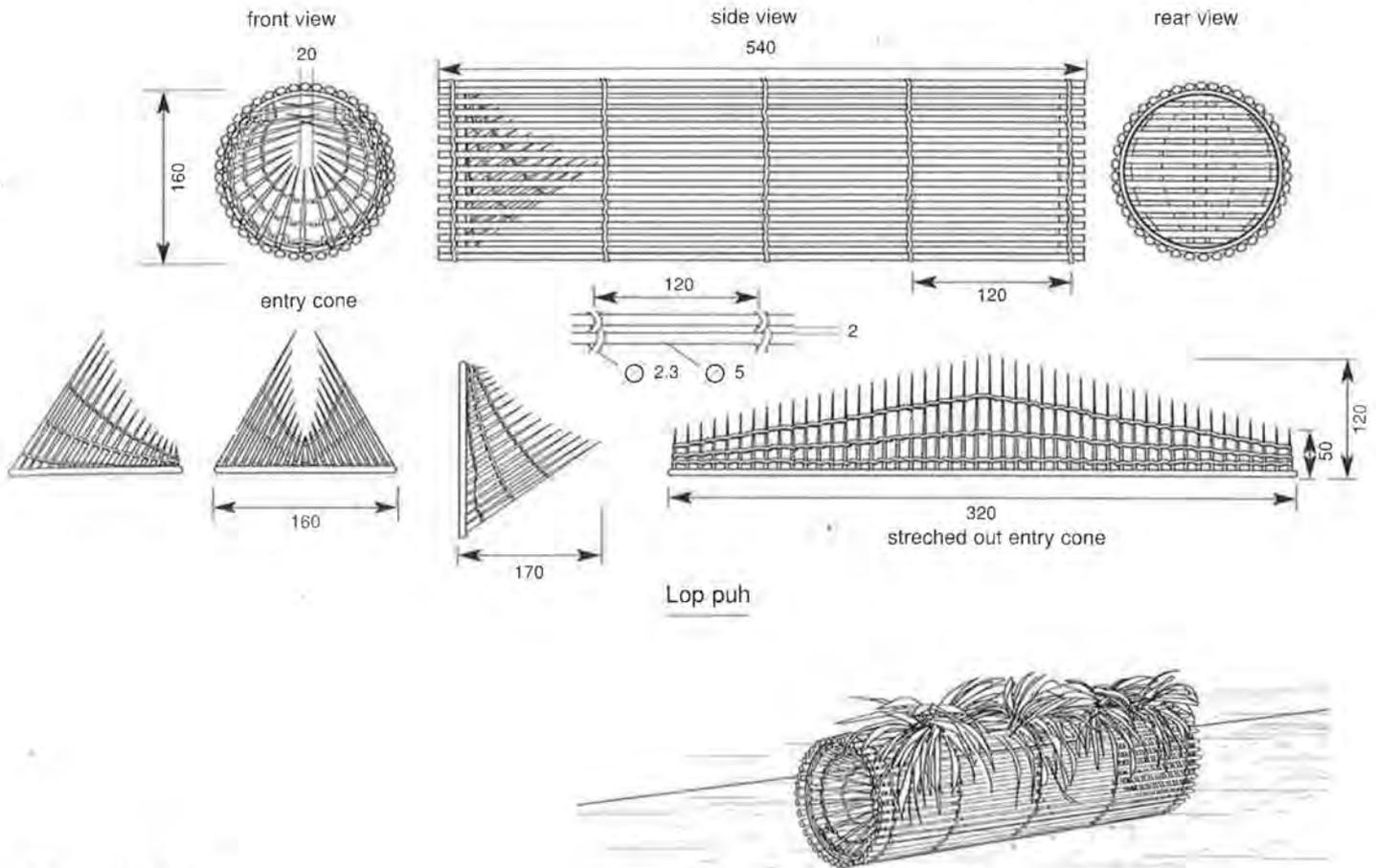
Not classified / not mentioned in the law.

Size, Cost & Season					
Province	Length in cm	Diameter trap in cm	Diameter entry in cm	Cost in R.	Season
Battambang	60	27	3	5.000	Feb-May
Kg. Thom	52	30	7	3.500	Jan-Jun

Operation

The traps are put in a row in places opened up between the water plants and bushes in front of the flooded forest, generally in still waters. It is set at





VARIATION

Lop puh / លុបពូស
Horizontal cylinder trap for snakes

The *lop puh* is a straight horizontal cylinder basket trap, 48 to 60 cm long and 14 to 18 cm in diameter. There is only one entry cone. The outer wall is made of bamboo slats, fixed with vines 12 cm from each other. The slats have a diameter of 5 mm and a space of 5 mm between them. The maximum width of the entry cone is up to 2 cm and its length is 5 cm. The round wall opposite the entry cone can be removed from its wooden stabilizing ring to collect the catch. The gear has a life span of two to three years, depending on materials used in construction, as well as on maintenance.

shallow parts of rivers, streams and channels, preferably in flooded forest, grass vegetation or under floating water hyacinth cover. Water bodies with currents are more productive than stagnant waters. The trap is fixed to the ground with a wooden pole attached to it at a depth of 1 to 5 m with the opening facing upstream. In Kandal a single fisherman uses 20 to 100 traps. The distance between the traps is 10 to 15 m. A bamboo fence is installed perpendicular to the current, leading fish and snakes from the shallow areas into the trap. In Kandal, chopped fish is put in the trap, but in Battambang *trey andaing* / catfish (*Clarias* spp.) is used as bait. It is kept alive in the trap.

This fishing gear is used during the rainy season in the

Size, Cost & Season				
Province	Length in cm	Diameter trap in cm	Diameter entry in cm	Season
Battambang	48	14	2	Aug-Feb
Kandal	60	14	2	Jul-Jan
Takeo	54	16	2	Jul-Jan

Three species of water snakes are commonly caught: puh prolit dong (*Enhydryis enhydryis*), puh kchan lamom (*Enhydryis bocourti*) and puh prolit kmaw (*Enhydryis longicauda*). Also python / puh thlanh (*Python molurus*) is occasionally caught. Most are used as feed in crocodiles farms, as they are cheaper than fish, but some are stripped of their skin and smoked or salted.

Horizontal Cylinder Trap for Shrimp

Lop Kampeh / Sai Kampeh



Lop kampeh, front view



Lop kampeh, side view

Description

This relatively small horizontal cylinder basket trap comes in different sizes. The variation reported from Prey Veng is 44 cm long, its diameter is 21 cm. The outer wall of the trap is made of very thin bamboo slats (\varnothing 3 mm), with a gap of 3 mm between them. The trap has 2 cones: the entry cone has a full vertical slit leading the shrimp into the 'killing' cone, which has a round entrance in the middle of the cone. At the back wall a door (7 x 11 cm) is located in the inferior part, serving to remove the catch from the trap.

without bait; in Takeo it is baited with crab.

For its operation occasionally one but usually two fishers with a boat are required. The trap is set out and lifted with the help of a long handled gaff. A thin bamboo or rattan stick marks the exact position of the trap.

Gender aspects

Men and women make and use the trap.

Target species

Shrimps

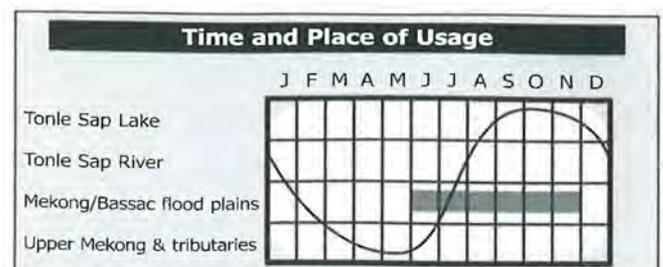
Legal aspects

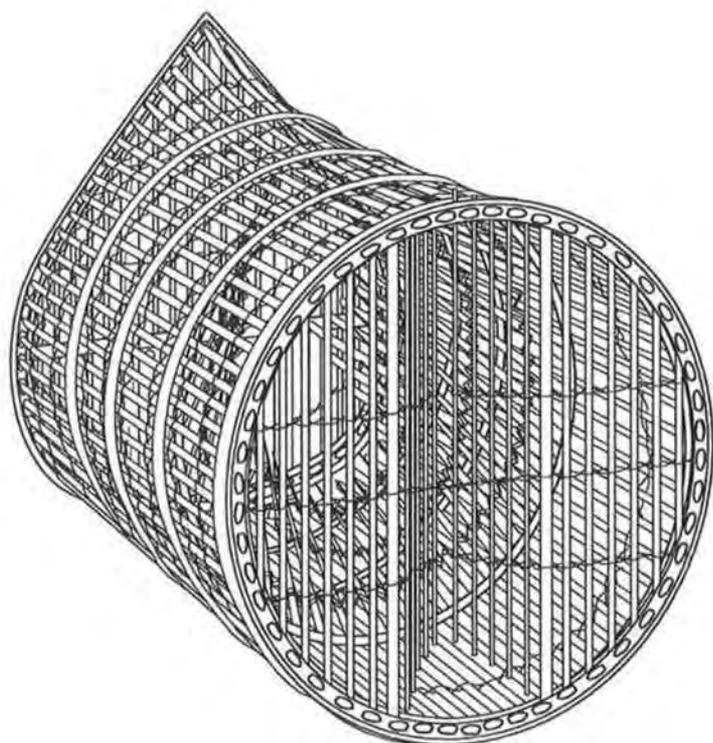
In the fishery law there is mention of a *lop*, which is classified as a middle-scale fishing gear, if higher than 0.8 m and with a diameter bigger than 0.3 m (No. 028 KOR SOR KOR).

Type, Size, Cost & Season							
Province	Local name	Length in cm	Diameter trap in cm	Diameter entry 1 in cm	Diameter entry 2 in cm	Cost in R.	Season
Prey Veng	Lop	44	21	3.2	2	5.000	Jul-Sep
Prey Veng	Sai	45	30	3.5	3	10.000	Jun-Sep
Takeo	Lop	45	20			7.000	Aug-Nov

Operation

The *lop kampeh* is widely operated in lakes, rivers and canals with slow water currents in the Mekong-Bassac flood plains. The trap is operated during the rainy season, however catches are markedly lower when it is actually raining. It is preferably positioned away from the current, close to inundated vegetation or branches where shrimps seek shelter, using poles to keep the gear in place. It is also used with fences across a stream. The suitable water depth is between 1 and 2.5 m. In Prey Veng the trap is used





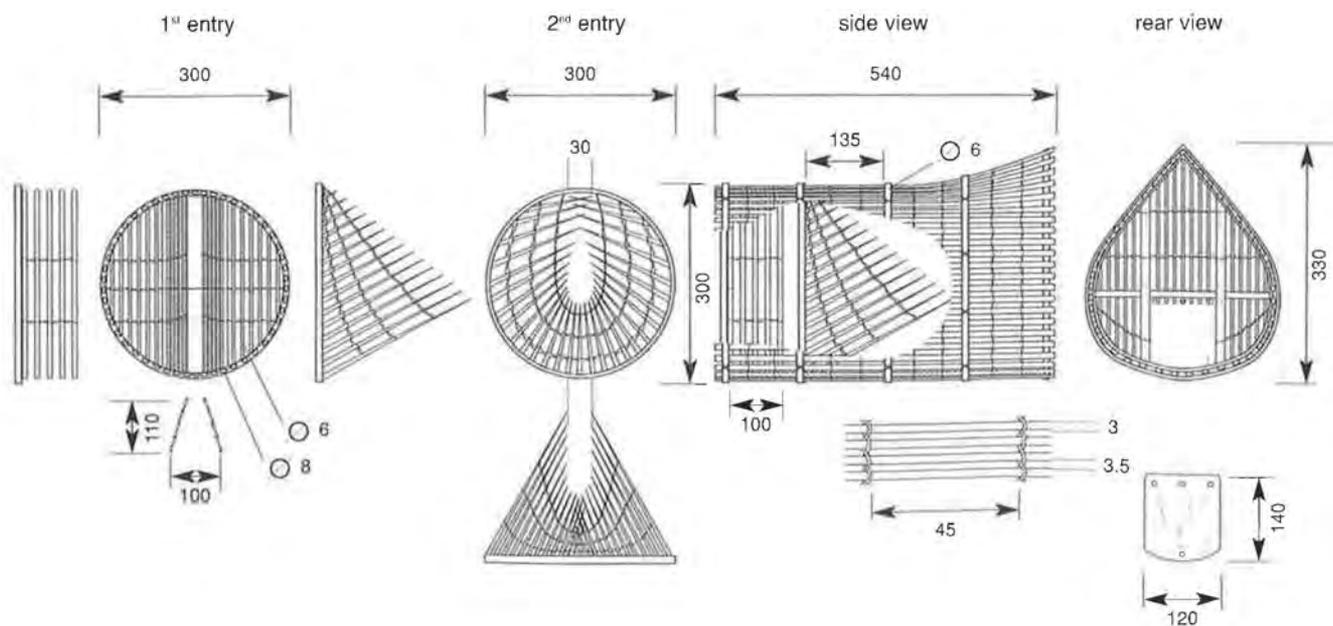
Sai kampeh, 3-dimensional view



Sai kampeh, front view



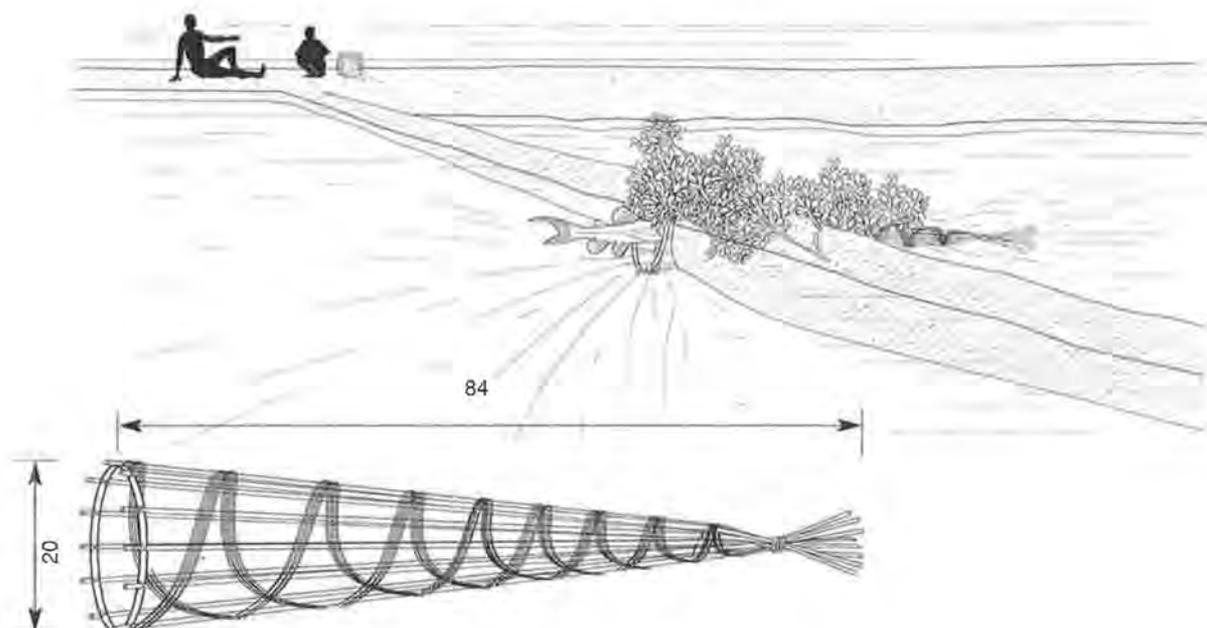
Sai kampeh, side view



Wedge Cone Trap

Leay

Leay operation



Description

The tubular wedge trap is approximately 80 to 85 cm long and is made of long vines (\varnothing 2 mm) woven in a spiral around finely split bamboo slats (4 mm) forming a tube. The tube has a wide mouth fixed by a bamboo ring and a body that tapers down to a closed end. The mouth has a diameter of 20 cm and at the opposite end the slats are bound together closing the tube. Bigger variations of this trap have been reported (but not documented) from rapids in the Sesan, Sekong and Srepok rivers and its tributaries where artificial stone barriers are set up to lead the fish into the trap. In fishing situations with a weaker current the tubular trap may be equipped with inward facing thorns, immobilizing the fish, as reported (but so far not yet documented) from the region bordering Lao PDR.

Operation

The trap is operated in strong currents and narrow passages where the fish is swept into the trap. It is wedged in the gear, as there is no maneuvering space to turn around and escape. Sometimes the fish creeps into the trap, gets stuck, wants to move backwards, but is hindered in doing so by the force of the water current

and its own scales, fins and tail. It only catches bigger fish of roughly the size of the trap. Since the trap can only catch one fish at a time the fisher commonly watches his trap in order to empty it as soon as there is a fish caught. Bait is not used. A fisherman usually operates several of these traps within the same river stretch of water.

Gender aspects

Household members participate in constructing the gear.

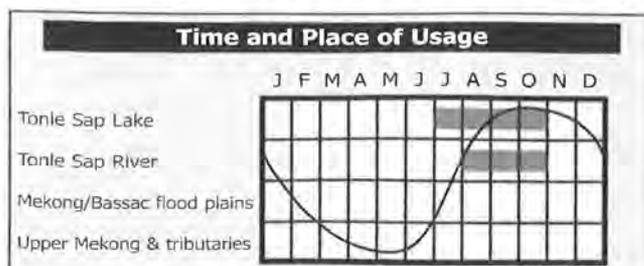
Main species caught

Trey slat (*Notopterus notopterus*); trey krum (*Osteochilus melanopleurus*); trey chrakaing (*Puntioplites* spp.); trey chhpin (*Barbodes gonionotus*); trey sandai (*Wallago attu*); snakehead / trey phtuok / trey raws (*Channa striata* spp.); trey andaing / catfishes (*Clarias* spp.); trey kranh (*Anabas testudineus*).

Legal aspects

Classified as a ricefield small bag trap, which is a family fishing gear (Table A, No. 28 KOR SOR KOR).

Size, Cost & Season				
Province	Length in cm	Diameter mouth in cm	Cost in R.	Season
Pursat	84	20	35.000	Jul-Oct
Kg. Chhnang	80	20	12.000	Aug-Oct





Giant wedge cone trap, Kratie



Giant wedge cone trap, also in Kratie

VARIATION

Leay thom / លាយធំ

Giant wedge cone trap

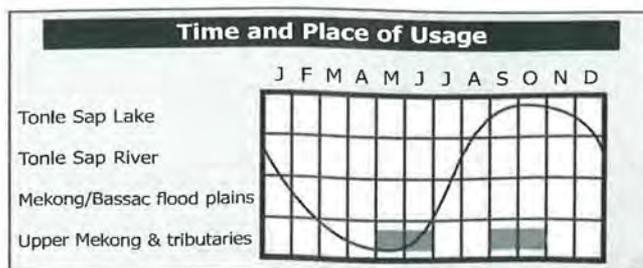
This big tubular wedge trap is made of bamboo slats up to 4 m long. A big bamboo pole (\varnothing 10 to 14 cm) is split to form the longitudinal frame. A node forms the closed end of the trap. Vines are woven in a spiral around the slats to form a cone of open-weave wickerwork. At the entry mouth the weaving is much denser than further toward the end of the cone. This densely woven border stabilizes the mouth (\varnothing 1.2 m) of the trap. The size of the trap is adjusted according to the physical conditions of the fishing grounds where it is used. The cost of the gear is R. 5.000 to 10.000 depending on the size and quality of construction.

This tubular trap is operated as a filtering gear in the rapids of the Mekong in Kratie and Stung Treng, and its tributaries the Sekong, Sesan and Srepok. It is also commonly used in the Khone falls inland delta in the Lao PDR. In preparation for installation, the fisher selects a suitable place within the rapids and if necessary constructs sort of a stone wall that channels the current into the slot where the opening of the trap is installed. The closed end of the trap is positioned at a much lower level than the mouth,

following the flow of the water. Fish entering the trap are unable to swim up the current, and thus get trapped. To empty the trap the fisher has to carry it on land. If the conditions allow for it, a fisherman may operate several of these traps within the same rapids area. Depending on the location and current, the use of this gear can be dangerous. Generally only men operate it.

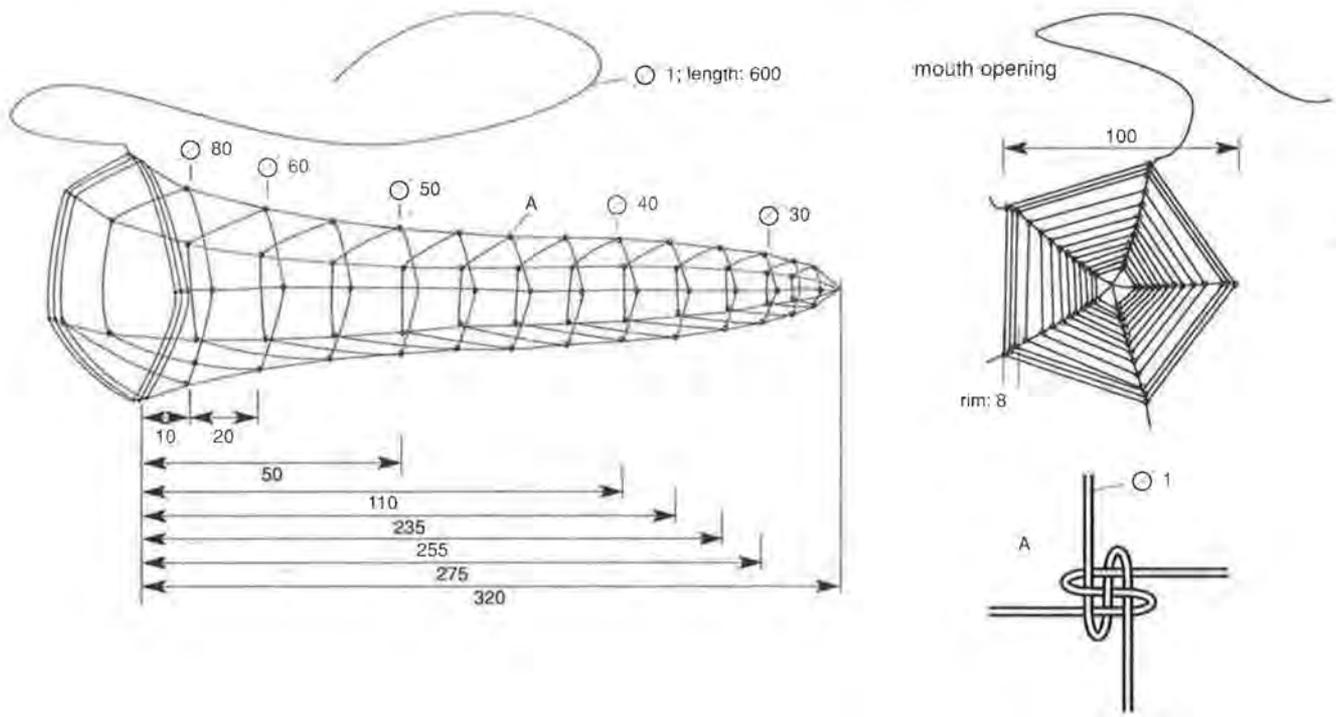
Main species caught are trey khya (*Mystus wyckioides*), trey stuak (*Wallago leeri*); trey krawbey (*Baga-rius* and *Glyptothorax* spp.); trey amboung (*Channa marulius*); trey chhlang kmao (*Mystus wycki*)

Legal aspects: not mentioned in the fishery law.



Snakehead Wedge Trap or 'Sock' Trap

Chhuch



Description

This tubular trap is traditionally made from rattan fibers or vines but nowadays monofilament nylon or thin wire is often used. The trap resembles a wide-meshed sock and is between 32 cm and 74 cm long. The mouth diameter is between 10 and 16 cm. In some cases nylon is used for weaving the trap tube and rattan fibers are used for weaving a special, wide opening entrance. Five longitudinal strings serve as horizontal weaving elements. These are connected by string in a spiral, tapering down from the mouth to the closed end. The size of the resulting irregular meshes is 10 cm near the mouth and 7 cm at the opposite end.

(sedges) or other flooded vegetation in water between 20 cm and 1 m deep. The *chhuch* is tied to the surrounding vegetation or anchored with pins stuck in the bottom. Breeding snakehead like building their nests in reed shelters and are attracted to these traps. The fish also use certain paths in the grass and this is where the fisher puts these traps as well. Commonly, several of these tubular traps are set out in a limited and controlled area. Nowadays some people are resorting (illegally) to the use of electro gear instead of these traps.

Gender aspects

Though women are reported to weave this tubular trap, they do not seem to operate the gear.

Target fish species

Snakehead / *trey diep* (*Channa micropeltes*) and *trey raws* (*Channa striata*)

Legal aspects

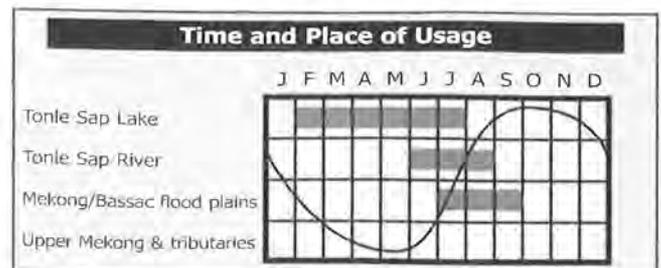
Classified as family fishing gear (No. 28. KOR SOR KOR).

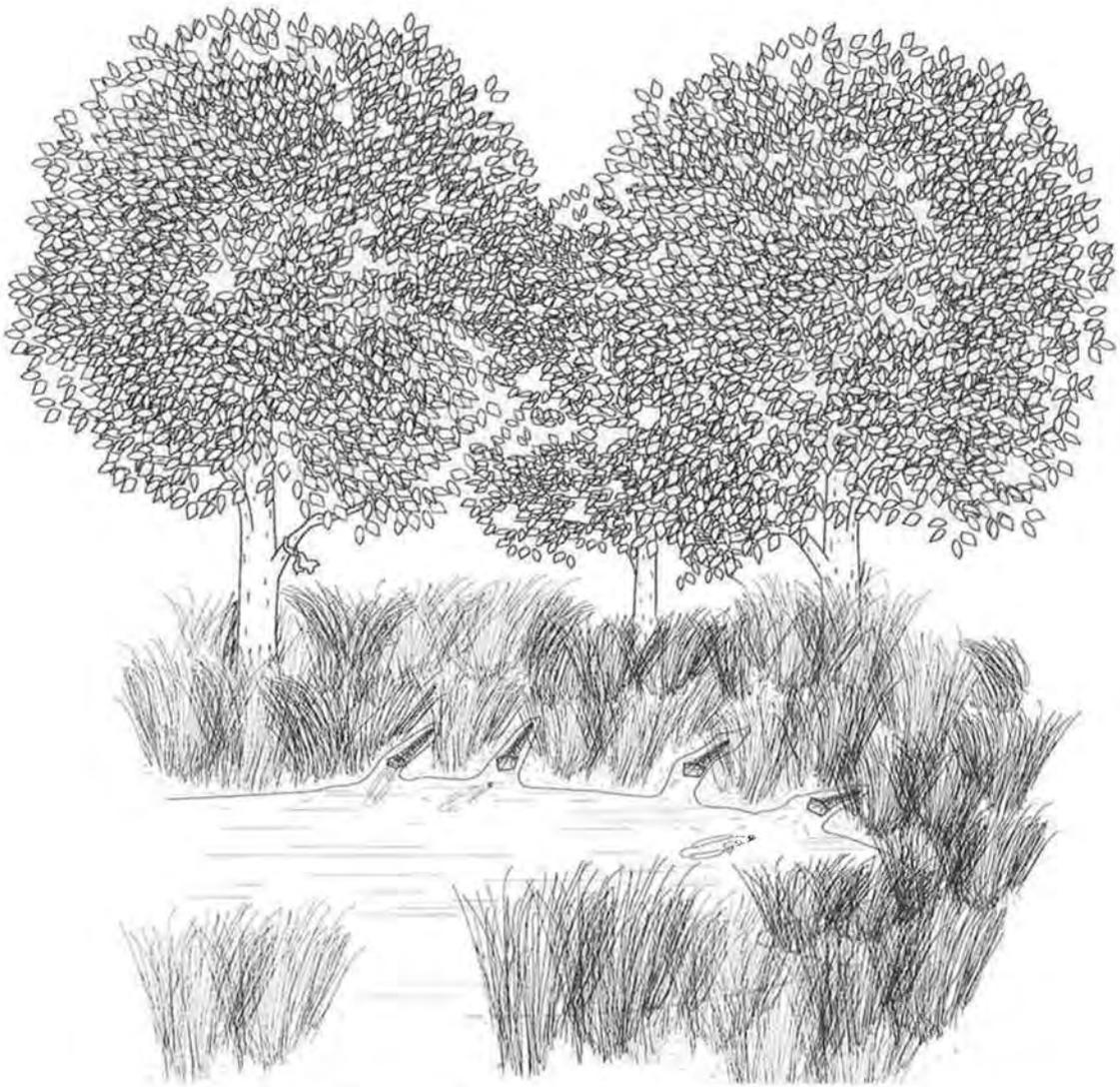
Size, Cost & Season				
Province	Length in cm	Diameter mouth in cm	Cost in R.	Season
Battambang	43	16	1,000	Apr-Jun
Pursat	74	16	3,800	Feb-Jul
Kg. Chhnang	32	10	1,500	Jun-Aug
Takeo	45	16	500	Jul-Sep

Operation

It is often placed in small openings or holes in the dykes that form a passage way between rice fields. A shaking float at the water surface indicates a fish has been caught.

In Battambang, Pursat and Kampong Chhnang it is used in small lakes, canals, pools and streams. Fishers insert the trap between the long inundated reed grasses





Placement of the traps in flooded vegetation popular with snakeheads



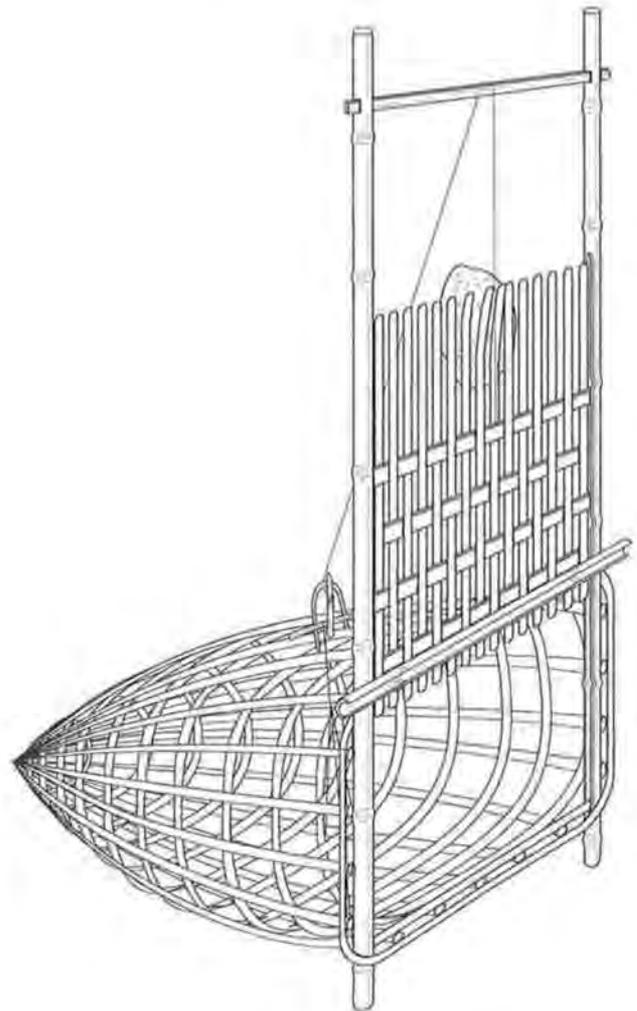
Drop-door Trap

Chann

Description

The drop door box trap has been reported mainly from the upper Mekong river in Kratie and Stung Treng provinces and from the higher reaches of the Pursat river. It is a roughly woven conical bamboo basket trap including a mechanically triggered door closing mechanism. The trap basket is around 1.2 m long and the maximum width at its rectangle entrance is 56 cm. In Kratie a piece of bamboo is split from one end into long strips, while keeping the other end together. Then the strips are loosely woven into a wide-meshed basket. In Stung Treng the basket is made of separate bamboo slats.

Depending on the conditions of the fishing grounds the fisher may equip his trap with longer or shorter door poles. In Kratie door poles are shorter than in Stung Treng. The door itself is woven with 2.5 cm broad bamboo slats. The upper edge of the door carries one or two stones (weight < 1 kg). In the center of the trap three monofilament strings are located, connected to a release mechanism that causes the door to fall down when touched, thereby closing the exit.



Size, Cost & Season					
Province	Length in cm	Diameter trap in cm	Door poles in cm	Cost in R.	Season
Stung Treng	120	56	310	3,000	Jun-Oct
Kratie	120	48	220	10,000	Jul-Oct

Operation

The trap is placed in quiet and shallow river sections, preferably in the shade of big trees. Its mouth faces downstream, targeting fish moving up-stream. The main period of operation is during the rising flood, when the water is muddy and fish is exploring recently inundated riverbanks for food. This trap only captures fish big enough to trigger the drop-down mechanism of the door. Bait is not used. When the fish enters the trap, it is very likely to touch the monofilament strings triggering off the guillotine-like fall of the door. A fisher usually operates several of these traps in a single river bay, positioning them along pathways of the bigger fish species. This type is also used in Pursat; in addition there is a variety where the trap is dug into the riverbank, but details have not yet been documented.

Gender aspects

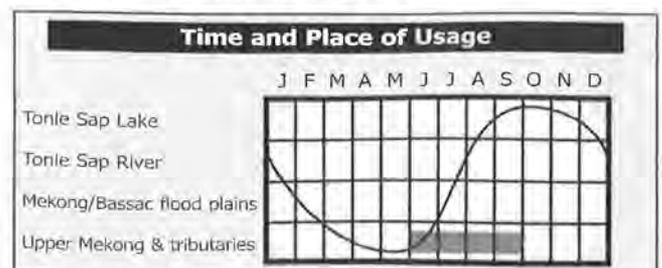
Both women and men construct and operate this gear.

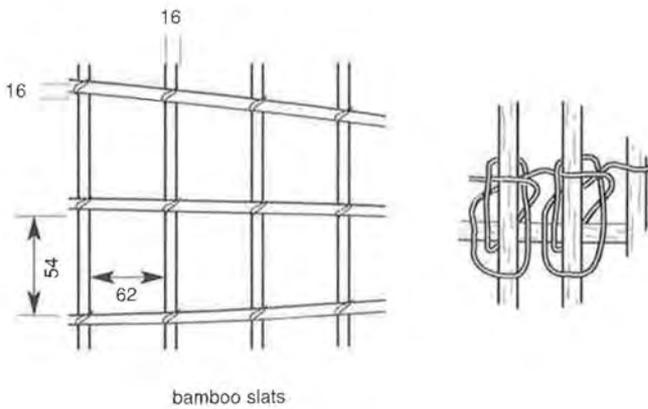
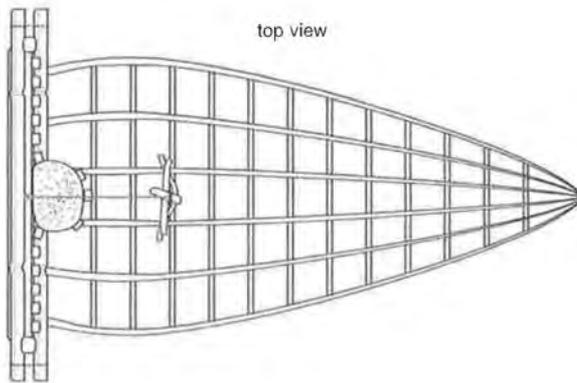
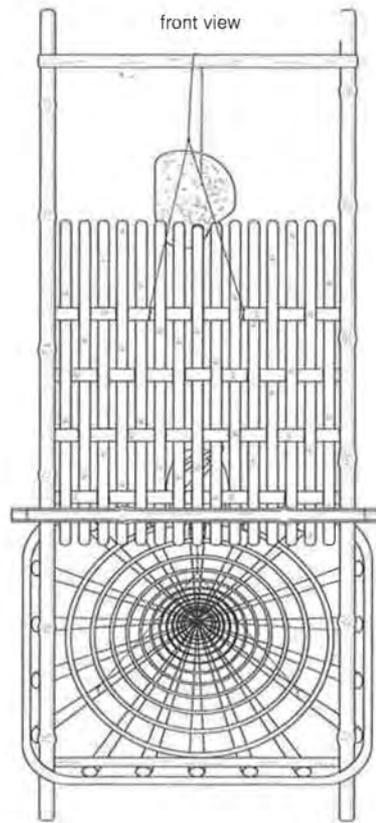
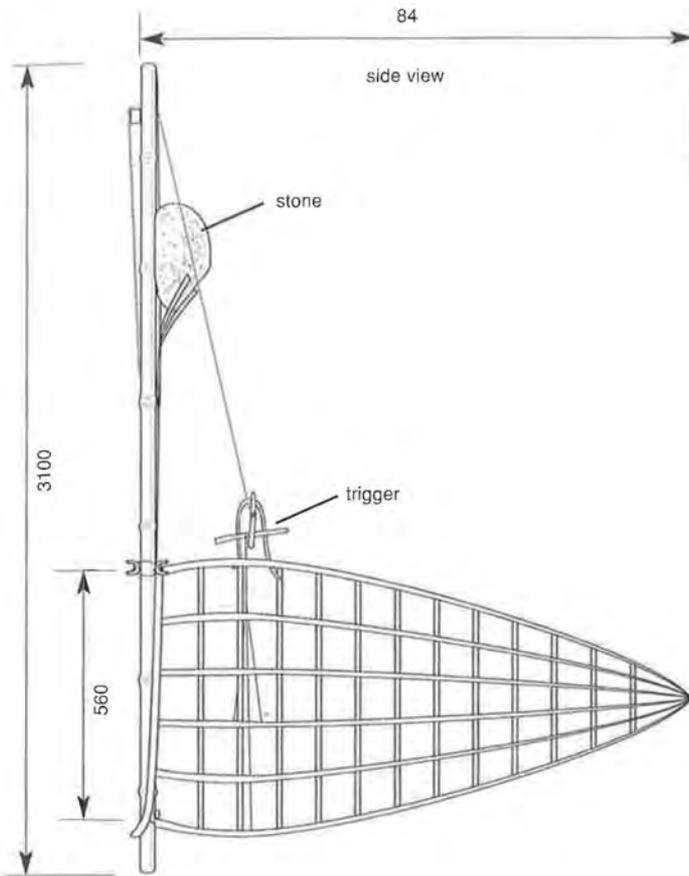
Target species

Mainly bigger fish species, such as trey krum (*Osteochilus melanopleurus*), trey khya (*Mystus wyckioides*), trey prul (*Cirrhinus microlepis*), trey pra (*Pangasianodon hypophthalmus*); trey pra kchau (*Pangasius bocourti*); trey po (*Pangasius larnaudiei*), trey sandai (*Wallago attu*), trey stuak (*Wallago leeri*).

Legal aspects

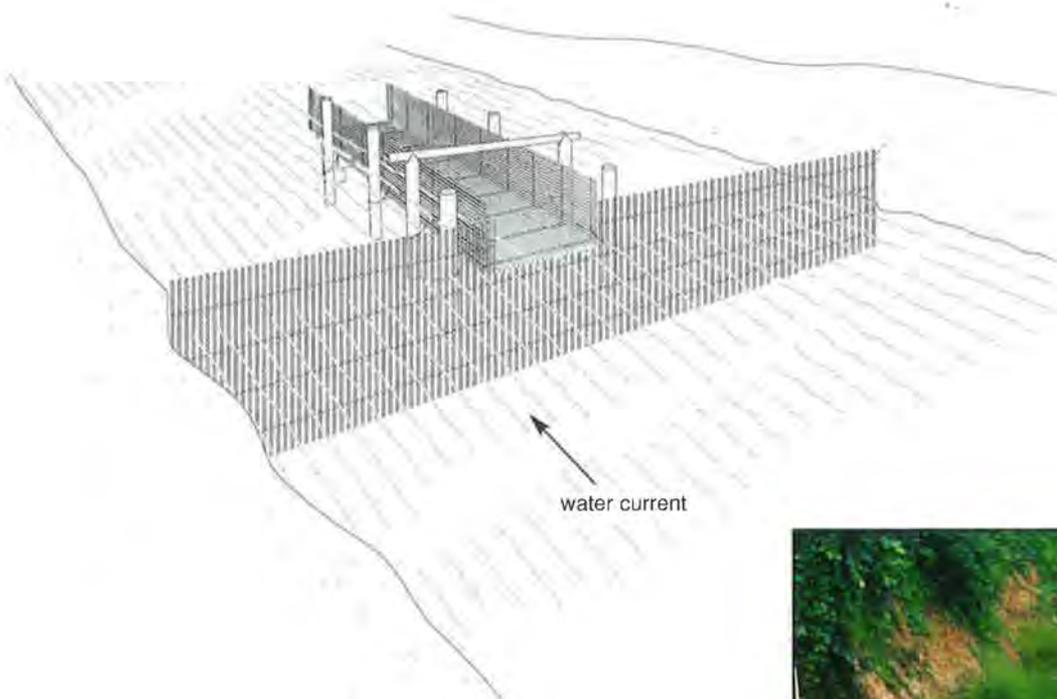
Not mentioned in the fishery law.





Current filtering Gear or Grid Trap

Trang / Sab / Chabor



Grid trap in Lao PDR, where it is called 'Li'.

Description

Many variations of the *trang* are found in the provinces bordering the southern Lao PDR, Stung Treng and Ratanakiri. Smaller sizes are used in canals or small streams in Kampong Chhnang and Kampong Cham, where they are called *sab* or *chabor*. The trap has ear fences spanning the width of the stream to guide the fish on to a platform of bamboo slats 10 to 15 mm apart - except in Kampong Cham, where the traps are made of netting with a mesh size of 2 mm. The water seeps through the platform, filtering out the fish. The standing sides of the platform and the strong current prevent the fish from escaping.

Operation

The gear is constructed after the water in the stream has reached its highest level and starts to go down, in September. The force of the current can be very strong and the construction process is not without dangers. These gears are very effective in capturing nearly all fish moving downstream, mainly the 'white' fish species cyprinids and pangasiids. By December this fishery is mostly over, as the streams recede below the base of the gear.

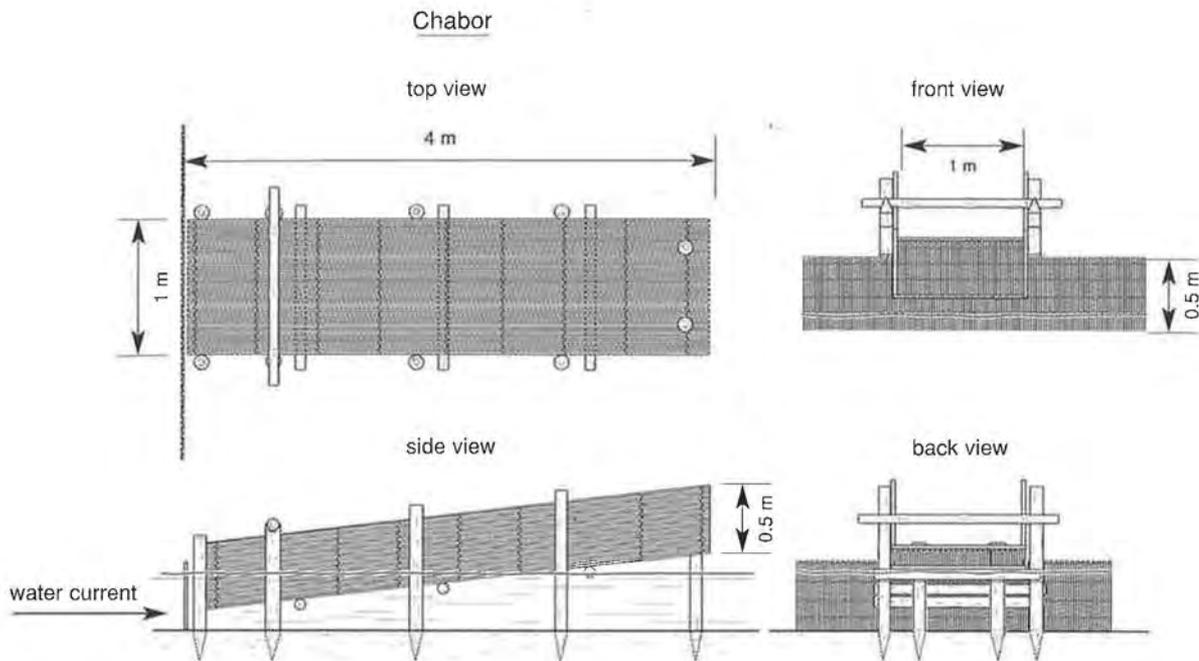
Gender aspects

Construction is done by men, while women and children assist with the collection of fish, especially later in the season.

Target fish species: trey riel (*Henicorhynchus* spp.); trey pra (*Pangasianodon hypophthalmus*); trey prakchau (*Pangasius bocourti*); trey pruel (*Cirrhinus micropilis*); trey chhpin (*Barbonymus* spp.).

Legal aspects

Not mentioned in the law, but operated as illegal fishing lots in Stung Treng province.



VARIATION

Sab sbai mong / សាបស្បែកមុង
Filter trap made of mosquito netting

This is a filter trap placed in a dyke separating rice fields of different altitudinal levels, so that water flowing from a higher to a lower field will pass through the trap. The trap has a wooden (mostly bamboo) frame on which mosquito netting has been fixed, in such a way that it is wide open at the 'high' side and tied close at the other end. Thus, water will flow in through the open end and seep out through the netting, leaving behind any fish, shrimp or crab it carried along. Reportedly used in Siem Reap, Battambang, Pursat, Kampong Chhnang and Kampong Cham, from June to November. Women and children mostly operate this gear. The cost is R. 10.000 to 15.000.

The catch consists of small fish (trey changwa phlieng, *Esomus* spp.), shrimps and crabs. The fish will be fermented and is then called *trey prai*.

A "sab" gear made of bamboo slats is mentioned in the Fishery Law as a family fishing gear (No. 28 KOR SOR KOR Table A I). However, this gear type is no longer used and is replaced by the variety described above, which is not mentioned as such in the law.



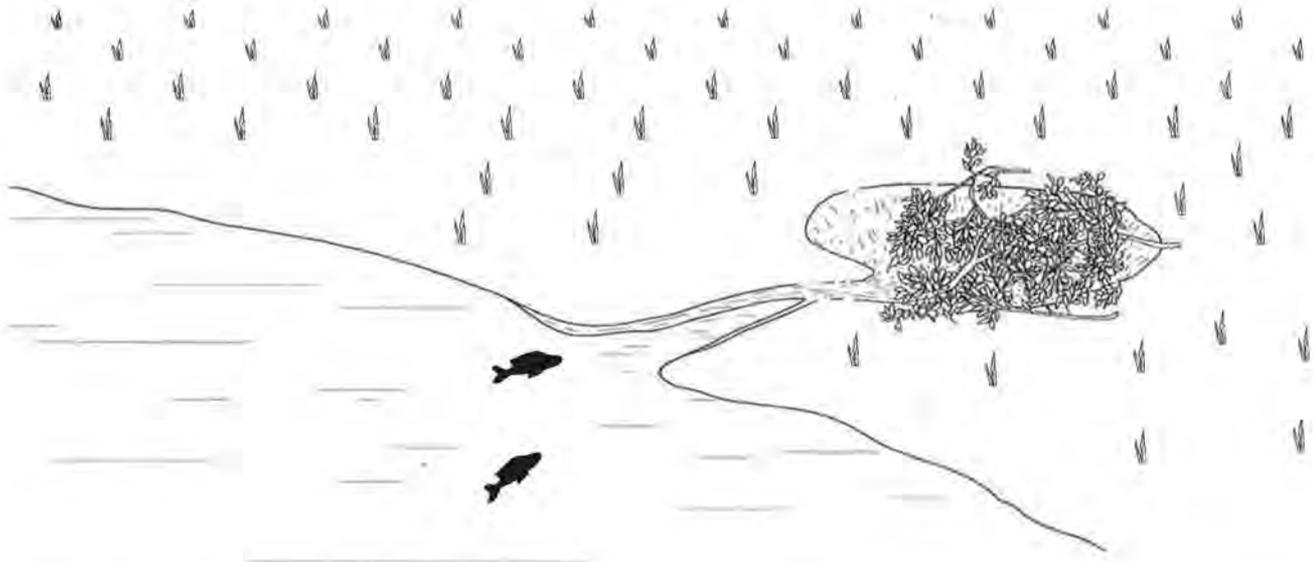
'Trang' in Chur Pamet, Stung Treng



'Sab sbai mong', Siem Reap

Pitfall Trap

Onlung Ungkoup



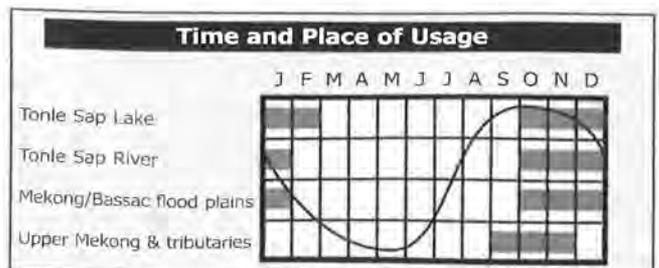
Description

The pitfall trap is widely used in the floodplains, where naturally occurring depressions are deepened or holes are dug to retain receding water, or to lure the fish into a hole without water. This trap is simply known as *onlung* or fish hole. To enhance its productivity the holes may be surrounded by a dyke or connected to a lead fence. Fish that try to make their way out of shallow water bodies in search of deeper waters fall into the hole and get trapped. Usually, the fish has to jump over a slight slope before it falls into the pit. The distance from the water to the edge of the pit is as short as possible, usually no more than 30 to 40 cm. The shape, size and implementation of each fish hole depend on its setting. Natural depressions can be used, artificially dug out small ponds, or dug in earthen jars may be used for this purpose. The entrance to the pit is formed by a very slight mud slope. Sometimes the fisher puts some branches with leaves over the hole in order to prevent the fish from jumping out again and to provide some shade.

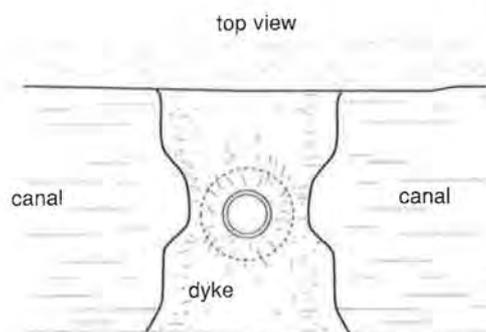
Operation

The pitfall trap is used during the dry season, that is at the beginning of the recession period, when fish are trying to find their way out of the flooded areas to reach deeper water bodies. The pit is set up in places where fish are more likely to move toward these deeper waters. This can be at the mouth of irrigation canals, in rice fields and also next to small streams. While the hole may be connected to the river through a specially made small canal, the slight slope leading into the pit is as short as possible, as mentioned before. Generally, the mud of the entrance to the pit is impregnated with the juice squeezed out of the roots of water hyacinth, collected from a more distant and bigger river or lake that holds water the whole year. Even mud taken from such a more distant place is used. Thus, especially when the wind comes from the right direction for spreading the smell of the bigger water body, fish are lured into the trap. Since fish tend to move or 'wander over land' at night, the entrance to the pit is impregnated with the right smell during the late afternoon, while the catch is collected the following morning. However, also during daytime fish jump into the pit, but to a lesser degree. The entrance to the pit needs permanent maintenance and adjustments following the receding water level. The season for operating pitfall traps lasts from

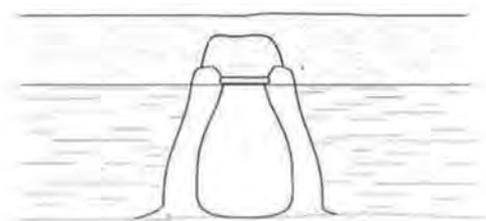
Size, Season & Environment				
Province	Depth in m	Pit diameter in m	Season	Environment
Battambang	0.8	0.5	Oct-Dec	ricefield, lake, canal
Pursat	0.8 - 1	0.5 - 1	Nov-Feb	ricefield
Siem Reap	0.6 - 0.8	0.8	Dec-Feb	ricefield, pool
Kg. Chhnang	0.8 - 1	0.6	Oct-Jan	ricefield, small lake
Prey Veng	0.5 - 1	0.4 - 1	Oct-Dec	ricefield, lake
Takeo	0.5	0.5	Nov-Jan	stream, canal
Kg. Cham	0.5 - 1.5	1 - 1.5	Oct-Jan	ricefield, canal
Kratie	0.5	0.5 - 0.8	Sep-Nov	ricefield



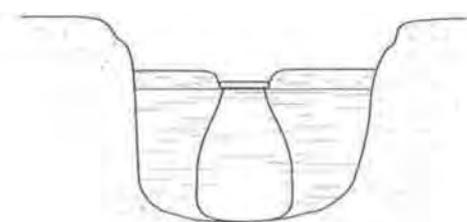
Pitfall Trap variations



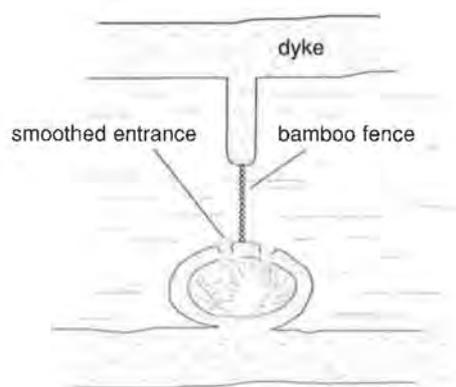
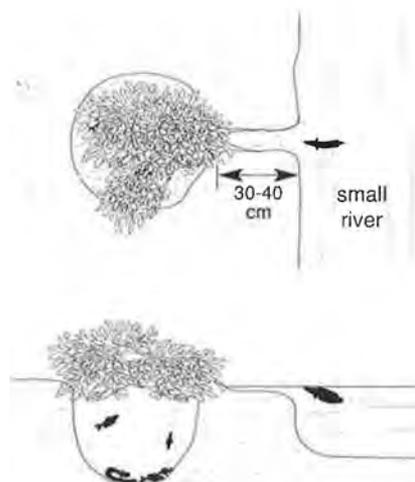
Jar inbedded in dyke across irrigation canal



cross-section of dyke and jar



cross-section of irrigation canal



November to January, during which three separate fishing periods can be distinguished. At the beginning, white fish or pelagic fish species (trey kranh, trey kawmpheanh, trey riel) will jump into the trap. A few days later black fish species (trey phtuok, trey raws, trey chhlang, trey andaing) form the major part of the catch. In the final stages of operation bottom-bound or demersal fish (trey chhlonh, trey antong) round off the season.

Gender aspects

Both women and men are involved in the construction and operation of this gear. Often, children experiment on their own digging holes and shaping entrances.

Target species

Climbing perch / trey kranh (*Anabas testudineus*); gou-rami / trey kawmpheanh (*Trichogaster* spp.); trey riel (*Henicorhynchus* spp.); snakehead / trey phtuok / trey raws (*Channa striata*); trey chhlang (*Mystus nemurus*);

trey andaing / catfishes (*Clarias* spp.); spiny eels / trey chhlonh chhnoht (*Macrognathus siamensis*); eels / trey antong (*Monopterus albus*).

Legal aspects

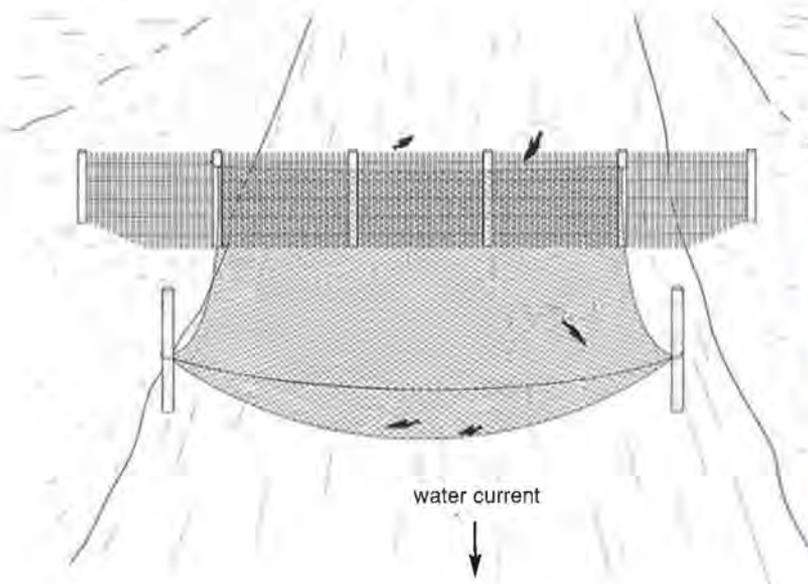
Not mentioned in the fishery law.



Pitfall trap with bamboo fence

Veranda Trap Net

Kantrong Trong Trey



Veranda trap net at Kampong Cham

Description

This trap consists of a net placed horizontally above the water behind a fish barrier, for the purpose of catching fish jumping over the barrier. The net usually has a mesh size of 1.5 cm. It is arranged between ropes (\varnothing 6 mm) and fixed to the fence on the downstream side of the barrier. The hanging ratio is 0.9. It is at least 2 m wide and its length may vary according to the size of the barrier and the canal or stream it is blocking. The net is suspended between four extreme points, two of them being poles of the fence construction. Additional supporting poles may be used depending on the length of the net.

The barrier consists of bamboo mats supported by wooden poles (\varnothing 3 to 5 cm, 2.3 to 2.5 m long). The bamboo mats measure 2 by 5 m each. The distance between the slats is 1.5 to 2 cm. The fence rises above the water surface by 30 to 50 cm.

Operation

When confronted with a barrier on their migration route, a number of fish species try to jump over it, hence the extended net on the other side of the fence. The softly swinging net does not provide sufficient resistance for the fish to jump out of again. The fisher periodically passes by in a boat to collect the stranded fish. The gear is used during the rising flood as well as during the drawdown of the flood waters.

There are almost no reports about the use of this gear in the provinces. Only in Kampong Thom it was reported being used from October to December (1998). However, according to Fily and d'Aubenton (1965) this type of device was frequently used in many different variations and in connection with various fishing operations, particularly barrages with

either *yor* nets or *lop* traps. Typically, it was used during the high flood season, when fences are nearly entirely submerged and cannot prevent fish from jumping over. Veranda nets were also used around the entrance of arrow-shaped fence traps during the January peak migration, when many fish refuse to enter trap gate and try to jump over the fence. The use of the veranda net seems to be typical for the floodplains; it was not reported from the upper Mekong and its tributaries.

Gender aspects

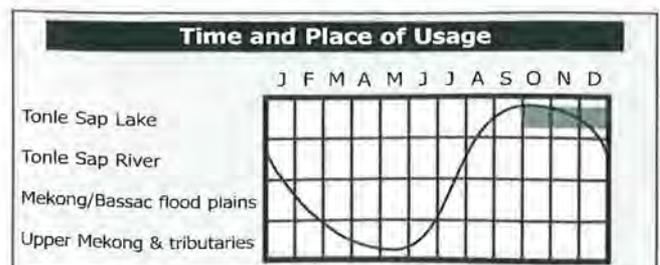
Except for the installation of the fence, which was done by male fishers, women were involved in every activity related to the operation of the jump trap. As soon as the gear was installed, all members of the family could easily harvest the fish using a boat.

Main species caught

snakehead (*Channa* spp.); trey riel (*Henicorhynchus* spp.); trey prul (*Cirrhinus microlepis*); trey krum (*Osteochilus melanopleurus*); trey khman (*Hampala* spp.); trey prlung (*Leptobarbus hoeveni*).

Legal aspects

Not mentioned in the fishery law.



C L O S E - U P



Netting

Fishing Lot Fence System with Pens

Nor Rut Chhuong / Nor Raev



*Fences, arrow-shaped structures, pens and traps in the Great Lake (Kampong Thom).
Flood forest can be seen on the left and top of the picture.*

Descriptions

Great Lake fishing lots

The main operations of the Great Lake fishing lots involve the use of kilometer long fences that are installed perpendicular to the receding waters in the drawdown period and parallel to the edge of the flood forests bordering the Great Lake. At each end lateral fences connected to the outer fence lead into the flooded forest area. The lake fences lead to arrow-shaped fences with pens connected to them. Depending on the direction of the currents of the receding waters and the wind direction at specific times, the lateral fences might be opened for a short period to allow fish to enter the fishing lot area. The fences are put up when the lake level has dropped to about 4 m, which is usually in February. According to the law, they have to be dismantled by the end of May.

The fishing lots are part of a limited access system that dates back to pre-colonial times. It was regularized by the French to provide a resource rent to the government. Recently, part of the areas enclosed in the lots have been taken out and opened up for

exploitation by the fishing communities in the area. Detailed descriptions are given in Chevey and Le Poulain (1940), Fily and d'Aubenton (1965), Van Zalinge *et al.* (2000), Degen *et al.* (2000, 2002).

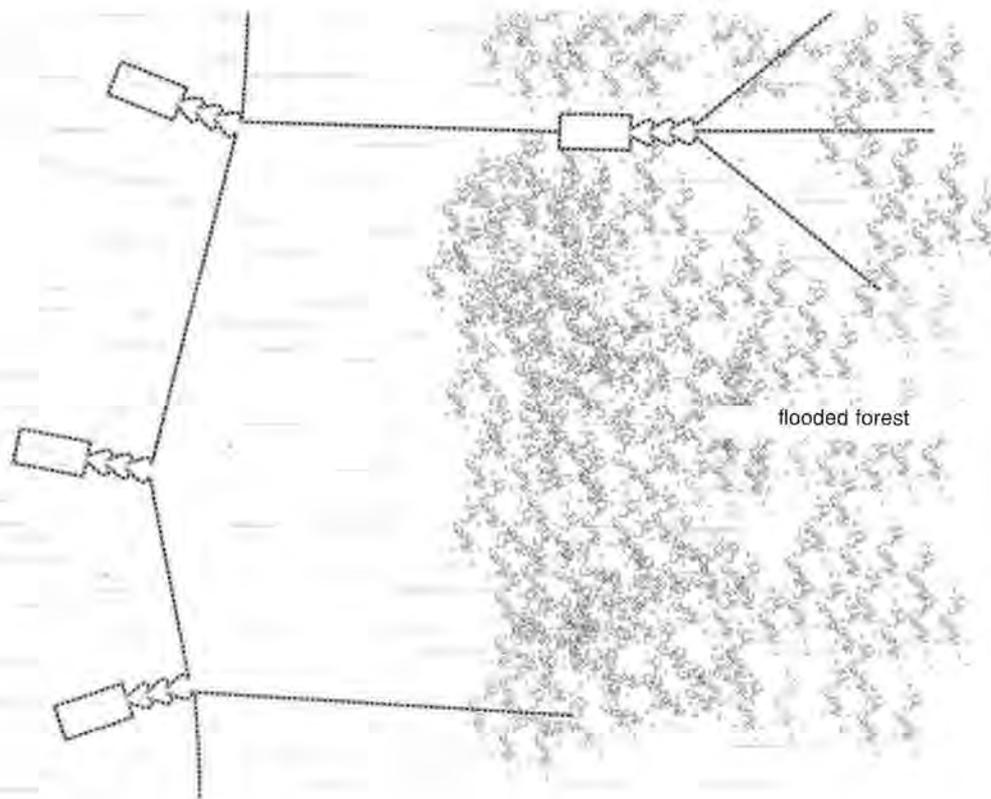
Lot fences

The fences are assembled with bamboo mats (5 x 3 m) attached to wooden poles (\varnothing 4 to 6 cm), which are placed at a distance of 50 to 70 cm from each other. The gap between the bamboo slats is 10 to 15 mm. The bamboo fence is driven up to 10 cm deep into the bottom. Nowadays, the bamboo in the fences is often replaced by nylon netting, which is cheaper and longer lasting.

Arrow-shaped traps with pens

Arrow-shaped traps with pens are located at strategic points along the fences. The fence and the pen are sometimes linked by means of a simple V-entrance or sometimes by an arrow- or heart-shaped labyrinth of fences, consisting of different pre-capture rooms. The entrances to the various

Schematic lay-out of a Great Lake fishing lot with fences, arrow-shaped trap systems and pens



rooms differ. For instance, the entrance into the pen is called the *prueh samphoeng*. It consists of 2 mats placed in a 'V', the *samphoeng*, leaving a narrow opening for small fish to swim through. Bigger fish have to swim upward to the next mat, the *sap*, the far end of which sticks out of the water, forcing the fish to jump out and into the pen. Returning is nearly impossible. To built these structures much experience is required and usually a so-called master fisherman is hired for the job. Each lot has its own master fisherman for at least the whole season. The pen (*soung*) or capture room is a rectangular enclosure made of fencing. Its size is 60 m long and 10 m wide, sometimes even bigger. The pen's fencing sticks out above the water surface. On top often 1.5 m high netting is placed to prevent fish from jumping over. Or the pens can be surrounded by a second fence at a distance of 1 to 2 m in order to re-capture escaped fish. An alternative measure is to attach a veranda or jump trap to the fencing (see 5.4.2). This was more common in the past.

Fish trapped in the pen are removed by seining. The captured fish are then sorted on a kind of platform that is constructed behind the pen. Here middlemen come to buy the fish.

Arrow-shaped bamboo fence trap

Lop raev / lop lok (see 5.5.2)

Shorter leader fences are connected at the outside (lake bound side) of the outer fence at a right angle and with a distance of 400 to 800 m between each other. At the end of each leader fence sits an arrow- or heart-shaped labyrinth chamber, guiding the fish into one big-sized *lop* trap. These leaders are usually outside the official fishing lot area, reaching far into the public water space of the Great Lake Tonle Sap. They are usually sub-leased to others by the lot owner.

Cost

Fences come in different qualities. The better the quality, the more often it can be re-used. A 5 m piece of fence of average quality costs R. 8.000 to 16.000; medium quality: R. 24.000 to 33.000; best quality: R. 49.000 to 57.000. In the field these prices are not expressed in the national currency Riel, but in gold.

Operation

In the Great Lake area the long fences and arrow-shaped pens form huge installations, adapted to the size of the individual fishing lot. They are operated during the recession or drawdown period. During the recession of the floodwaters the fish move out of the

Fishing Lot Fence System with Pens (cont.)

Nor Rut Chhuong / Nor Raev



Soung / Pen with jumping snakeheads

flooded forests and into the Great Lake. On their way to deeper waters the fish will encounter the fence and follow it until they enter one of the pens or capture chambers. Fish in the open Great Lake area (and outside the fishing lots) may move along any obstacle - such as the outside wall of the fence - leading them to the lead fences and finally through the pre-capture and capture rooms into the *lop* trap.

Fences are usually put up in the second half of the drawdown period, as waterlevels may be too high during the first half. Besides, the law specifies that fences can be put up from the 1st of February and have to be removed by the 20th of May. Most white fish (cyprinids) therefore have left the flooded forest and maybe even the lake before the fences are put up. Black fish such as the Channidae leave the flooded forest much later and therefore constitute a large proportion of the fishing lot catches.

During the 3 to 4 months of receding waters (February to May) the lead fence and the pens are usually moved according to the water level, until, at the end of the dry season the structure reaches far into the open but shallow water area of the Great Lake. At the end of the season these fenced areas in the open lake are then seined systematically (see also the chapters on seines 7.1 and 7.2).

Gender aspects

Men exclusively operate this gear; women can be involved during the construction process, such as

mat weaving. Sometimes, fishing lot owners prohibit women to participate in fishing operations, believing women bring bad luck to fishing.

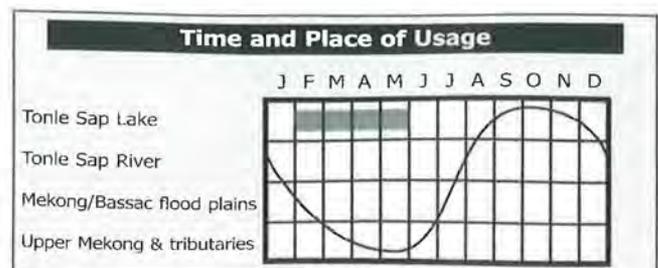
Main species caught

snakehead (*Channa* spp.); gourami / trey kawm-pleanh (*Trichogaster* spp.); trey chhlang (*Mystus nemurus*) and many more species.

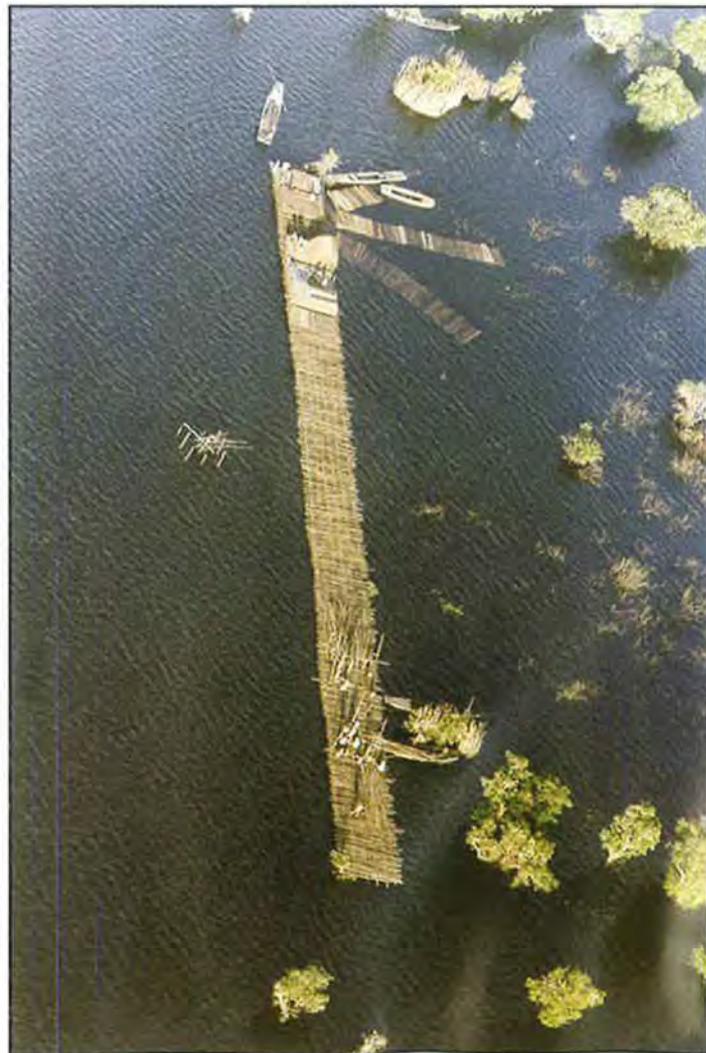
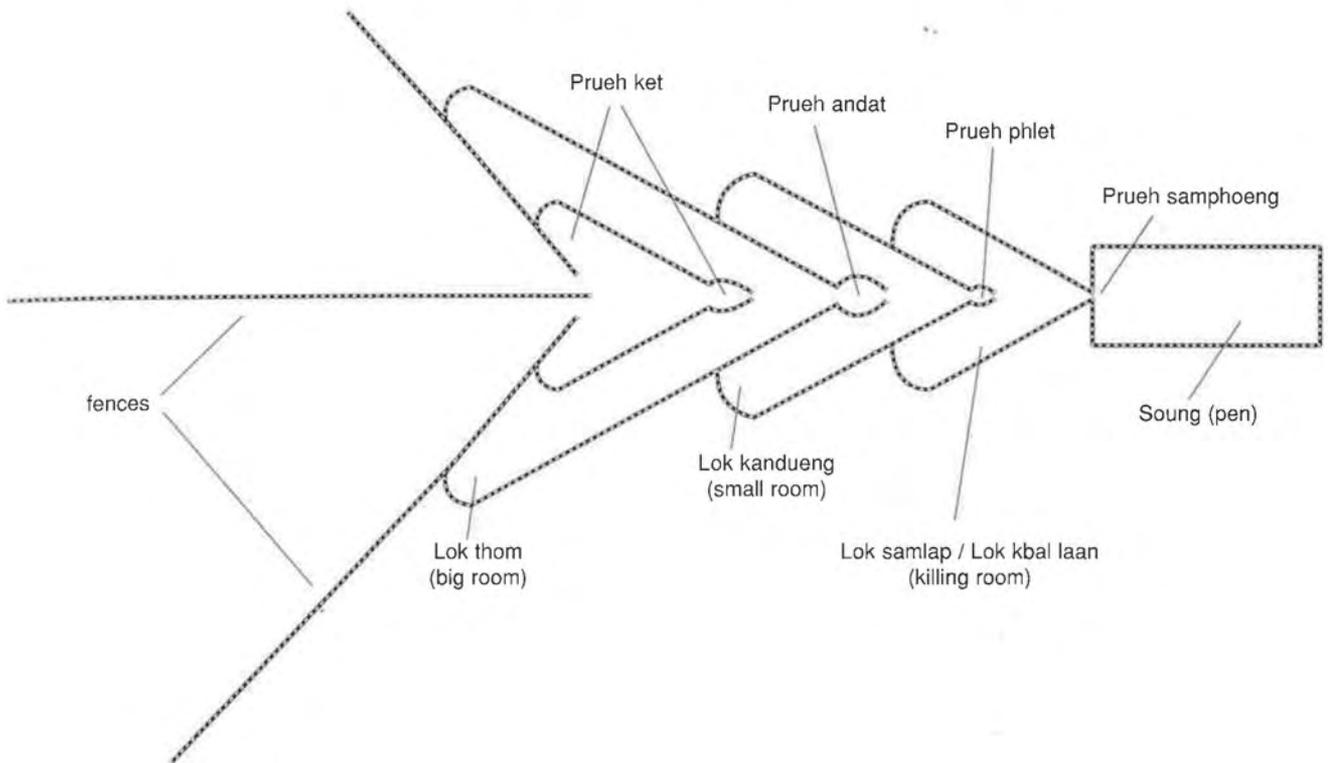
Legal aspects

Large-scale fishing gear, according to No. 28 KOR SOR KOR Table A III. In the Great Lake Tonle Sap area leader fences cannot exceed a length of 500 meters and can operate not further than 4 kilometers from the shore, and only from February 1 to May 20. As well as in other areas according to proclamations of the Ministry of Agriculture, Forestry and Fishery (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 14).

All kinds of fishing barriers in which the distance from one bamboo slat to the next is less than 1.5 centimeter are prohibited, No. 33 KRO.CHOR Chapter 2, Article 17, H).



Lay-out of an arrow-shaped trap system with pen



Preparation of a piece of fencing

Fishing Lot Fence System with Pens (cont.)

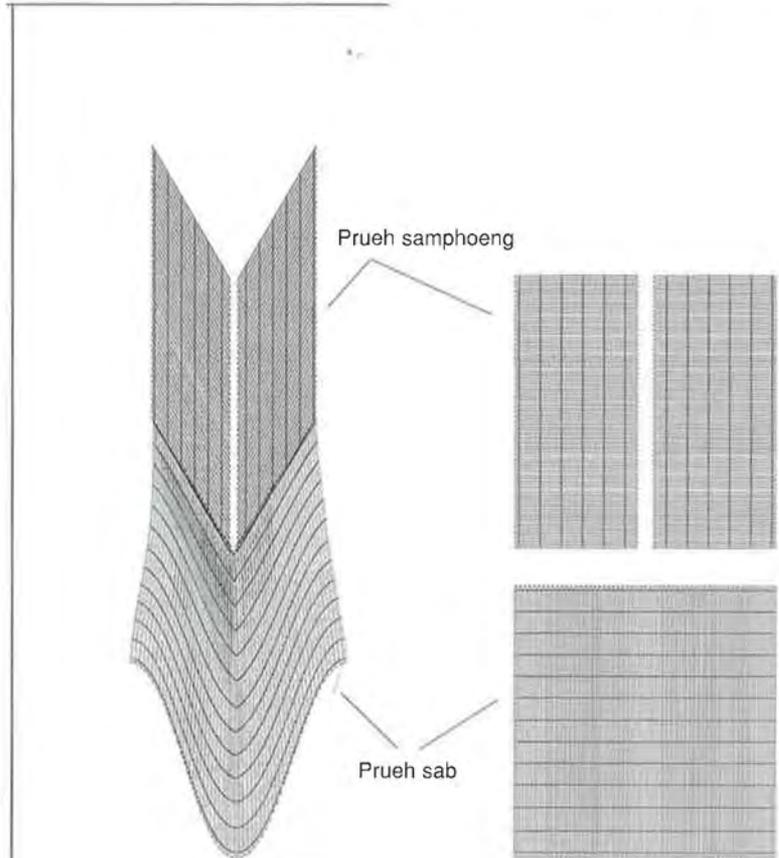
Nor Rut Chhuong / Nor Raev



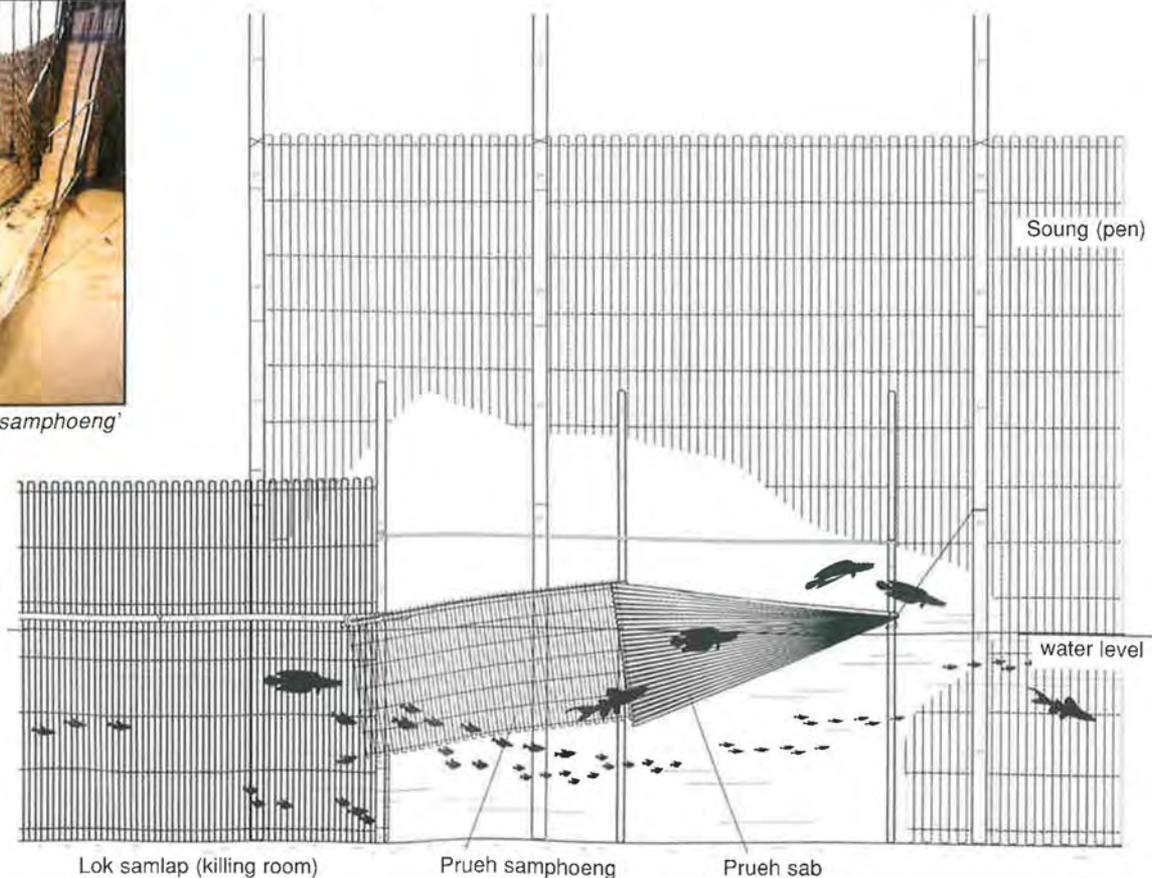
Arrowshaped trap with pen



Arrowshaped traps and fences, Kg. Thom



Pen with 'prueh samphoeng' and 'sab' entrance



C L O S E - U P



Random selection of Mekong freshwater fish, showing a wide variety of shapes and colors.

Arrow-shaped Bamboo Fence Trap with Horizontal Cylinder Trap

Lop Nor / Lop Lok / Lop Raev



Arrow shaped fence system with trap; Kampong Chhnang

Description

Long fish weirs connected to heart- or arrow-shaped capture chambers with big lop traps attached to them are typically found in the Great Lake Tonle Sap (see Fily and d'Aubenton (1965) and Troeung and Phem (1999)). Despite their large-size the law classifies them as middle-scale fishing gear. In Kampong Thom the name *lop lok* is used and in Battambang *lop raev*, while in all other provinces in the country the name *lop nor* is used.

Arrow-shaped bamboo fence trap

In the open waters of the Great Lake, such a leader fence, made of bamboo mats, can be 200 to 500 m long, and from 50 to 200 m in flooded forest areas or rivers. It is 1 to 5 m tall there where it ends in the pre-capture chamber (*lok* or *nor*); there can be up to three big heart-shaped capture rooms and three to four minor heart-shaped entrance rooms positioned before each pre-capture room. The width and the length of the pre-capture rooms diminish going inward, from respectively 20 m and 30 m in the first pre-capture room to 5 m and 10 m in the third pre-capture room. Likewise, the size of the opening gates is scaled down from 1 m between the lead fence and the first pre-capture room to 7 to 10 cm at the final entrance into the capture chamber or *lop nor* trap. The fences usually protrude at least 0.2 m above the water surface.

Lop lok / Lop nor

This big-sized *lop* trap is fixed at the end of the

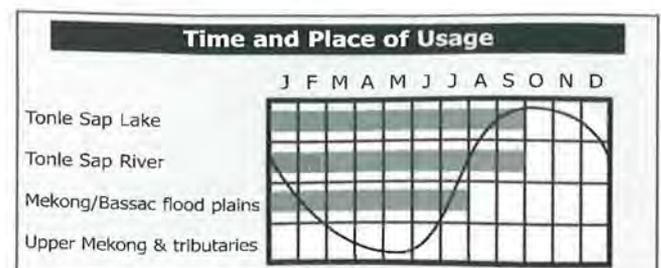
arrow-shaped trap arrangement. It is made of bamboo slats, fixed to the inner stabilizing rings with vines or nylon yarn. Its length ranges from 140 to 260 cm and its diameter varies between 67 and 113 cm depending on the fishing ground. Those used in the Great Lake area are the largest traps, while those operated inside the flooded forests or other sheltered areas are commonly smaller in size. The two successive inward facing spike cones are between 12 and 17 cm wide at the first entry cone (*prueh duen*) and between 5 and 14 cm at the 'killing cone'. Sometimes the first entry cone is not inward facing, but is a vertical slit entrance (*prueh saioeun*). The gap between the slats of the trap mantle is between 15 and 20 mm.

Cost

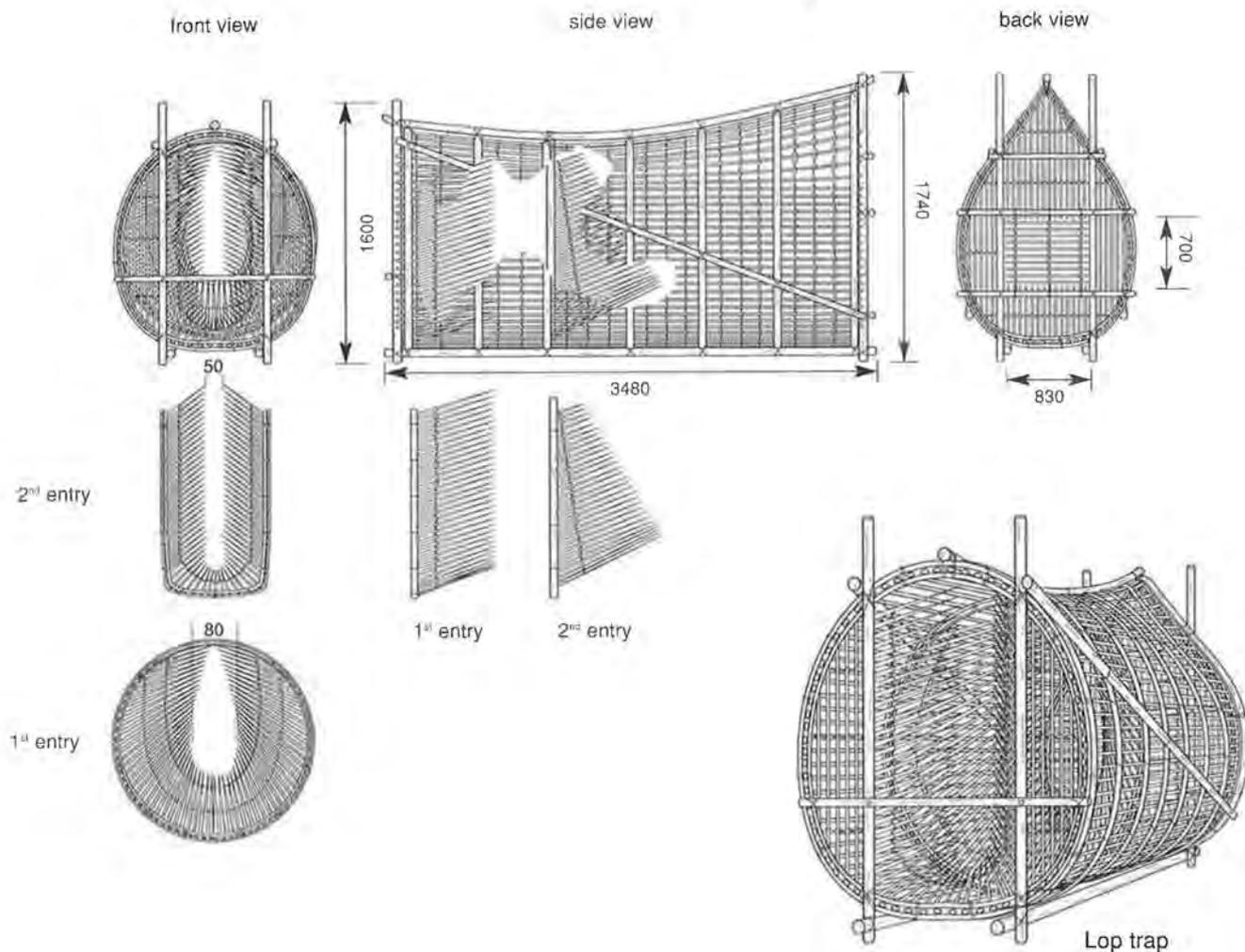
R. 200.000 to 2 million depending on the size.

Operation

The large *nor raev* heart-shaped hedge trap



Lop Nor trap



installations are largely used around the Great Lake Tonle Sap. Traps used in the flooded forest are adapted to the particular situation with respect to current (strength and direction) and bottom conditions. When the flood recedes, the traps are moved toward the Great Lake. In order to gather the catch the *lop* trap is lifted out of the water and a fisherman climbs in it to remove the fish. He must do this carefully, as water snakes are frequently among the catch.

In other fishing grounds on the flood plains outside the fishing lots, the *lop nor* installations are considerably smaller and have much shorter fences.

In recent years nylon netting is replacing the bamboo fences. This is improving the trap's ability to catch fish and has lowered its construction costs (Troeng and Phem 1999). As a consequence of this improvement the number of trap installations is increasing.

Gender aspects

Men exclusively operate this gear; women can be involved during the construction process, such as matt weaving.

Main species caught

Snakehead / *trey chhdaur* / *trey diep* (*Channa micropeltes*); *trey chhkok* (*Cyclocheilichthys enoplos*); pangasiid catfish / *trey pra*; *trey riel* (*Henicorhynchus* spp.); *trey chhpin* (*Barbonymus gonionotus*); *trey khman* (*Hampala* spp.).

Legal aspects

Middle-scale fishing gear according to No. 28 KOR SOR KOR Table A II. The connecting fence on a "lop nor" or "raev" trap must be shorter than 500 m. Wooden poles less than 0.5 m apart in a line, even without fencing material in-between, are considered a fence.

Arrow-shaped Bamboo Fence Trap with Horizontal Cylinder Trap

Lop Nor / Lop Lok / Lop Raev



Great Lake trap, seen from the rear; Siem Reap



Great Lake trap with fences, Pursat



Lop Nor fish catch, Siem Reap



Retrieving a trap from inside the flooded forest, Siem Reap province



Along the Tonle Sap River in Kampong Chhnang province



Arrow-shaped trap in flooded forest, Kampong Chhnang province



Chapter 6

GILLNETS

AND

ENTANGLE

NETS

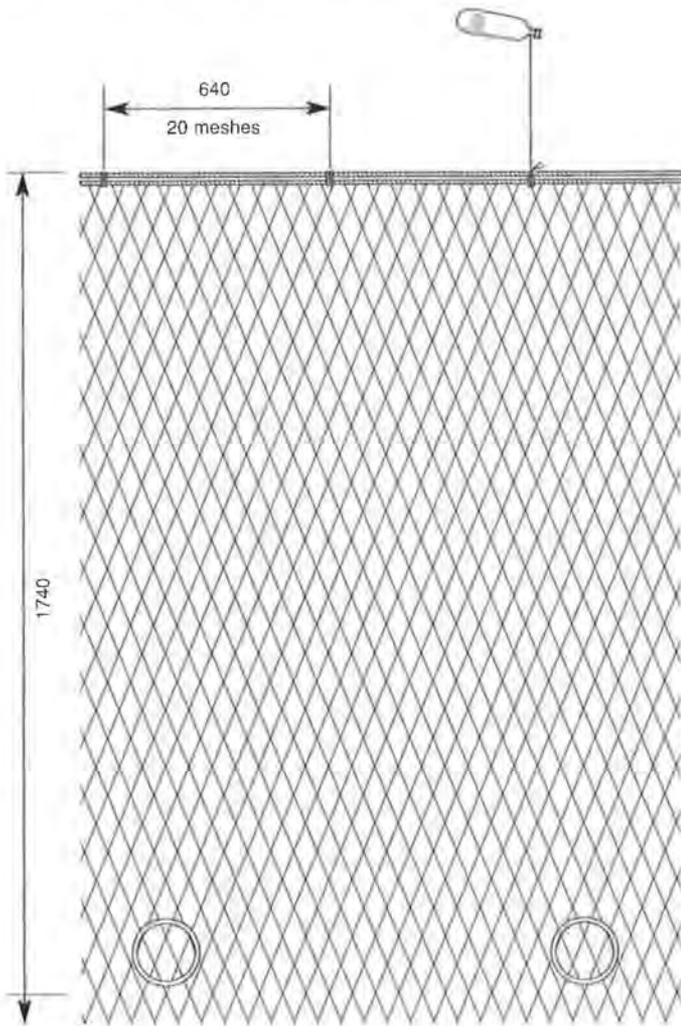
6.1 Stationary Gillnets

6.2 Drift Gillnets

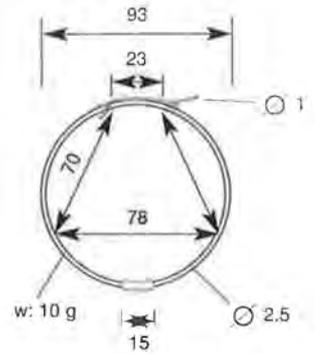
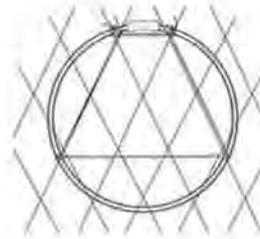
6.3 Encircling Gillnets

Stationary Gillnet

Mong Kang / Reay



metal rings, used as weights



spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey kros (*Osteochilus hasselti*); trey sraka kdam (*Cy-clocheilichthys apogon*); trey chakraing (*Puntioplites* spp.); there are another 9 species frequently captured as well.

Mesh size group 50 - 70 mm: most common is 60 mm; length of net 100 - 700 m; depth 1.5 - 1.8 m. Hanging ratio recorded is 0.44. Prices vary from R. 385 - 700 per m.

The nets are set mostly at the surface and in mid water. They are used year round in most provinces. The catch consists mainly of: trey chhkok (*Cyclo-cheilichthys enoplos*); trey kantrang preng (*Param-bassis wolffi*); trey chhlang (*Mystus nemurus*); trey chakraing (*Puntioplites* spp.); there are another 5 species frequently captured as well.

Mesh size group >70 mm: mesh sizes vary from 80 - 90 mm; length of net 60 - 1200 m; depth 1.2 - 4 m. Prices vary from R. 458 - 680 per m.

The nets are set mostly at the surface and less so at the bottom. They are used most of the year, but there are no reports for April and May.

The catch consists mainly of: trey chhkok (*Cyclocheilichthys enoplos*); trey krum (*Osteochilus melanopleurus*); trey kaek (*Morulus chrysophekadion*); trey khlhang hai (*Belodontichthys dinema*); trey pruol (*Cirrhinus microlepis*); trey chhpin (*Barbonymus gonionotus*); there are another 5 species frequently captured as well.

Gender aspects

Both men and women construct and operate these gears.

Size Variations

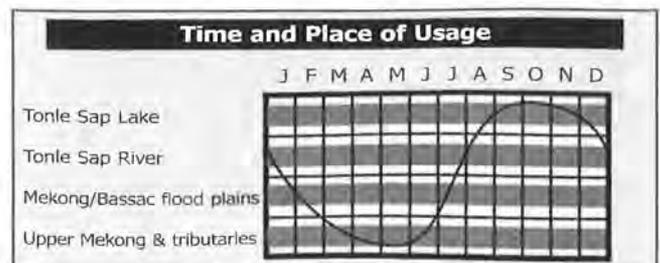
- mesh size smaller than 50 mm
- mesh size between 50 - 70 mm
- mesh size bigger than 70 mm

Description, cost, operation and main species caught

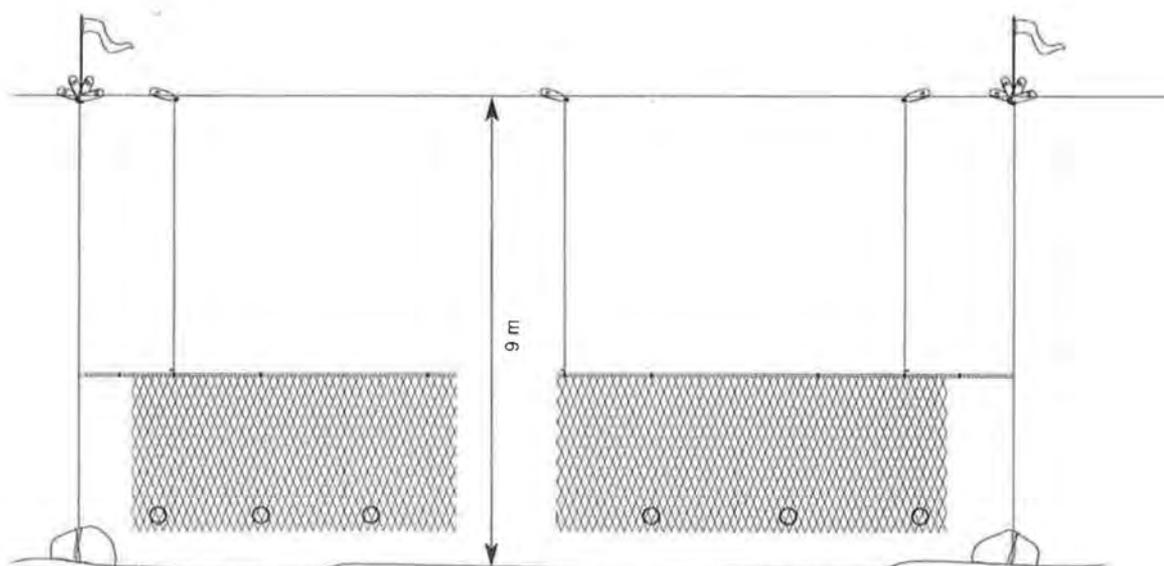
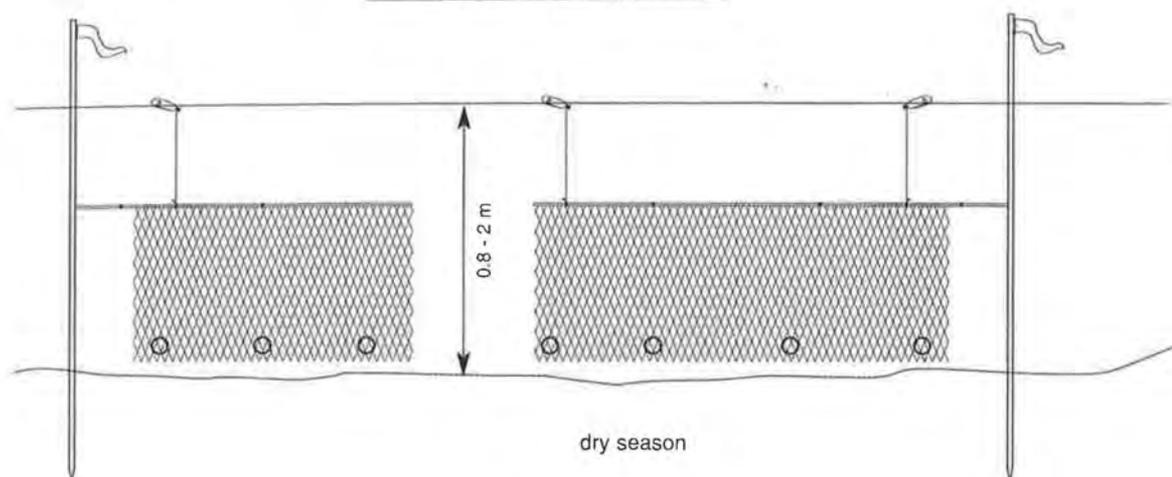
Stationary gillnets are made of mono- or multifilament nylon, although multifilament is being used less and less. Smaller meshed nets are mostly monofilament, while larger meshed nets can still be multifilament. Usually the fisher buys the materials and assembles the net at home. Most nets have a footrope, but not all. Metal rings are used as weights; sizes vary.

Mesh size group < 50 mm: mesh sizes 40 - 45 mm; length of net 50 - 1000 m; depth 1.8 - 3.5 m. Hanging ratio varies from 0.43 - 0.55. Prices vary from R. 250 - 462 per m. The nets are set at the surface and used year round in most provinces.

The catch consists mainly of: trey riel (*Henicorhynchus*



Stationary gillnet setting positions



flood season

Legal aspects

The use of gillnets as Family Fishing Gear is limited to lengths of less than 10 m in the law (No. 028 KOR SOR KOR). Of course such a length is not realistic and most people use longer lengths.

A mesh size smaller than 15 mm is disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E, F).

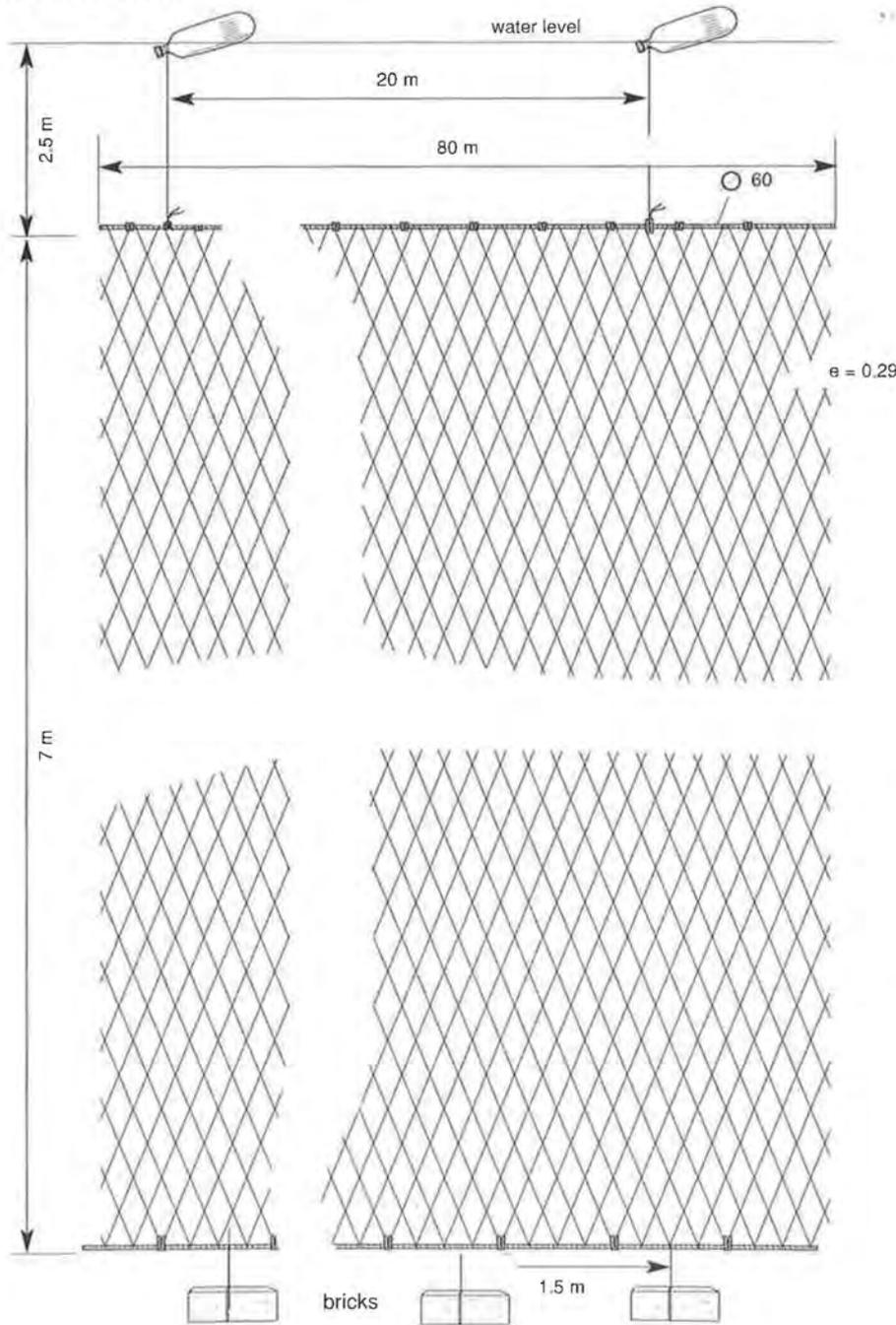
Proposals have been made to ban the use of very large mesh sized nets in view of the negative effects on the brood stock of a number of valuable species.

The use of extended fixed gill nets or gill nets for catching "boa" (= python) snakes is prohibited.



Net mending utensils

Stationary Gillnet (cont.)
VARIATIONS



Mono-filament 50 mm



Multi-filament >70 mm

Mong onlong / មងអង្រួង

Deep-pool gillnet

This multifilament gillnet is characterized by its large mesh size (350 mm). Its length is 80 m and the depth 7 m. Hanging ratio E varies from 0.29 to 0.57. The cost is relatively very high at R. 2500 per m. Floats can be empty plastic bottles or 4 m long bamboo sticks, which are attached to the net by ropes that are several meters long.

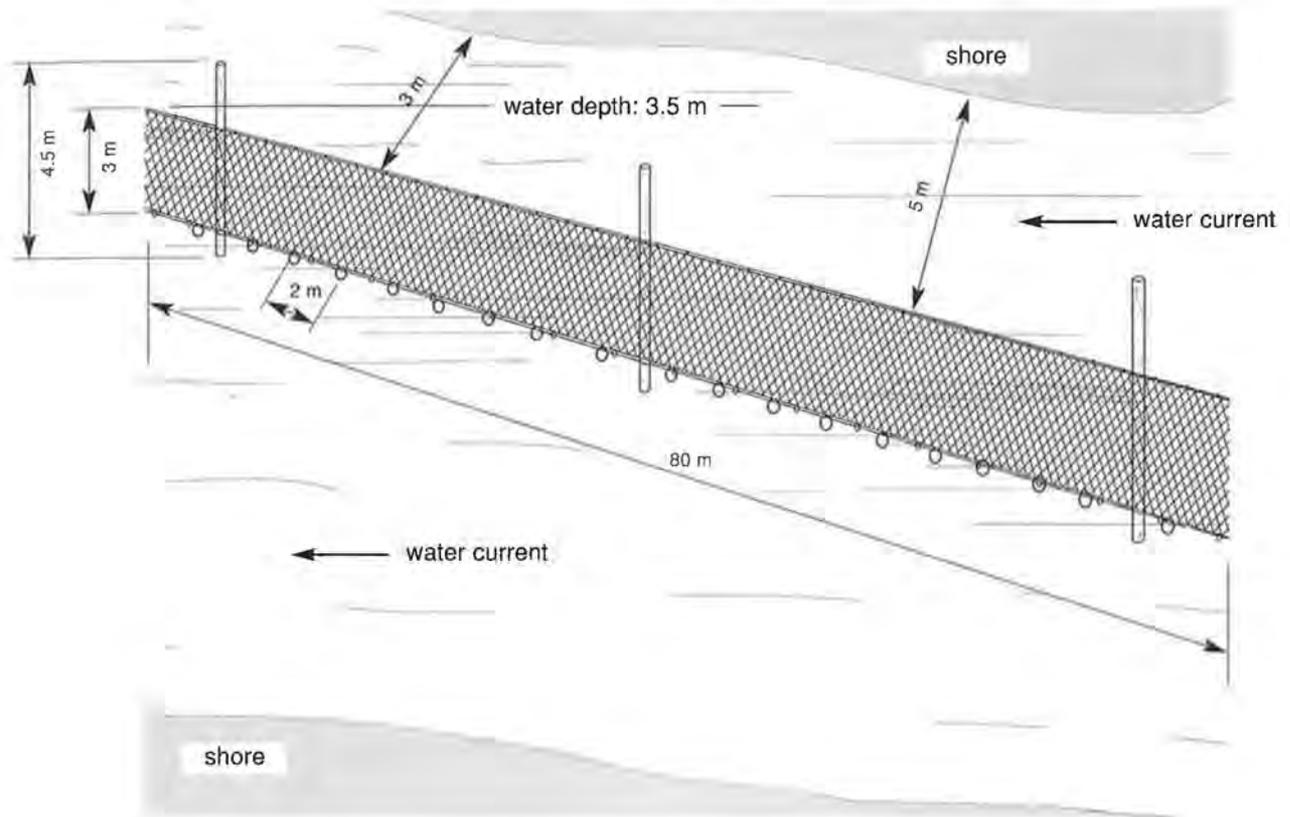
It is set on the bottom of deep pools in the Mekong during the drawdown of the river from November to May. At this time brood stock of various migratory species are concentrated here. At the beginning of

the rainy season spawning takes place in this part of the river in Kratie and Stung Treng. The catch consists mainly of: trey pra (*Pangasianodon hypophthalmus*); trey trawsak (*Probarbus* spp.); trey stuak (*Wallago leeri*); trey kolreang (*Catlocarpio siamensis*). Sometimes also Irriwaddi dolphins (*Orcaella brevirostris*) are accidentally caught.

Mong kang / Mong reay sre / មងកាំង / មងរាយស្រែ
Paddy gill net

The monofilament net is set between poles. The mesh size is small (30 mm); length is 80 m; depth up to 3 m. The hanging ratio, $e = 0.5$. The price of a complete net is R. 375 per m. Head and foot rope consist of two strings; the latter carries metal rings.

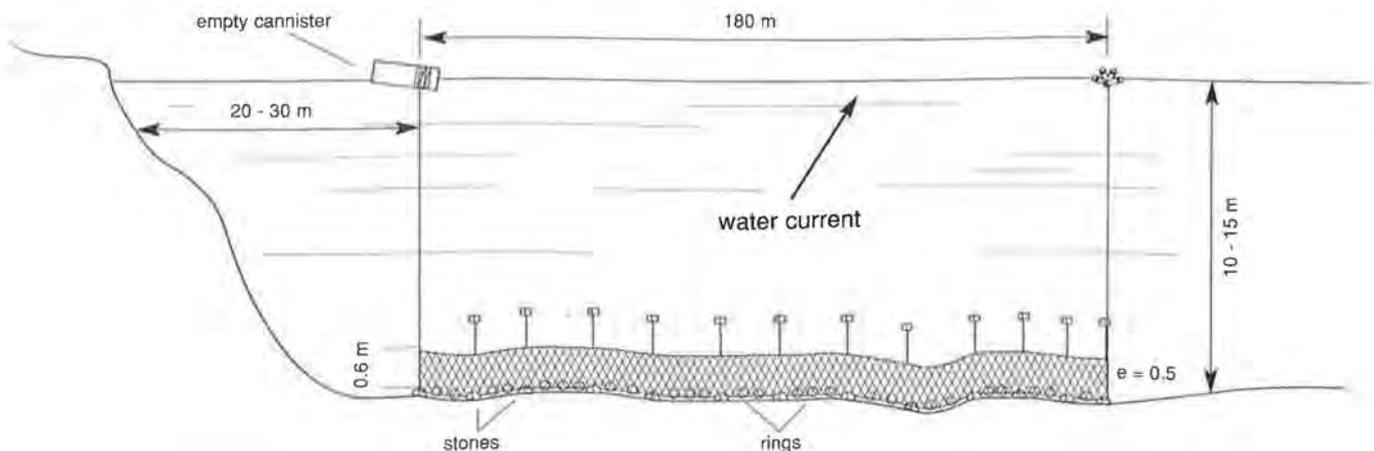
It is a family fishing gear that is used in rice fields whenever there is sufficient water in them. Catch consists of small fish, mainly climbing perch / trey kranh (*Anabas testudineus*), but also gourami / trey kawmpheanh (*Trichogaster* spp.) and trey kanchos (small *Mystus* spp.) are important.



Mong trey andet chhke / មងត្រីអណ្តាតផ្កែ
Flatfish gillnet

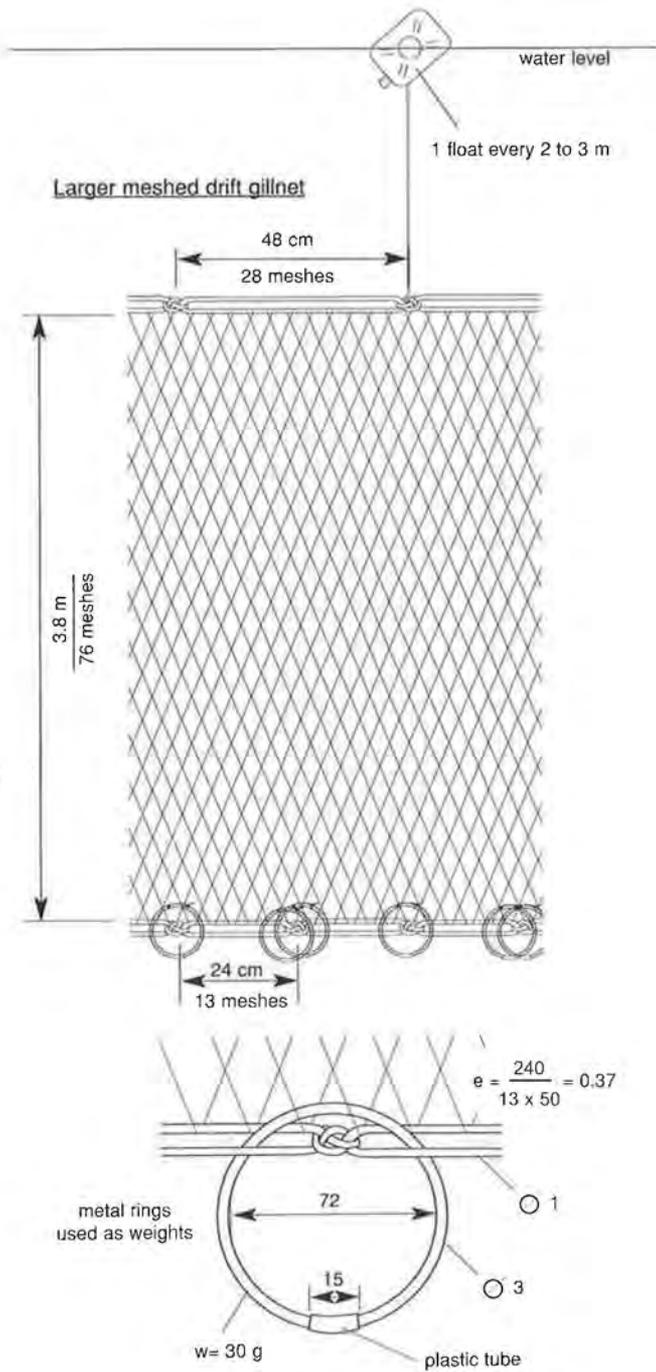
The mesh size is 40 to 45 mm; length 100 to 180 m; depth 0.6 m. $E = 0.5$. Cost is R. 250 per m. It is a bottom set net that is mainly used in Phnom Penh, when water levels are lowest from March to

May. The target species are flat fish (soles & tongue-soles) / trey andat chhke, such as *Achiroides* spp., *Euryglossa* spp. and *Cynoglossus* spp.



Drift Gillnet

Mong Bandet



Drift gillnet 'mong bandet'

Cost

R. 30.000 to 45.000

Operation

The net is set across the current and drifts downstream for a while. After it is taken up and the fish is removed, the fishers move back upstream for a repeat.

Gender aspects

Usually men and sometimes children are involved in preparing and operating these nets.

Main species caught

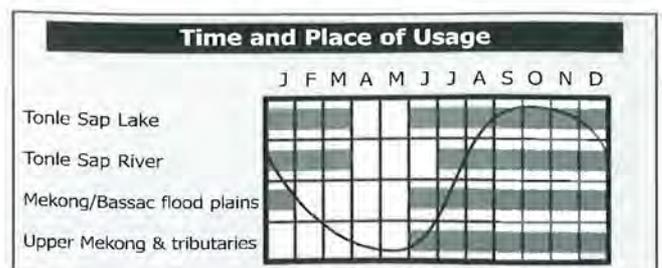
Trey chhpin (*Barbonymus gonionotus*); trey chhkok (*Cyclocheilichthys enoplos*); trey kaek (*Morulus chrysophekadion*); trey krum (*Osteochilus melanopleurus*); trey slat (*Notopterus notopterus*).

Legal aspects

Gillnets or all kinds of seine nets with a mesh size smaller than 15 mm are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E, F).

Description

All nets are made of nylon. Monofilament is most commonly used. Netting material is bought in the market. Fishers prepare the net themselves, as is done for stationary gillnets. On a drift gillnet only rings are used for weighing down the net, as they are lighter than lead weights and can be easily added or removed. The ring opening is closed by a small removable piece of plastic tube. Nets with larger mesh sizes (65 - 80 mm) are commonly used. In Stung Treng the mesh size is largest (80 mm).



VARIATIONS

There are a few variations related to the target species:

Mong trey riel / មងត្រីរឿល

Riel gillnet is named after the target species: the cyprinid trey riel (*Henicorhynchus siamensis*). Mesh-size: 30 - 50 mm; length: 35 - 210 m; depth: 1.5 - 3.8 m. Reported hanging ratios vary from 0.34 to 0.41. As the gear is used in mid-water, the floats are connected to the upper top of net with a 1 m long rope (or 2 m according to Fily and d'Aubenton, 1965). Floats are usually pre-fabricated pieces of plastic.

Its use is particularly popular when the riel migrates from the Great Lake through the Tonle Sap river to the Mekong. The migrations take mainly place in a time window of 6 to 1 days before the full moon in October to March, but especially in January. These riel tend to be larger in size than those caught in the Dai fishery and are therefore usually sold fresh in the market.

Species commonly caught: trey riel (*Henicorhynchus* spp.); trey chhpin (*Barbonymus gonionotus*); trey chhkok (*Cyclocheilichthys enoplos*); trey khnawng veng (*Dangila lineata* and *cuvieri*). In addition some 10 other species are also regularly caught.

Mong trey pruol / មងត្រីព្រួល

Pruol gillnet.

Here the target species is trey pruol (*Cirrhinus microlepis*). Meshsize: 85 - 100 mm; length: 100 - 150 m; depth: 2.2 - 4 m. Reported hanging ratios vary from 0.42 - 0.50. As the gear is used in mid-water, the floats are connected to the upper top of net with a 0.5 m long rope (or 2 m according to Fily and d'Aubenton, 1965).

The net is floated for short distances with the current. The main migration is again from October to March, but with a peak in November and December. According to Fily and d'Aubenton (1965) this method of fishing is also used in July, when the fish returns to the floodplains. At this time fishing is illegal, though.

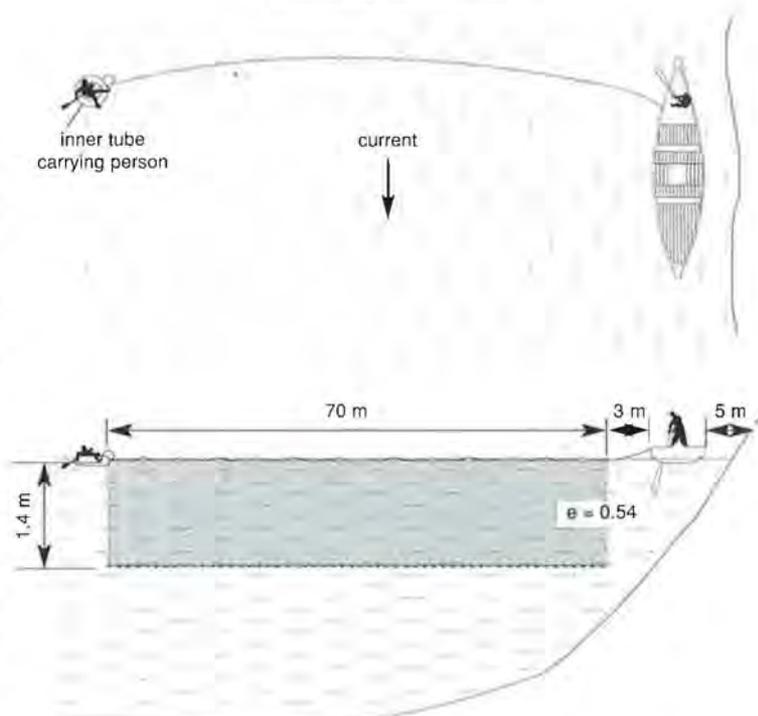
Species commonly caught: trey pruol (*Cirrhinus microlepis*). Other species caught are trey krum (*Osteochilus melanopleurus*); trey chhpin (*Barbonymus gonionotus*); trey kaek (*Morulius chrysophekadion*).

Mong trey changva / មងត្រីចង្វា

Rasbora gillnet

The target species is trey changva (*Rasbora* spp.). Meshsize: 20 to 25 mm; length: 70 m; depth: 1.4 m. The reported hanging ratio is 0.54. This gear is used

Rasbora gillnet operation



at the surface. One end is tied to the boat and the other to the inner tube of a car tire, in which a child sits, if no second boat is available. This is to keep the net straight. The closed rings are small and are fixed to the bottom line. Floats are prefabricated pieces of plastic.

The net is used on the Tonle Sap and Mekong rivers in the Phnom Penh area in July to October, when the water is rising. The target species is rasbora, but also other small species are caught and all are marketed fresh.

Species commonly caught: trey changva (*Rasbora* spp.). Other species taken are trey phtoung (*Xenentodon cancila*); trey slak russey (*Paralaubuca* spp.); trey riel (*Henicorhynchus* spp.).

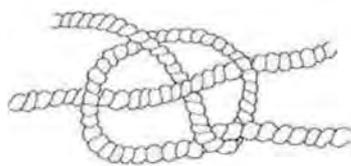
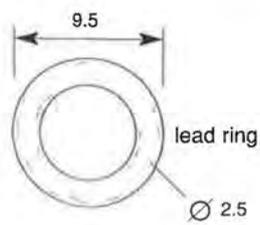
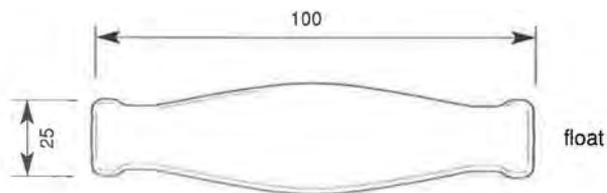
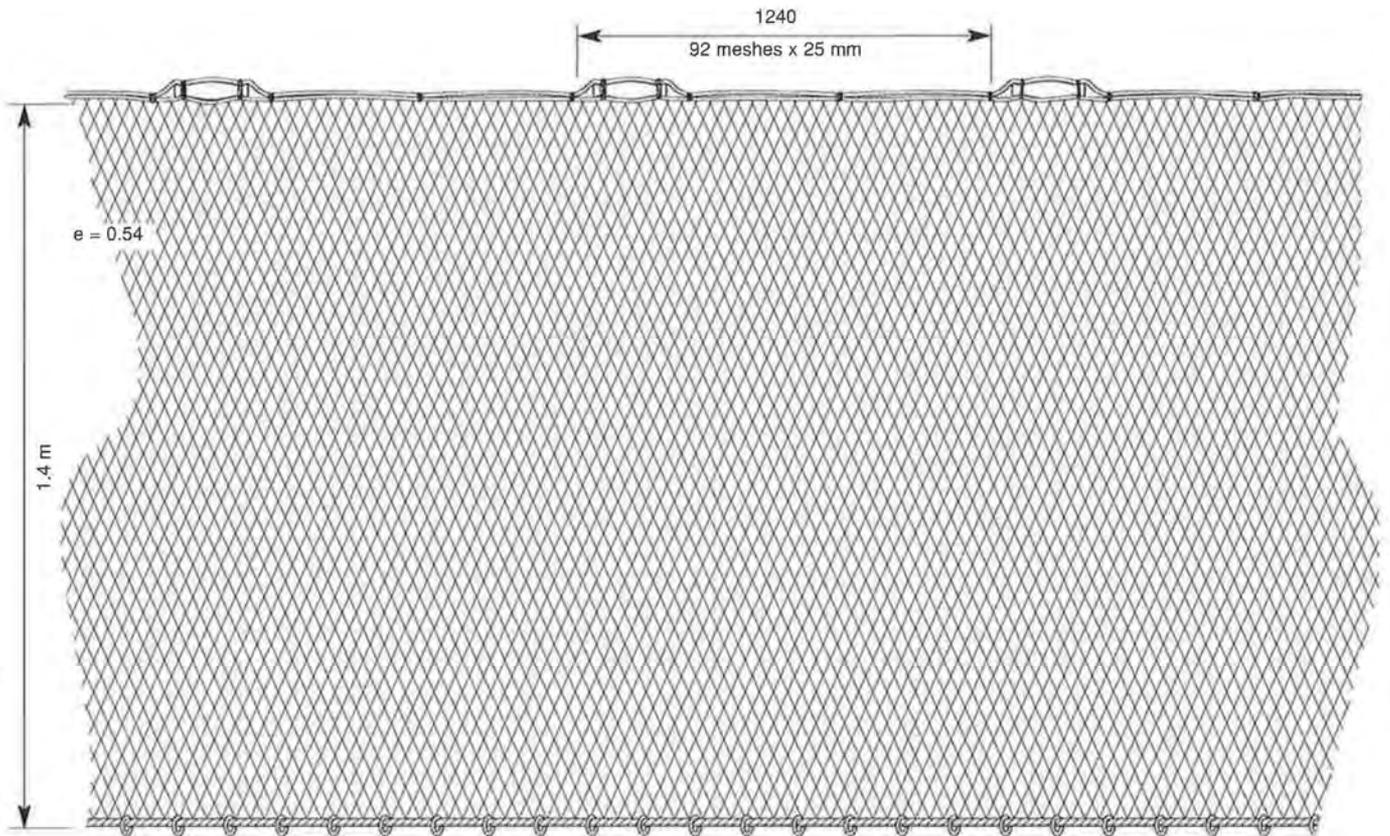


Monofilament gillnet, rings and various floats

Drift Gillnet (cont.)

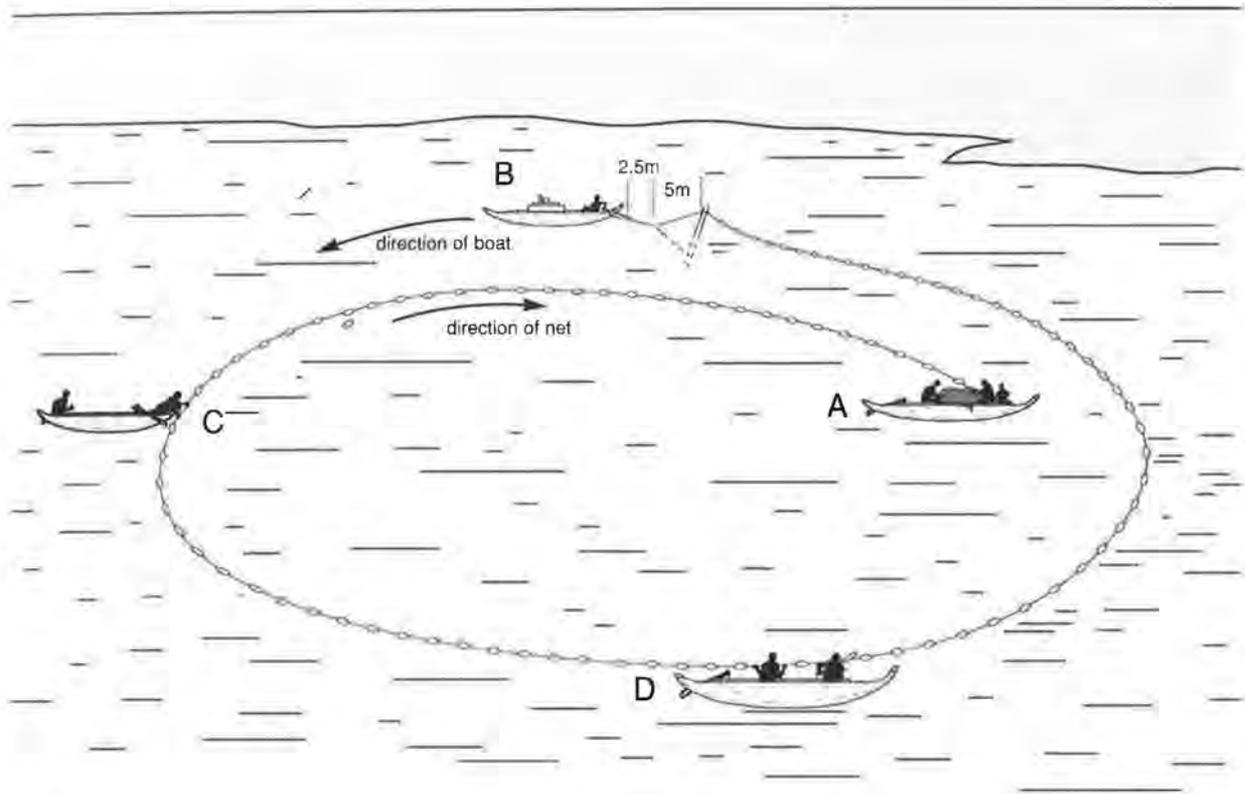
VARIATION

Rasbora drift gillnet



Encircling Gillnet

Mong Hum or Mong Krolok

**Description**

This rather big-meshed (60 to 70 mm) multifilament nylon net is mounted on a superior nylon rope (\varnothing 16 mm) and an inferior rope. At each end the webbing is fixed to a long wooden pole (\varnothing 7 cm), which serves to drag the net into a circle. The superior rope carries plastic floats (15 cm long, \varnothing 7cm) every 50 to 80 cm, while the inferior rope is equipped with lead sinkers (200 g) every 50 to 60 cm. The length varies from 200 to 800 m and the depth from 2 to 6 m. The reported hanging ratio in Pursat is 0.29.

The seine net *uon hum* is quite similar (see 7.2), but the *mong hum* has a much larger mesh size. The *mong hum* was first introduced in Battambang in 1986.

Cost

R. 1500 per m in Battambang

Operation

The *mong hum* is only operated in the Great Lake Tonle Sap, mainly in Pursat and Battambang. It can be used during the whole year but is preferably used during the recession period at a water depth between 2 and 5 m during daytime. Though the webbing is that used for gillnets, it is operated in a similar way as the more common purse seine (*uon hum*, see 7.2). Three to four boats participate in the operation. Boat A carries the net. Engine boat B pulls it off boat A assisted by A's crew and describes a wide circle.

When all the net is paid out, A's crew starts pulling it in again, while engine boat B keeps dragging the net in tighter circles. The other boats C and D help pulling the rope toward boat A. The overall operation can be carried out more quickly than with the seine net *uon hum* and has therefore become popular. Six and sometimes more operations are done per day, involving 8 to 15 people.

Gender aspects

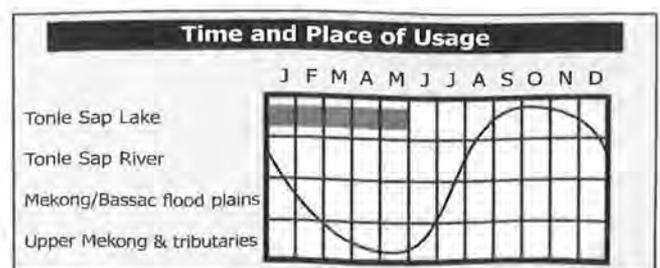
Household members can construct and operate the gear.

Main species caught

Mainly large fish such as: snakehead / trey chhdaur / trey diep (*Channa micropeltes*); trey chhkok (*Cylocheilichthys enoplos*); trey khman (*Hampala* spp.). Another eight species regularly occur in the catch.

Legal aspects

This gear is not mentioned in the law.



Hand Dragged Gillnet

Mong Os Dai

Description

Nylon multifilament gillnet with 60 mm mesh size; 35 to 50 m long and 6 m deep (105 meshes), but hung 1 to 2 m deep in order to form a bag, when pulled. Floats and weights are spaced 0.5 to 1.5 m apart on head- and footrope. A pole of 1.5 to 2 m long is attached to each end to allow a person to pull the net.

Cost

R. 4400 per m.

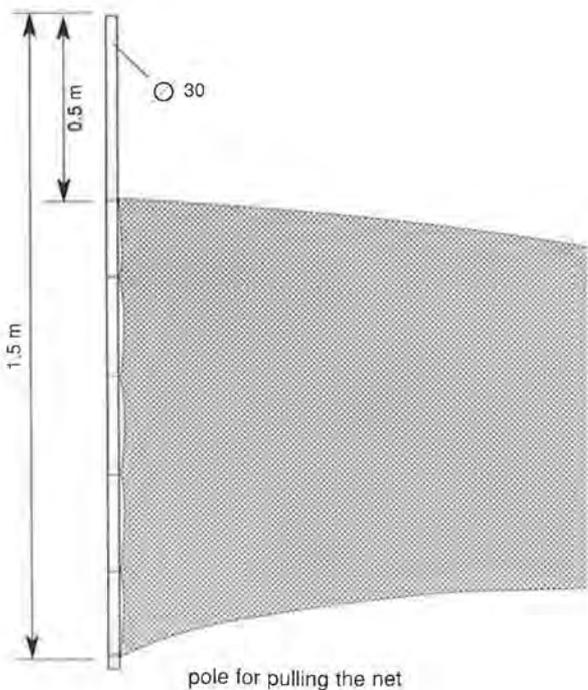
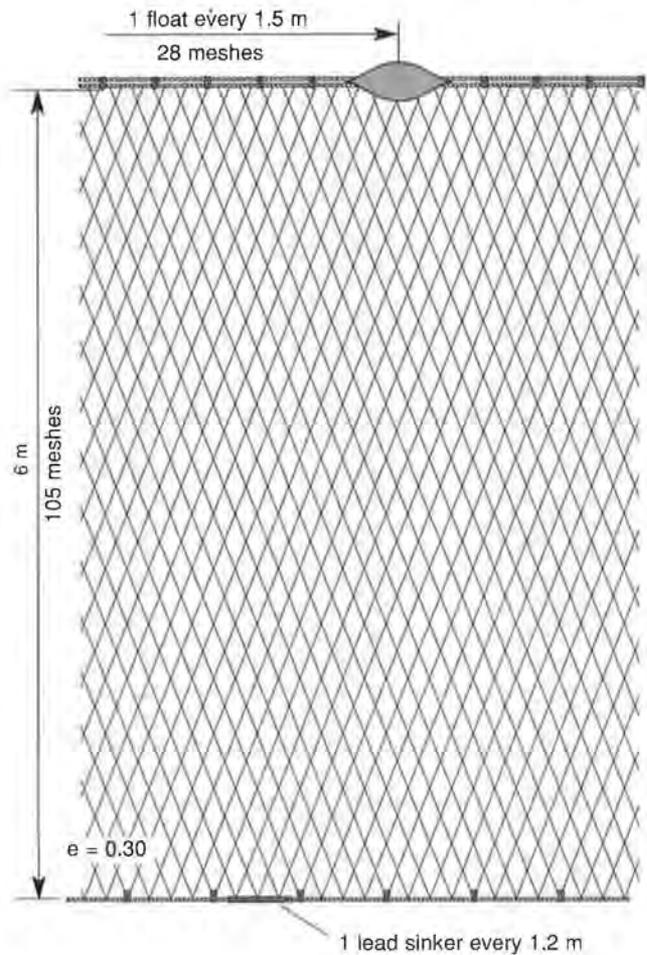
Operation

Used in little lakes, streams and along the lake shore in water up to 1.5 m deep. The fishers drag the net by the poles through the stream or move it around in an arc in the lake and finally on to the bank. The net is pulled in such a way that it forms a shallow bag. Sometimes two nets are dragged side by side through the stream. If the net is dragged a long distance, big fish trying to escape are removed by hand by people wading in front of the net. These people also remove obstacles on the bottom.

Fily and d'Aubenton (1965) mention the names *mong dek* or *mong way* for this kind of gear, but these names are apparently no longer used much.

Gender aspects

Mainly used by men.

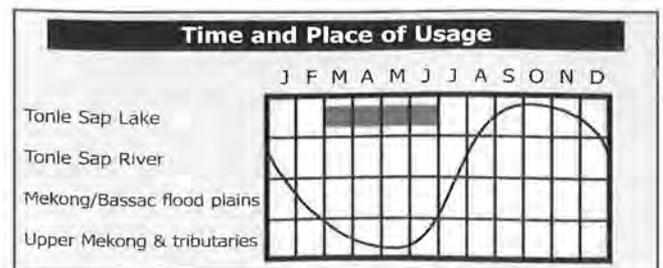


Main species caught

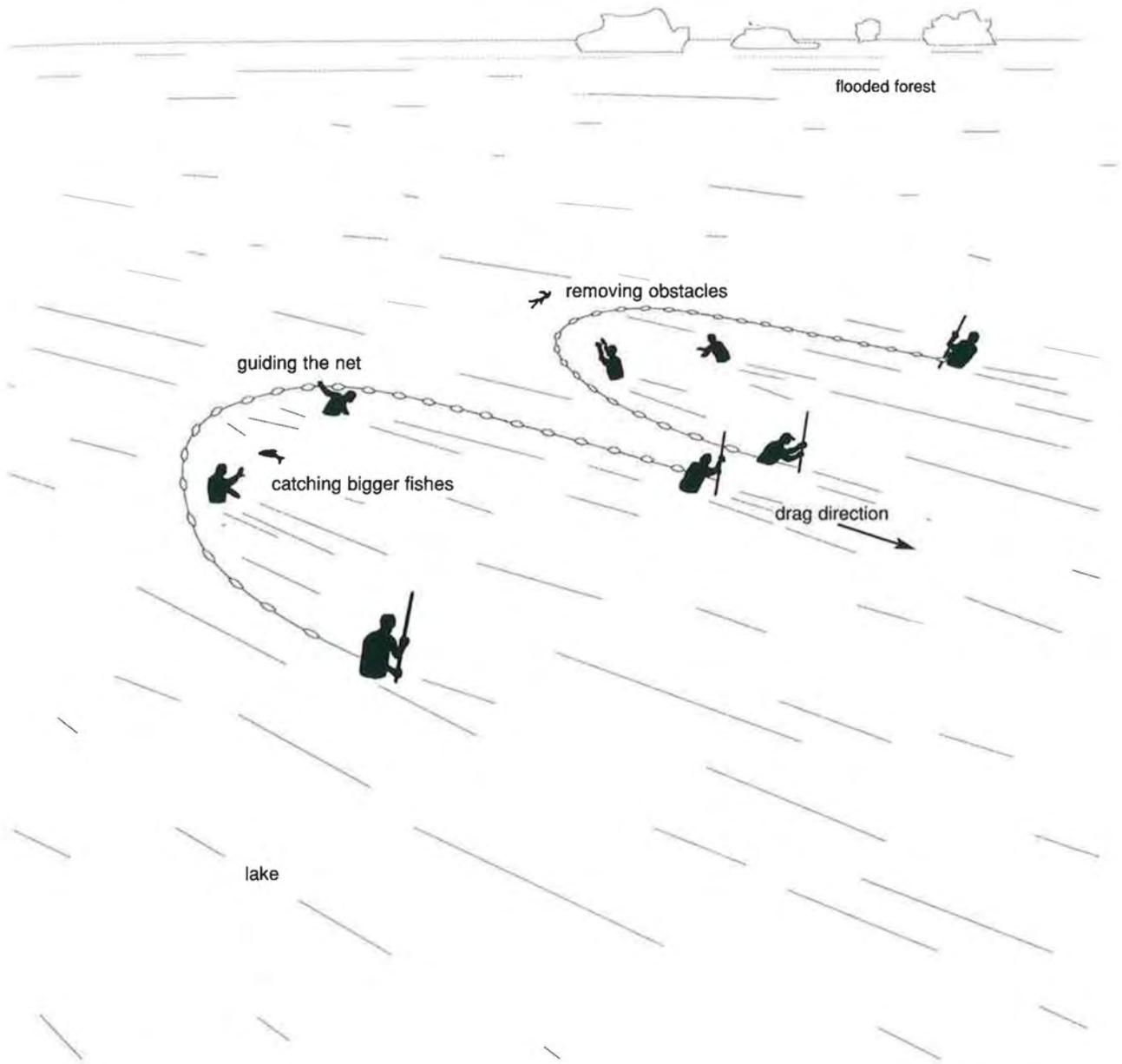
Snakehead / trey chhdaur / trey diep (*Channa micropeltes*); trey chhkok (*Cyclocheilichthys enoplos*); trey krum (*Osteochilus melanopleurus*); trey riel (*Henicorhynchus* spp.); trey chhlang (*Mystus nemurus*) and a number of other species as well.

Legal aspects

Mesh sizes smaller than 15 mm are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E).



Mong os dai operation



Mong os dai operation, Pursat



Chapter 7

SURROUNDING

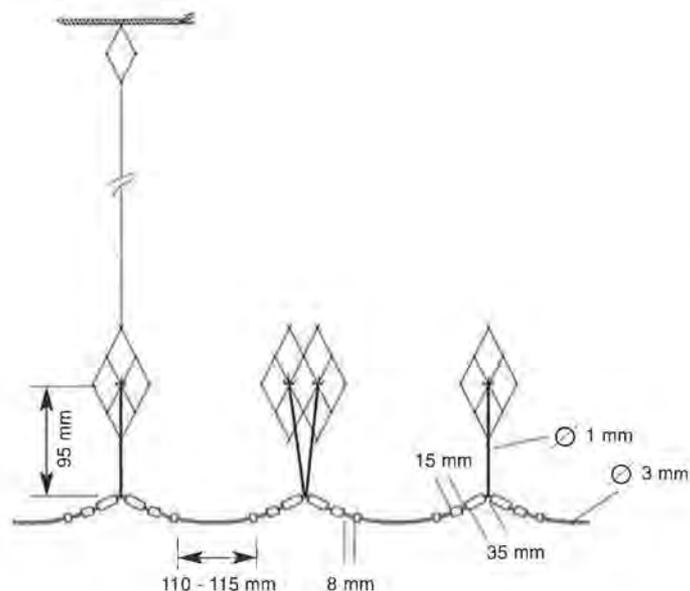
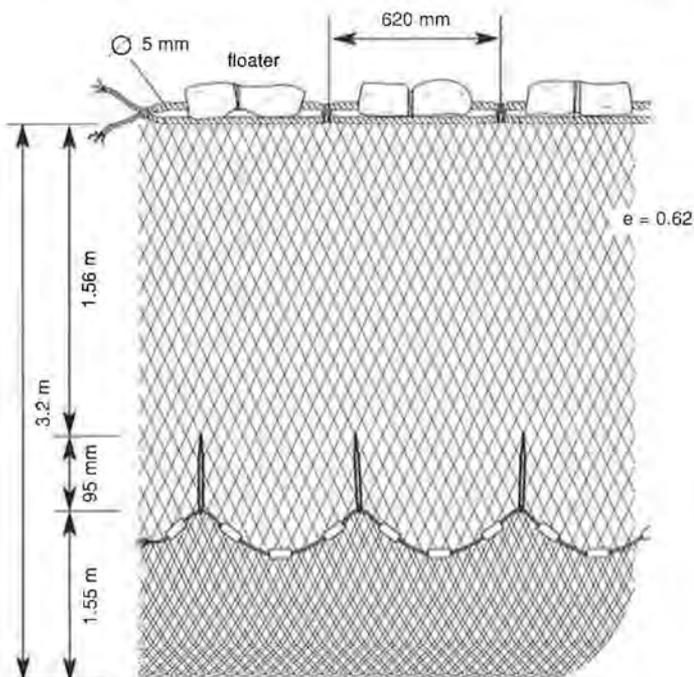
OR

SEINE NETS

- 
- 7.1 Seine nets with
footrope bags
 - 7.2 Encircling Seine Nets
 - 7.3 Hand-dragged Seines

Seine Net with Footrope Bags

Uon Proyung

**Description**

A wide variety of seine nets are termed *uon proyung*. Depending on the specific fishing setting, whether in deep rivers or shallow lakes, without currents or with strong currents, the nylon multifilament webbing is between 30 and 150 m long and between 2.5 and 8 m high. The mesh size varies between 18 mm and 40 mm. Occasionally, the middle part of the net may have a smaller mesh size than the lateral wings, as reported from Kampong Chhnang. The footrope is suspended on the webbing, forming a bag. The suspension can be as high as 2 m or as low as 30 cm. In Battambang, the bag is a smaller mesh size (15 mm) than the rest of the net (20 mm). Reported hanging ratios lie between 0.5 and 0.7. The footrope either carries lead weights or a chain. The headrope is equipped with plastic foam floats at distances between 20 and 60 cm. The lifespan of the gear is up to 5 years.

Cost

R. 200.000 to 3 million, depending on specifications and size.

Operation

The seine net with a footrope bag is used in a large variety of situations and settings. Consequently, it is also used in many different ways. It can be used as purse seine in deep rivers or lakes operating with boats or as beach seine in any water body. Depending on the size of the net up to 15 to 20 workers are necessary to haul in the net, pulling at the head and footropes.

Gender aspects

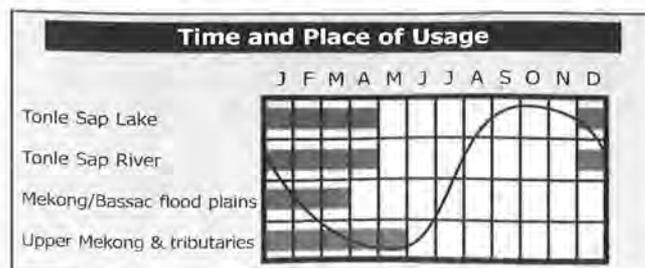
There is no gender discrimination in assembling the net and women and children often participate in fishing crews.

Main species caught

Trey chhkok (*Cyclocheilichthys enoplos*); trey riel (*Heni-corhynchus* spp.); snakehead / trey chhdaur / trey diep (*Channa micropeltes*); trey chhpin (*Barbonymus gonio-notus*); trey chhlang (*Mystus nemurus*); trey kanchos (small *Mystus* spp.) and others.

Legal aspects

The *uon proyung* is a middle-scale fishing gear and thus liable to taxation (No. 28 KOR SOR KOR). All kinds of seines with mesh size smaller than 1.5 centimeter are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E).



VARIATION

Uon proyung os dai / អ្នក ព្រាយងអូសដៃ

This seine is smaller than the *uon proyung* and it has a pole attached to each end. Samples from Siem Reap province are up to 40 m long and 3.2 m or around 62 meshes high. Its mesh is 40 mm with a general hanging ratio of 0.6. As indicated by the word *proyung*, the net has pockets along the footrope where the fish get caught when the net is being hauled. These pockets are fixed by turning over the lower rim (footrope) and fastening it by small (10 cm long) twines at a distance of 9 meshes to the webbing. The resulting longitudinal pocket is 1.55 m deep. The cost of the gear is between R. 56.000 and 200.000, depending on the size.

The gear is set out by hand in shallow waters near the shore at a water depth of 1.5 m. Two or three fishers set out the net in a semi-circle from one point of the shore to another up-stream point of the shore. It is important that the footrope and headrope are hauled at the same speed. At each end of each line a fisher pulls the two lines onto the shore simultaneously. A third fisher may check that the footrope does not get stuck at any obstacle the river bottom. Finally, he may lift the headrope above the water surface in order to avoid bigger fish jumping

out of the capture area encircled by the net. Usually, mixed crews operate these nets.

Main fish species captured: *trey chhkok* (*Cyclocheilichthys enoplos*); snakehead / *trey chhdaur* / *trey diep* (*Channa micropeltes*); *trey chhpin* (*Barbonymus gonionotus*); *trey krum* (*Osteochilus melanopleurus*); *trey riel* (*Henicorhynchus* spp.); *trey khnawng veng* (*Dangila lineata* and *cuvieri*); *trey kanchos* (small *Mystus* spp.); *gourami* / *trey kawmpheanh* (*Trichogaster* spp.).



'Uon proyung' showing footrope bags; Battambang

Encircling Seine Net

Uon Hum

Description

This surrounding net is made out of long multifilament webbing framed by a float line and a lead line or chain. The size varies considerably depending on the environment where it is used. Smaller sizes are used in rivers and small lakes. In Prey Veng, for instance, versions as short as 40m are operated. The biggest ones with a length of up to 1200 m are operated in the open waters of the Great Lake Tonle Sap. Here the nets are composed of 3 sections:

Size, Cost & Season						
Section	English name	Khmer name	Length in m	Depth in m	Mesh size in mm	Hanging ratio
1 st	barrier	sach robaing/ sach loeung	100 - 200	4 - 6	20	0.60
2 nd	fence	sach chunh cheang	450 - 750	6 - 8	20	0.44
3 rd	bag	sach thork/ sach tong	50	10 - 12	20	0.36

At high water (2 to 4.5 m) the shorter and deeper version is used and at low water (0.7 to 1.6 m) the longer and less deep version. The hanging ratio varies between 0.36 and 0.6. Commonly, the headrope as well as the footrope are double ropes. Mesh size: 20 to 40 mm. These nets are heavy: a 400 m (mesh size 25 mm) net in Kampong Thom weighed 200 kg.

In the past the nets were made of ramie fibers (thmey, *Boehmeria nivea*) treated with betel chalk and the bark of the mangrove smach tree (*Melaleuca leucodendron*) in a process of rinsing and boiling. Nowadays the nets are made exclusively of nylon strings and ropes.

Cost

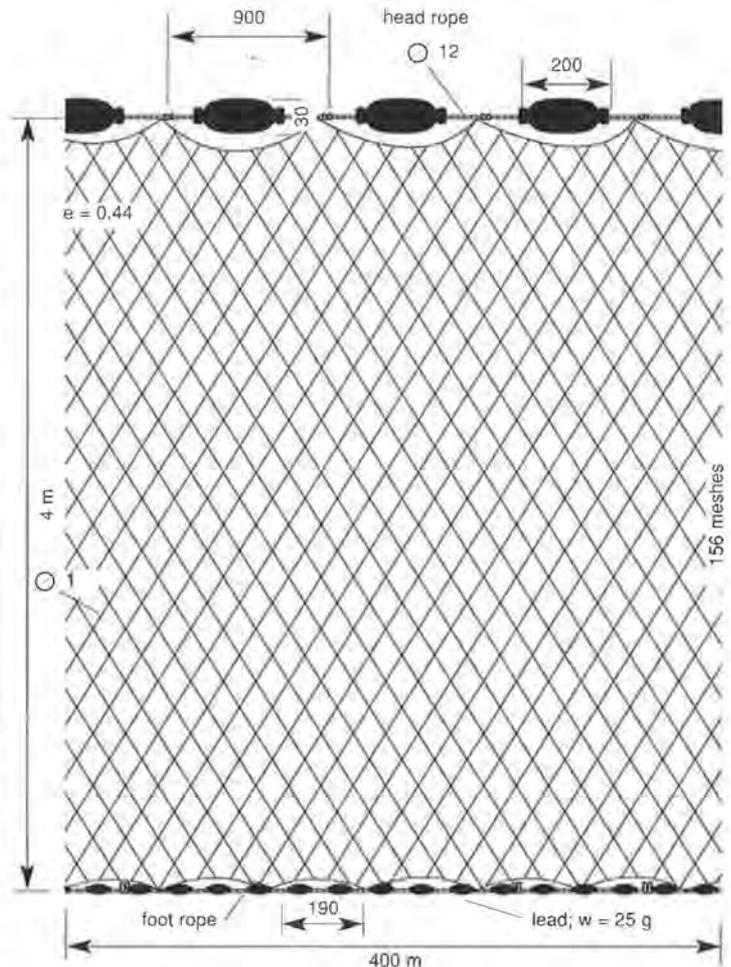
R. 200.000 (Prey Veng) to R. 38 million (Pursat) per net. With maintenance a net will last 3 years.

Operation

The *uon hum* is still largely being operated as described by Fily and d'Aubenton (1965), although there have been some improvements.

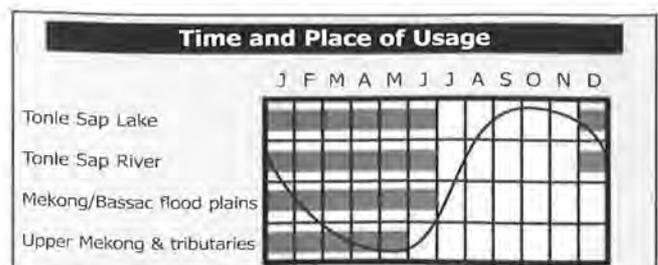
Large nets in the Great Lake

The operation at high water differs a little from the operation at low water, when people can keep their heads above the water. Four or five boats are used in the operation, two of which have an inboard engine. Another boat is a 5 ton fish carrier and another a 2 ton net carrier. A master fisherman decides where to fish and then leads the operation.

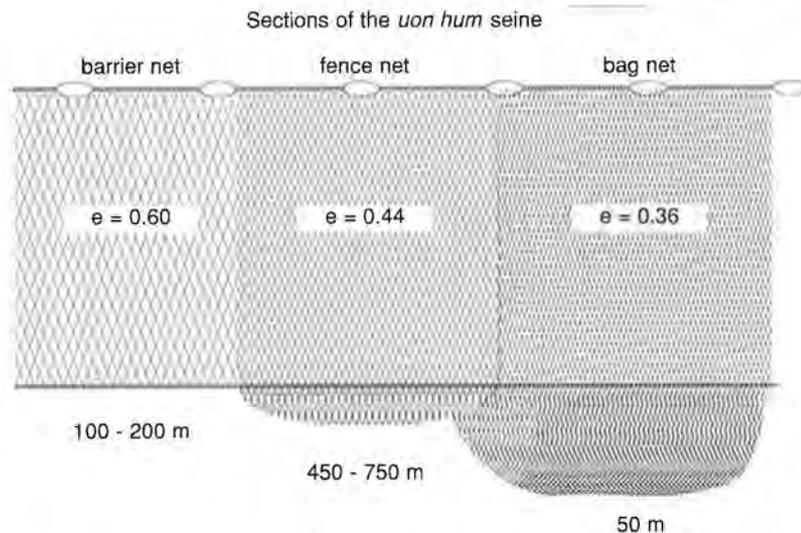
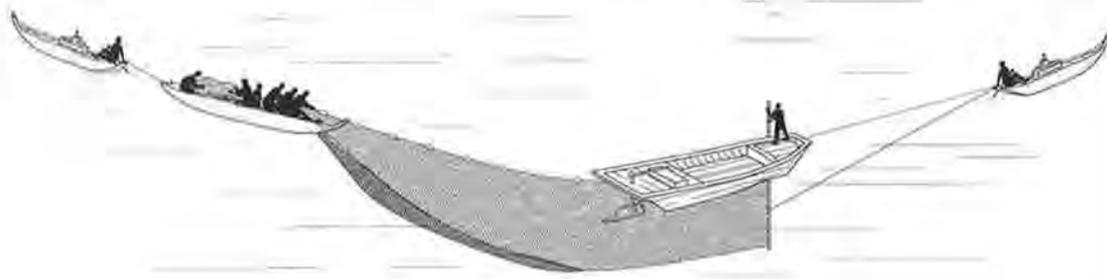


High water operation

The bag-end of the net is attached to a wooden pole for dragging, the *chhoe chang ngang*. One of the motorboats pulls the fish carrier and the net, which is paid out from the net-carrying boat, which itself is being pulled in the opposite direction by the other motorboat in such a way that a circle is formed. First the bag is set followed by the rest of net. The circle is completed once the fish carrier and the net carrier meet. The ends of the net are between the two boats and are kept close together to prevent fish to escape. The net carrying boat now starts pulling in the net, while the fish carrier and the bag are still being held, thereby making the circle smaller and smaller. Eventually the bag is the last part of the net to be pulled in. This is done by lifting the



Great Lake low-water seine operation: setting the net.



footrope up above the water leaving the fish in the bag. The bag is then emptied with scoop-nets or simply hoisted into the fish carrier.

Low water operation

In this operation the fish carrier is replaced by a fifth boat that carries a heavy wooden structure, the *baang uy*. This consists of a massive piece of wood fixed across the front of the boat in such a way that both ends extend beyond the sides of the boat. Each end has a slot in it. In addition there is a separate sturdy pole with an oval-shaped board fixed to one end. The board has a hole, into which the pole for dragging the bag - the *chhoe chang ngang* - fits. When the circle is closed, a man drops into the water and places pole for dragging into the hole. Then he puts the board on top of the footrope of the part of the net that is being pulled in by the net carrying boat to ensure that both parts of the net rub against each other and no fish can escape. To increase the stability of this arrangement the top of the sturdy pole is inserted in a slot and thereby connected to the boat. The man remains standing on the board till the operation is finished. An iron bar on the bottom of the board helps keep the footrope in place.

Smaller nets in rivers

This operation requires at least 3 boats in order to set out the net from one point on the shore to the other. One boat carries the net and its crew releases it into the water while progressing in a semicircle to the other point on the shore. To pull in the net requires a minimum crew of 6 to 8 people.

Gender aspects

Women and men build these seine nets. In the Great Lake only men operate them, but women and children often help with the smaller nets.

Main species caught

In Pursat: *trey chhkok* (*Cyclocheilichthys enoplos*); snakehead / *trey chhdaur* / *trey diep* (*Channa micropel-tes*); *trey chhlang* (*Mystus nemurus*); *trey prama* (*Boe-semania microlepis*); *trey kanchos* (small *Mystus* spp.); *trey riel* (*Henicorhynchus* spp.); *trey chhpin* (*Barbony-mus gonionotus*).

Legal aspects

The "uon hum" is a middle-scale fishing gear and thus liable to taxation (No. 28 KOR SOR KOR). All kinds of seines with mesh size smaller than 1.5 centimeter are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E).

Encircling Seine Net (cont.)

VARIATIONS

Uon os loh or Uon kie / អ្នកអូសលុត ឬ អ្នកកៀរ

Sweeping seine

The *uon os loh* is structurally the same net as the *uon hum*, but it is adapted for being operated with motorized boats inside the Great Lake fishing lots. Its webbing, of 20 mm mesh size, a length of several hundred meters and a height of 3 to 4 m, is made of multifilament nylon with a high breaking strength. The floats are fixed at a distance of 25 cm between two ropes of 8 mm diameter ; the webbing is rigged to a third rope (\varnothing 10 mm). All three ropes are combined into one thick head line. The foot rope is composed of two ropes (\varnothing 8 mm each), carrying sinkers at a distance of 40 cm. The smallest net is made up of 400 kg of webbing, 300 kg of ropes, 700 floats and 150 kg of lead weights. After rigging the net, the whole gear is treated with a rubber-petroleum mixture in order to temper the yarns.

As the name indicates, this seine net is operated in fishing lots (*loh*), but only in the Great Lake. It is operated towards the second half of the recession period (February to May), when the water level in the lake has decreased to approximately 3 to 4 m and the water movement is very slow if not stagnant and wind conditions allow for a smooth operation. Inside the space encircled by the net, two motorized boats pull the net with strong ropes that are attached to the foot and head ropes. In this way the net is slowly pulled towards the shore. Once the capture area is too small for the two boats, they leave it and the net is then further towed in by hand. Normally 12 to 20 people are needed to operate this seine net.

It is operated at daytime. One single operation may take up to two and a half hours so that a maximum of 4 operations can be undertaken on one day.

This seine net is also operated inside the fenced off areas of the Great Lake fishing lots in order to sweep the fish from one fenced area into another, leading them into a final fish pen from where they are harvested. The catch will therefore consist more of snakeheads (*Channa* spp.), as well as the species caught by the *uon hum* (see above).

The *uon kie* is very similar to the *uon os loh*, but is only used in riverine fishing lots. It is a sturdy net that can be more than 100 m long and 5 to 8m high. The mesh size of the webbing is generally 25 to 50 mm. The type of *uon kie* reported from Kandal province

does not carry floats on the head rope. The version reported from Takeo province uses floats, similar to the *uon os loh*. Both types of seine nets are equipped with chain sinkers.

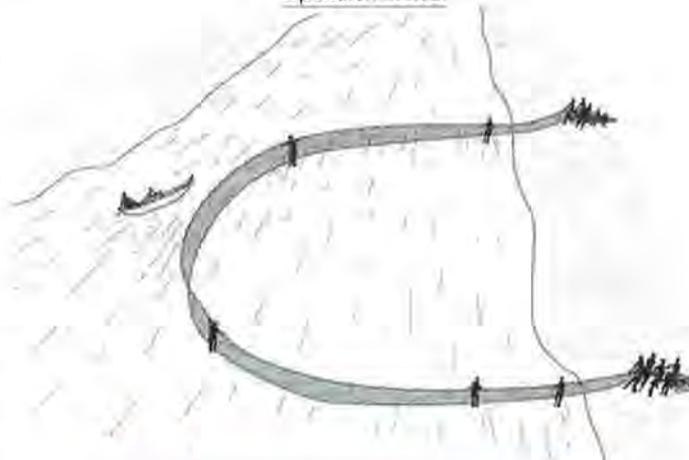
The *uon kie* without floats is used in combination with wooden stakes. The edge of the head rope is fixed to the stakes well above the water surface. It is used to harvest brush parks or *samrah* (see Chapter 15).

The version with floats is used in the same way as other seine nets, either as beach seine or with boats. According to Fily and d'Aubenton (1965), the rivers and streams within the fishing lots are swept with these seine nets late in the season (March or April), when the current is weak. First the entries to these waters are closed off with fences. Then seining is undertaken by drawing along a net the width and depth of the stream, thus pushing the fish towards a capture chamber. The end-of-season concentrations of fish behind or in front of the barrages mainly contain the catfish *trey po* (*Pangasius larnaudi*), *trey pra* (*Pangasianodon hypophthalmus*) and also the featherbacks *trey kra* and *trey slat* (*Chitala ornata* and *Notopterus notopterus*). Larger operations like this are described as *kummie loh* in section 8.3.1.

Uon klah / Srong / Uon pra / អ្នកខ្លា / ស្រុង / អ្នកប្រា

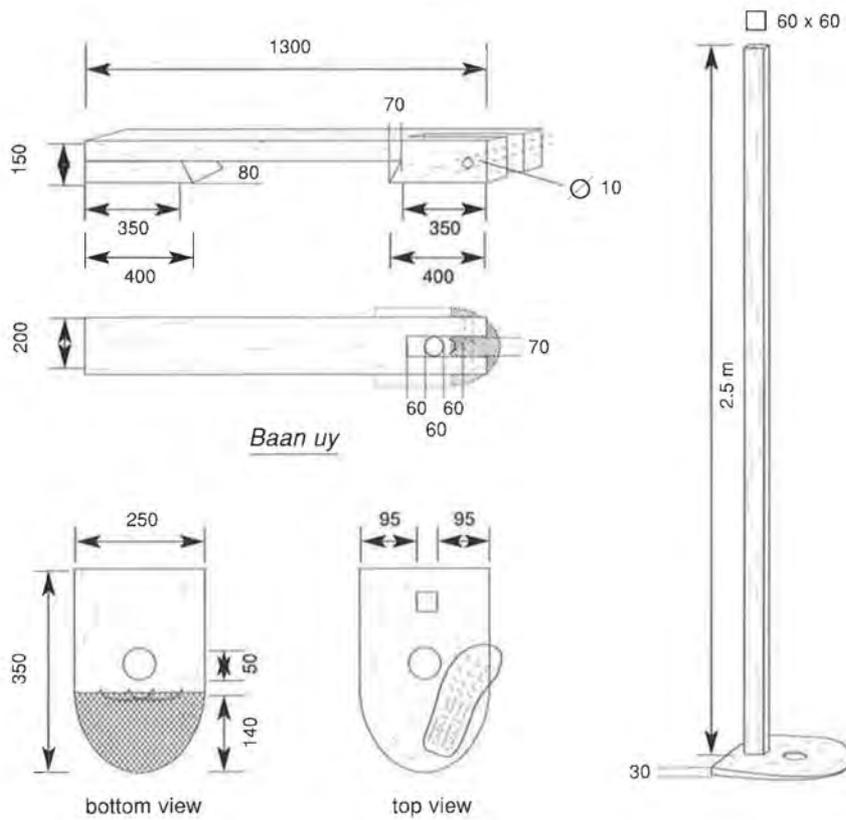
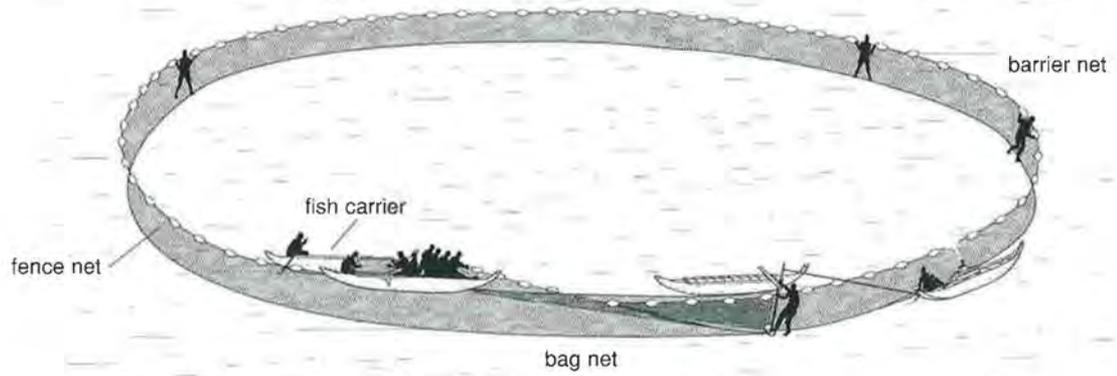
Fily and d'Aubenton (1965, p. 386-397) mention these types of seines, but they are apparently no longer used.

Operation in river

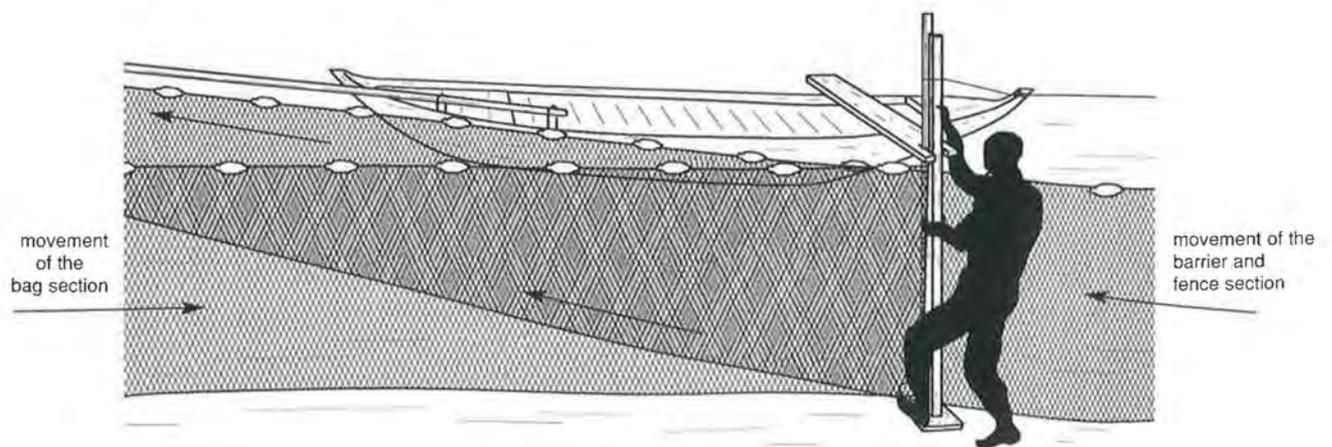


Operation in river

Great Lake low-water operation: closing the net



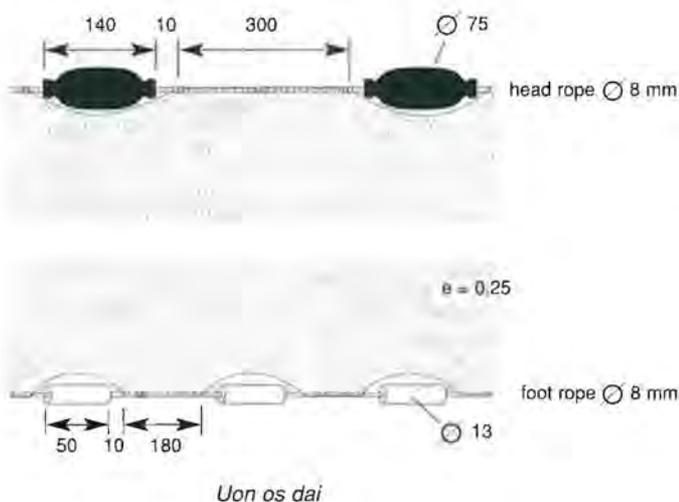
'Baan uy'



Closing the net, detail: *baan uy*

Hand Dragged Seine Net

Uon Os Dai



Uon os dai seining operation, Pursat

Description

The *uon os dai* is a relatively small seine made out of nylon monofilament or polyfilament. It is between 20 m and 100 m long and 3 m to 6 m deep. The mesh size varies between 15 mm and 40 mm with a hanging ratio ranging from 0.3 to 0.6. For example, to construct a 50 m long and 5 m high *uon os dai* (as observed in Kampong Chhnang), 23 kg of webbing (mesh size 20 mm), 20 kg of nylon ropes for foot and head lines, 100 foam plastic floats and 25 kg of chain as sinkers are used. Commonly the bottom line is thinner (\varnothing 6 mm) than the cork line (\varnothing 10 mm). To keep the resistance of the polyfilament webbing, the net has to be treated with a solution-mix of rubber and petroleum. The ends of the webbing are generally fixed to wooden poles.

Cost

R. 500.000 to 4.135.000 depending on the size.

Operation

The *uon os dai* is a hand operated seine net, which is commonly operated in smaller sections of rivers or lakes. The smaller versions of the gear are set out by hand in shallow waters near the shore. Often the water in front of the net opening is beaten to scare the fish into the loop. Depending on the size of the net, smaller or larger groups of operators are needed to haul the net on to the beach. People have different responsibilities in setting the net out and gathering it. It is important that the footrope and the head rope are hauled at the same speed. At each end of each line one or more people pull the line onto the shore. Additional fishers are positioned along the semi-circle to make sure that the footrope

closely follows the bottom surface and does not get snagged on obstacles. The closer the net is hauled to the shore the bigger the bag between footrope and head rope gets. Finally, the head rope is lifted above the water surface to prevent bigger fish jumping out. If the catch is large, the fish are scooped out. If the catch is small, it is pulled with the net onto the shore.

Gender aspects

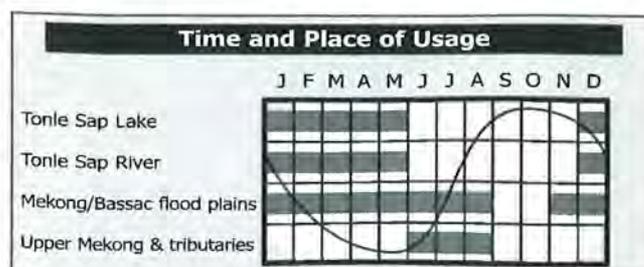
Mainly men work with this net.

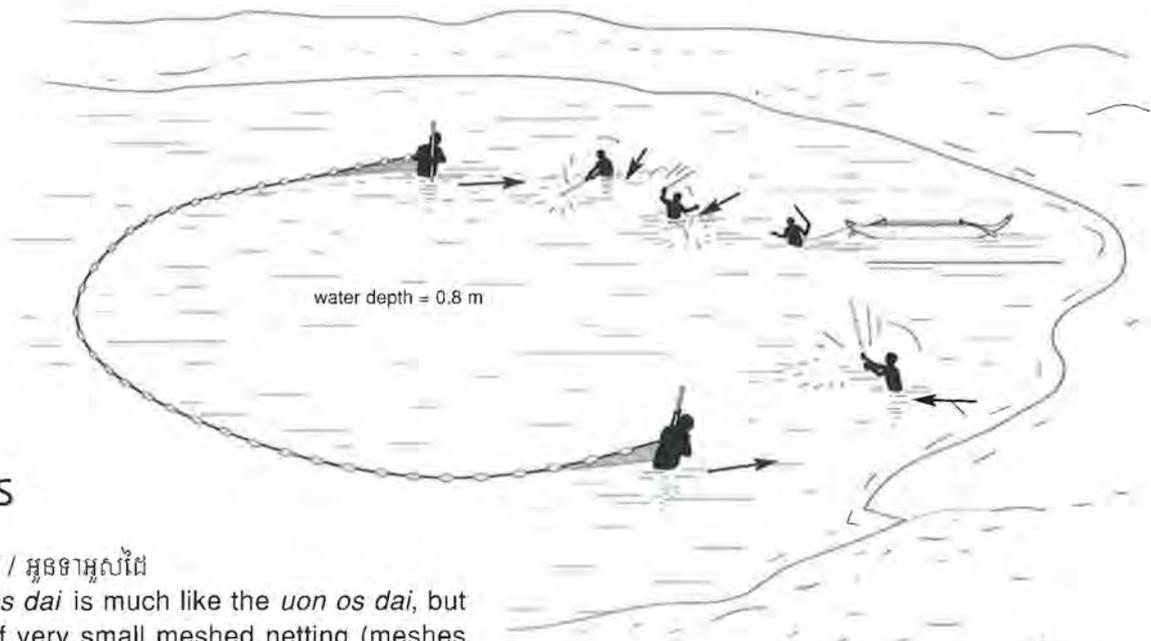
Main species caught

Trey chhkok (*Cyclocheilichthys enoplos*); snakehead / trey chhdaur / trey diep (*Channa micropeltes*); trey chhpin (*Barbonymus gonionotus*); trey krum (*Osteochilus melanopleurus*); trey riel (*Henicorhynchus* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey kanchos (small *Mystus* spp.); gourami / trey kawmphleanh (*Trichogaster* spp.).

Legal aspects

All kind of seines with mesh size smaller than 15 mm are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E).



Uon tea os dai operation

VARIATIONS

Uon tea os dai / អ្នកទាម្កូសដៃ

The *uon tea os dai* is much like the *uon os dai*, but is made out of very small meshed netting (meshes are square-shape with 1 mm each side), which makes its use illegal. The netting is up to 70 m long and up to 6 m high framed by a head and a footrope and at its ends two wooden poles. Floats and sinkers are arranged in tandem 80 cm apart on the cork line and lead line respectively. The cost of the gear is approximately R. 200.000 depending on the size of the gear.

Duck farmers use it to catch very small fish for feeding directly to the ducks, or for processing as dry feed. Depending on the characteristics of the water body, the gear is operated as a beach seine or as a purse seine, with boat or without. Nets used in purse seine mode are usually very high. At least 4 persons are needed to operate the net in purse seine mode: two pulling the net on its pulling poles at each end and two people moving with the (slow) current towards the extended net, while scaring the fish into it by splashing sticks onto the surface of the water. Once the fish chasers reach the net, they join in pulling and closing the net. While narrowing the capture area, the net is folded and the parallel parts of the bottom line are slowly pressed against each other. It is reportedly mainly used by men in the dry season: in Kampong Chhnang from December to May and in Pursat from March to June.

Target catch: small fish, shrimp, crabs and snails. Glassfish / trey kanchanh chras (*Pseudambassis notatus*) was reported to be an important target species in Pursat.

Uon sbai mong / អ្នកស្វែងមុង

The *uon sbai mong* is very similar to the *uon tea os dai* and is also made out of mosquito netting with poles fixed at the ends. The very small mesh makes it an illegal gear. Its length is around 50 m and its width 5 m;

however, it can vary in size according to the setting it is used in. To firmly fix the netting on the float line, the netting is rolled over a nylon rope before it is sewed on to it. The floats are then fixed between this rope and a second nylon rope. The distance between the floats is 30 cm. Similarly, the footrope is rolled up on two nylon ropes and firmly sown before the chain is fixed to it. The cost of the gear is approximately R. 250.000 for a net 50 m long and 5 m high.

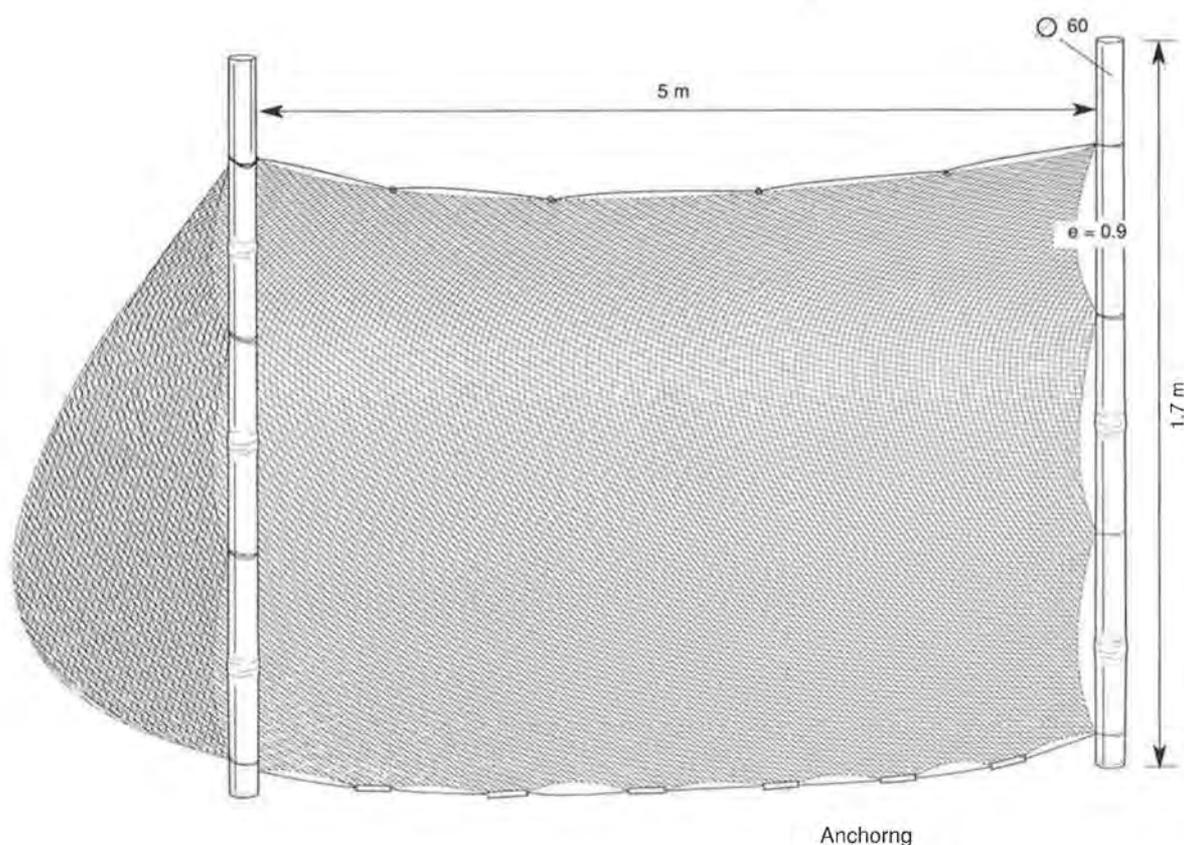
Because of its relatively heavy weight, the *uon sbai mong* is operated only as a beach seine net in shallow waters with weak currents. It is used mainly at night. At least 4 persons are needed for its operation. On each end two persons hold the wooden pole and pull the net behind them, wading forward against the current. Often this gear is used to quickly catch some food for domestic consumption. The information suggests the net is only used in Prey Veng from November to August. The *uon sbai mong* is mainly operated by men.

Target catch: small fish, shrimps, crabs and snails.



Uon sbai mong, Prey Veng

Hand Dragged Seine Net (cont.)

**Anchorng** អញ្ចង

The *anchoring* is a piece of netting rigged to a nylon rope and suspended between two wooden sticks at each end. The netting is from 1.5 to 5 m long and its height is between 1 and 1.5 m. It may or may not carry lead or chain sinkers on its bottom line. If it does not, the footrope is significantly stronger ($\text{Ø } 15 \text{ mm}$) than the headrope ($\text{Ø } 3 \text{ mm}$). The net webbing is usually made of mosquito netting, but also netting up to 5 mm has been observed (Pursat), making it an illegal gear as well. Cost: R. 15.000 to 30.000

This double stick net is used mostly during the dry season in shallow waters, irrigation canals and rice fields by women and children. At least two operators are needed, one at each wooden stick. Wading through the water they press the inferior line against the bottom surface. The catch gathers in the loosely hung netting forming a sort of wide pocket. To remove the catch the two fishers may lift the inferior part and carry the net horizontally to the beach. Its use has mainly been reported from the provinces around the

Great Lake for most of the year.

Target catch: small fish, shrimps, crabs and snails.

Sub-decree No. 28 KOR SOR KOR allows the use of the *anchoring* provided the meshsize is 15 mm or more. It is considered a family gear below the length of 3 m and above this length a middle-scale gear and thus liable to taxation.



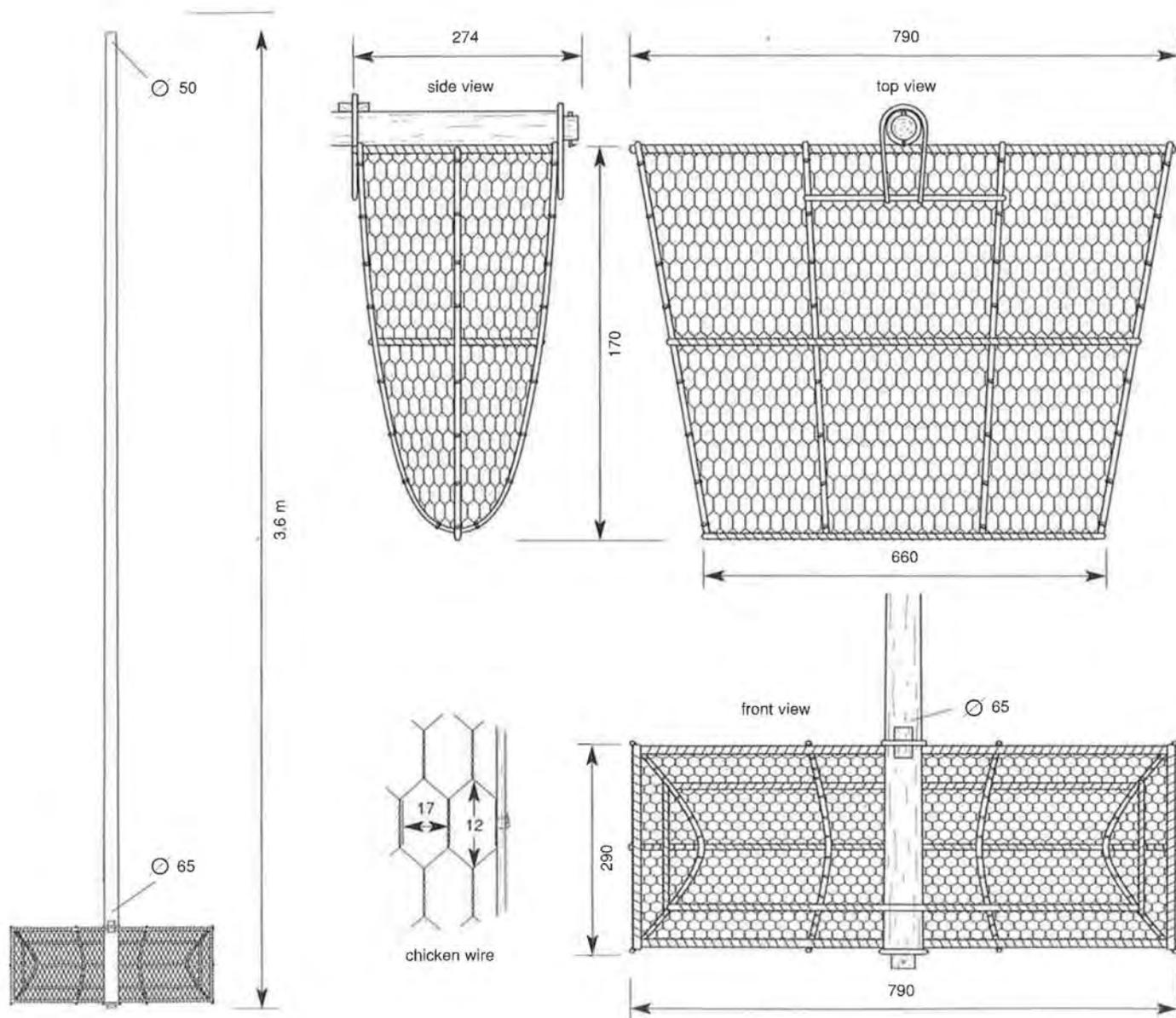
Anchorng, Battambang

Chapter 8

DRAGGED GEARS

- 8.1 Clam Scraper
- 8.2 Trawl Nets
- 8.3 Dragged Fences

Boat dredge for clams



Boat dredge on the Great Lake

Boat Dredge for Clams (cont.)



Chhnuok Tru village in Kampong Chhnang: unloading bags of clams from the Tonle Sap river



Use of anchoring kao leah in a Pursat river



Hand scraper for clams



Collected clams

VARIATION

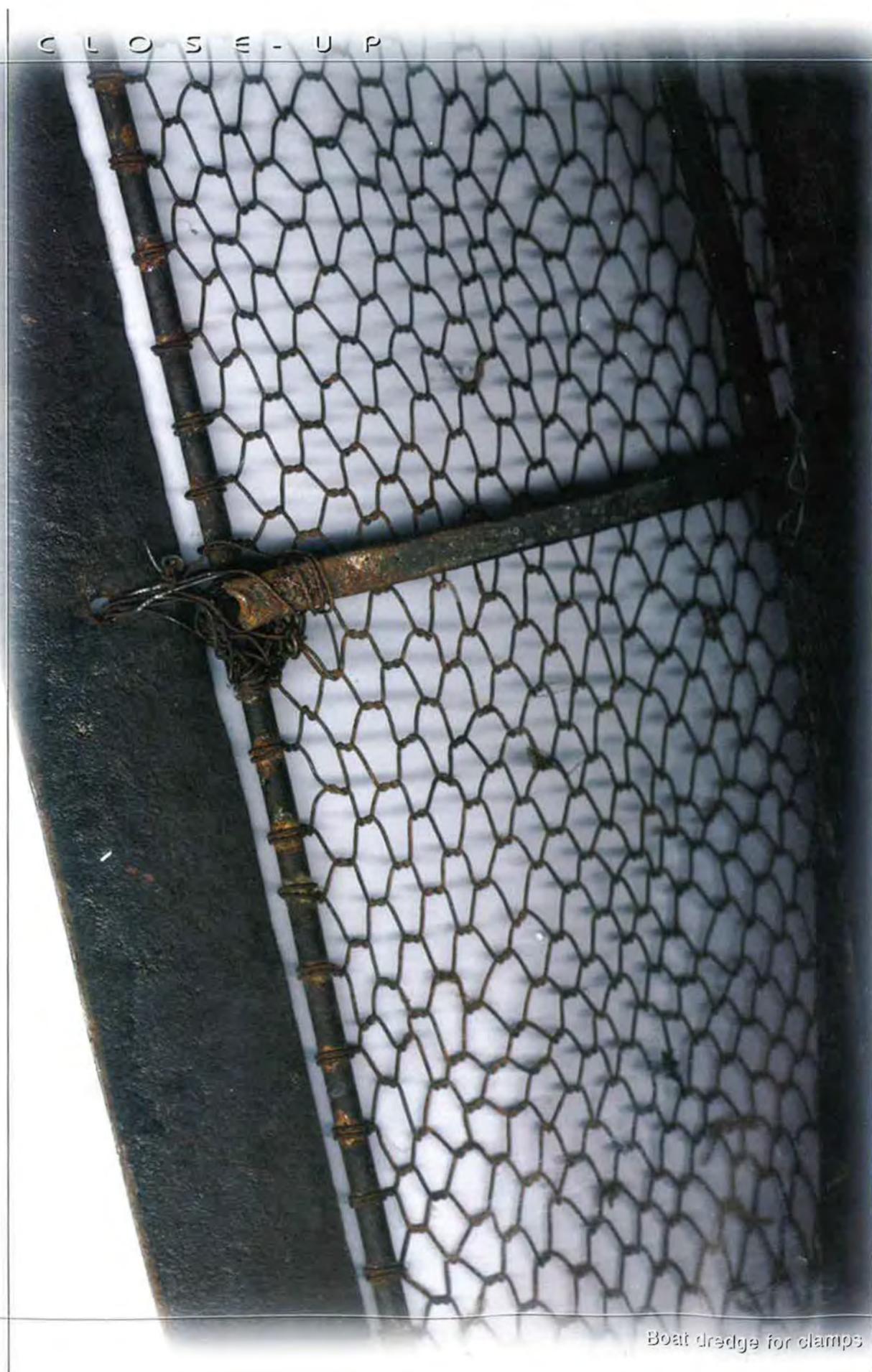
Anchoring kao leah / អញ្ចាញការលាស
Hand scraper for clams

The hand scraper for clams consists of an open basket, is attached to a long bamboo pole. The half-circled base frame (radius 35 cm) is equipped at its straight edge with a sort of metal blade with a supporting frame fixed to the half circle. Starting right at the metal blade the edge of the supporting frame describes another, but smaller half-circle with a radius of 29 cm and reaching a maximum elevation of 17.5 cm above the base frame. The entire frame of the scraper is covered with mesh wire. At the center points of the half circles, both the base frame and the supporting frame, a bamboo handle (between 2.5 and 3.1 m long) is fixed. The bamboo pole is inserted into an iron ring (\varnothing 3.5 cm), which is an integral part of the base frame and firmly knotted with wire at the supporting frame. A stabilizing iron stick at the back of the scraper is prolonged 9.5 cm beyond the frame and bent into a

hook at its end. The hook fits into a hole in the bamboo handle, providing additional stability and resistance. The cost of the gear is R. 25.000 to 30.000 (depending on the quality of construction).

This gear was only reported from Pursat province. It is operated in shallow parts of rivers towards the end of the dry season (March to May). The scraper is dragged over the bottom with short movements. The sharp edge of the dredge cuts under the surface layer of the sand and gathers it in the basket. The movements during the fishing operation separate the clams from the sand and clean them at the same time. The clams are retained in the wire mesh, which must be emptied periodically into a bucket or basket in order to avoid losing them. Though the gear is operated individually, it is commonly used by whole groups of families, peers or friends.

C L O S E - U P



Boat dredge for clamps

Deep Drag Net (Trawl)

Neam



Neam operation, Kampong Chhnang

Description

The *neam* is a trawl net operated from one boat. It is a big bag net with a mouth opening 9 to 11 m wide and 2 to 5 m high. The headrope carries one float in the center. The footrope is rigged to a sinker chain and at each end it carries a bigger, 3 to 4 kg stone or metal weight, which are attached to the ropes for hauling up the net. These ropes pass through metal rings at the ends of the headrope and are fixed to the ends of the boat. A separate rope also runs through these rings on the headrope and is connected to the boat. Thus, the opening of the net is regulated by manipulating the two ropes. The net is 9 to 14 m long and conical in shape. While the net walls are generally of 20 mm mesh size, the 2 m long codend is made out of 10 mm mesh size. By releasing the knotted string the codend is opened to remove the fish. Lifespan is 2 to 5 years.

More modern *neams* - recently reported from Phnom Penh - are somewhat larger than the older version described above. The footrope is commonly 14 m long and the headrope 16 m, while the total length of the net is 25 m. The mouth opening is maximum 6 m high. The net is pulled at a distance behind the boat.

Cost

R. 300.000 to 2 million, depending on the size.

Operation

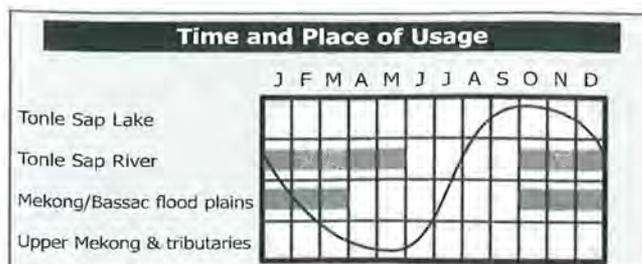
The *neam* is a mobile bag net and like the *dais*, it is operated towards the beginning of the second half of the recession period in slow moving water currents. The *neam* is only operated in rivers. To increase the spread of the net the boat is positioned broadside to the current with the ropes fixed to the front and rear of the boat. The boat moves downstream with the bag below and behind it. The boat must move faster than the current in order to keep the net open, thus engines are commonly used. The long-tailed engine is placed on the side of the boat.

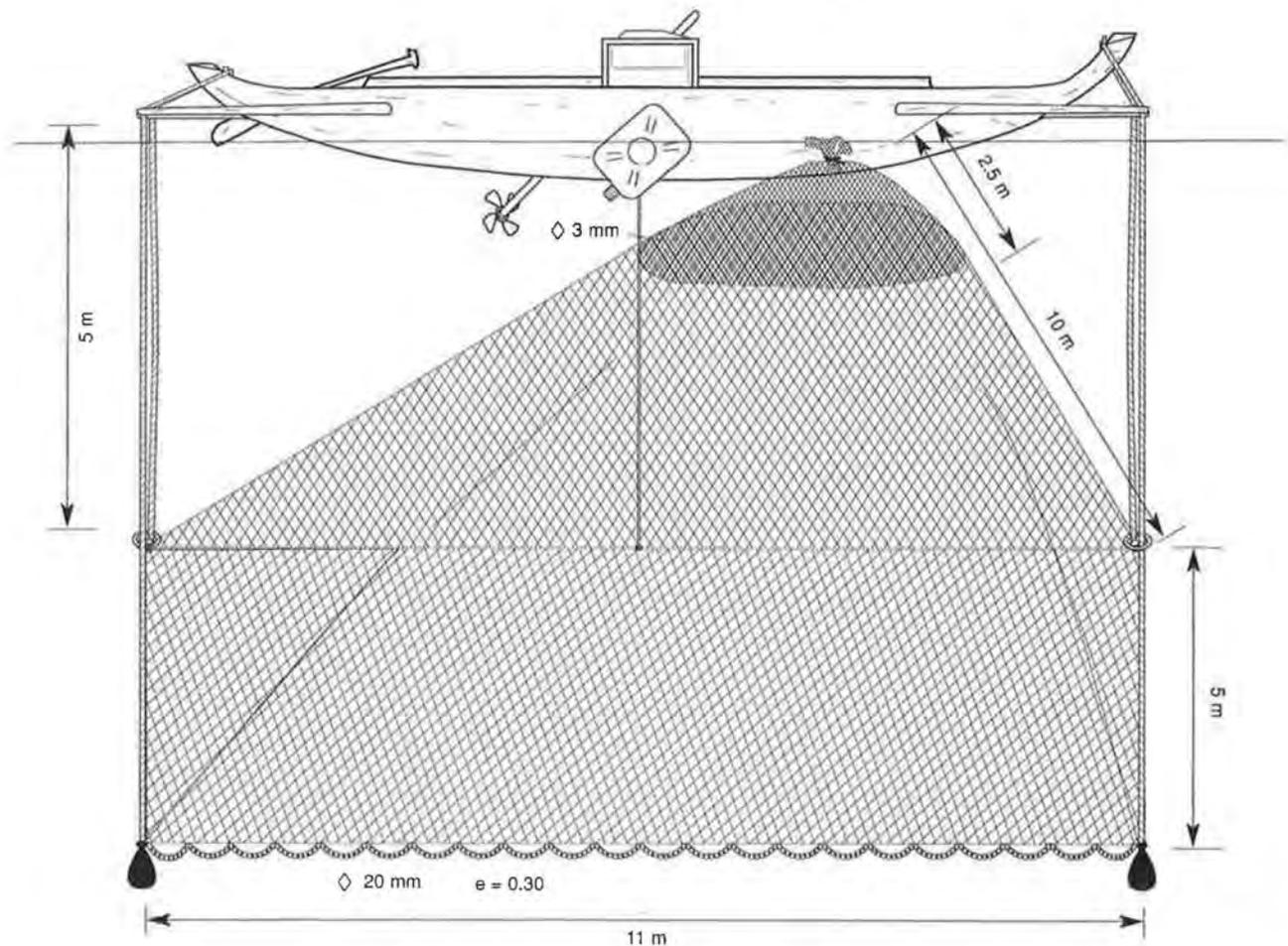
The boat is equipped with an additional platform at the front and at the rear, from where the fishermen handle the ropes. At least three fishers are needed to operate this trawl net: one at each end of the boat for taking care of the ropes and a third one for piloting the boat with the engine. After 10 to 15 minutes the net is pulled on board by quickly hauling the footrope, first to close the mouth of the net and then both ropes to bring it to the surface and into the boat. Vietnamese fishers often operate this gear.

Gender aspects

Men commonly operate this gear, but occasionally also family groups, including women and children.

Size & Season				
Province	Net length in m	Mouth width in m	Mouth height in m	Season
Kg. Thom	10	11	5	Jun-Mar
Kg. Chhnang	10	10	2	Oct-May
Kandal	14	9	3	Oct-Mar
Kg. Cham	9	10	2	Oct-Jul





Main species caught

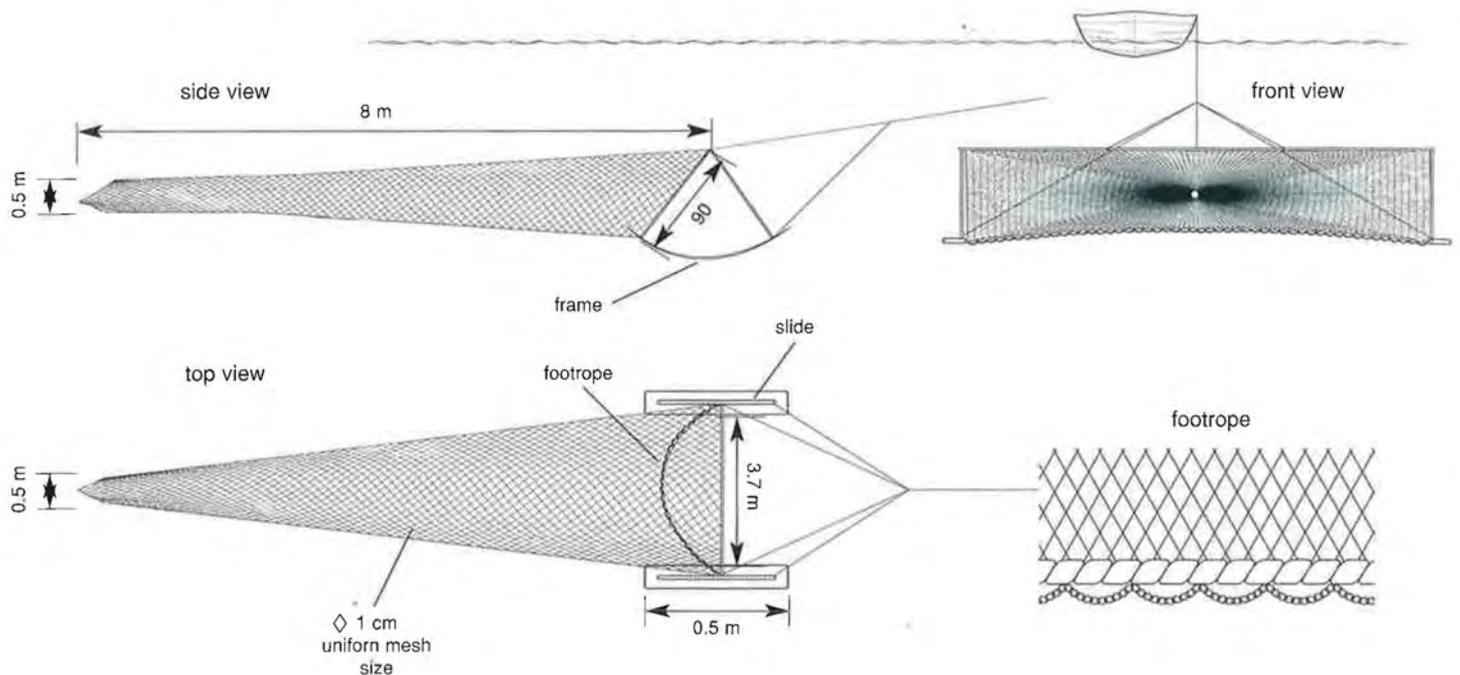
In Kampong Chhnang: trey riel (*Henicorhynchus* spp.); trey chrakaing (*Puntioplites* spp.); trey kampream (*Polynemus multifilis*); trey khnawng veng (*Dangila lineata* and *cuvieri*).

In Prey Veng: trey ach kok (*Dangila spilopleura*); trey riel (*Henicorhynchus* spp.); trey chrakaing (*Puntioplites* spp.); trey sandai (*Wallago attu*).

Legal aspects

No. 28 KOR SOR KOR Table A II authorizes the use of a deep bag net (neam) dragged from the stem and stern of a boat, however the Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, G forbids the net to be dragged by machines. Hence the neam as presently used is an illegal gear.

Deep Drag Net (Trawl) (cont.)



Framed drag net 'Uy kampeh', Battambang

VARIATIONS

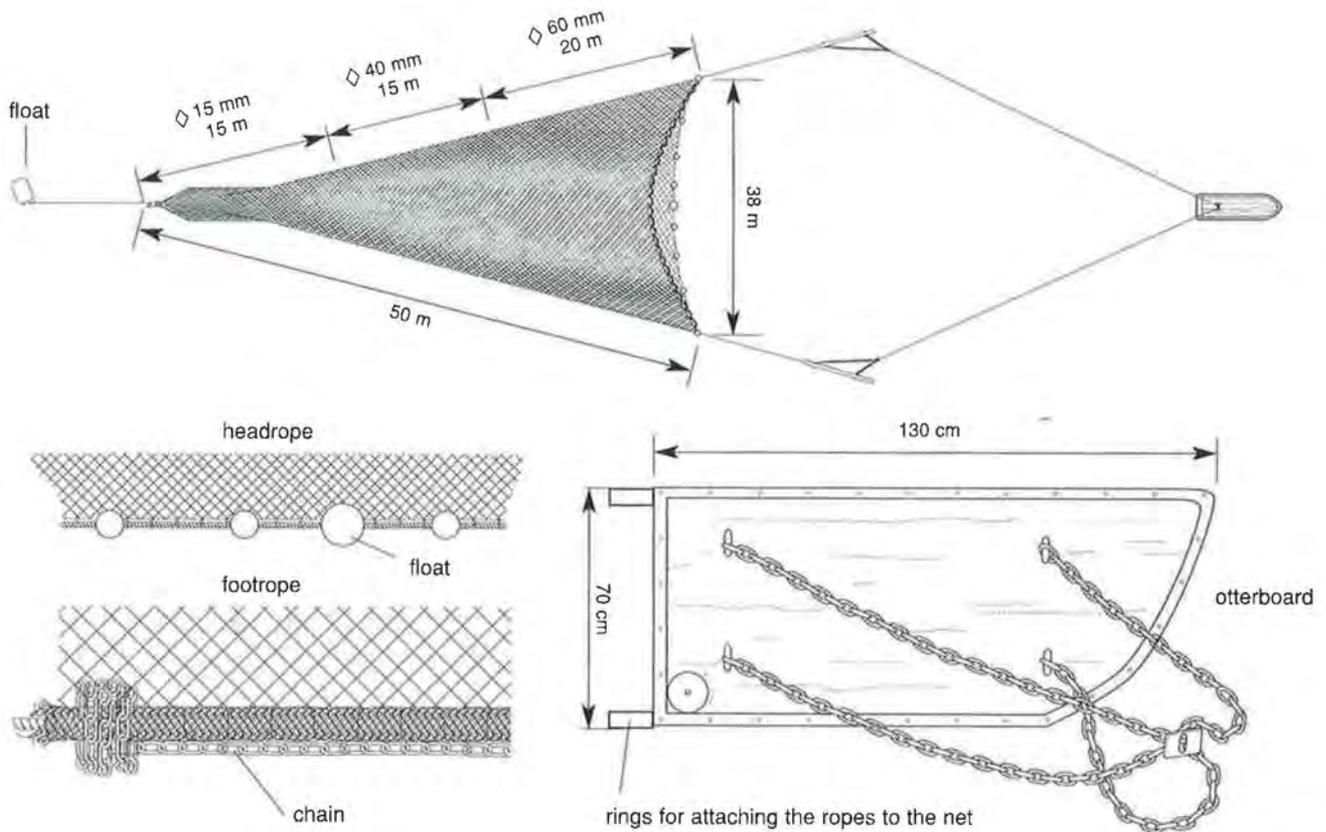
Uy kampeh / ឌុយកាំពិស
Framed shrimp drag net

The framed shrimp drag net has only been recorded in Battambang, where it is used from December to April. The rectangular mouth of an 8 m long bagnet with a mesh size of 10 mm is framed on top by a 3.7 m wide iron beam. The sides are fixed to an iron triangle with sides of 0.5 m. The top beam is connected to the

triangles. A heavy footrope is fixed to the bottom line, running across the mouth of the net.

It is towed by one boat, which is connected by ropes to the iron triangles. The bottom side of the triangle is broadened to allow it to slide over the bottom. The target species are shrimps.

Yankao / Dai masin



Otterboard



Head- and footrope



Float

Yangkao / Dai masin / យ៉ាកាវ / ដាយម៉ាស៊ីន
One-boat trawl

The *yangkao* is of Vietnamese origin and is widely used in Cambodia. The Khmer name refers to a bagnet (trawl) pulled by a motorized boat.

This is a one-boat operation in which a trawl-like net is towed along the bottom of larger streams and rivers. The footrope of the net has a heavy chain and the headrope carries floats. The wings are connected with strong ropes via otter boards to moorings at the stern of the boat or to sturdy piece of wood fixed at the stern perpendicular to the boat axis.

Reports mention a net length of 25 to 50 m; mesh

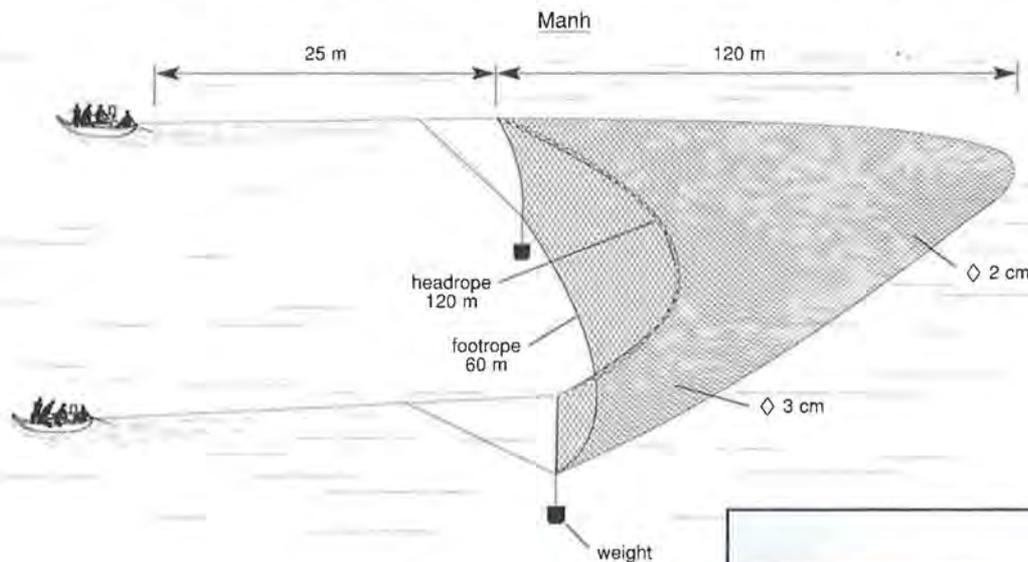
sizes vary from 30 to 80 mm near the mouth, 20 to 50 mm in the middle of the net to 10 to 15 mm at the codend. Costs seem to vary considerably between provinces: R. 0.45 to 8.4 million.

In Kandal the trawl is used from December to June. However, fishing with this gear is illegal and therefore it is commonly operated under armed protection, as catches are high and lucrative. Because the gear is illegal, it has been difficult to collect detailed information.

In the marine coastal areas of Cambodia a similar net can be used legally with a license under decree No. 28 KOR SOR KOR Table B.

Pair Trawl ('River Pelagic Trawl' according to the Fishery Law)

Manh



Manh, Mekong River, Kampong Cham: last stage of the operation

Description

Mid-water trawl net, 20 to 100 m long and 10 to 60 m wide at the mouth, pulled by two boats (with 35 hp engines) in Battambang. It has a headrope with floats and a footrope with lead sinkers and a weight attached to each wing. The short wings of the net are connected to the boats by 25 m long ropes. The mesh size of the bag is 15 to 30 mm. The hanging ratio reported in Battambang is 0.71. In Kandal the net is 120 m long and it has a footrope of 60 m. The wings are directly connected to the boats by short ropes. The mesh size is 20 mm in the bag and 30 mm near the mouth.

Cost

R. 0.7 to 2.6 million, depending on the size.

Operation of the gear

The net is pulled by two boats with long-tailed outboard engines. When the operation is finished, the two boats come together and first the footrope is taken in. Then the rest of the net follows. The crew size is 6 to 15 people.

The gear is outlawed in the country, but is nevertheless very popular. In Kampong Cham and Kandal province over 200 units have been reported to target the large upstream migrations in particular of schools of *trey riel* (*Henicorhynchus* spp.) in December, January and February each year. In Battambang the gear is used until May.

Gender aspects

Families often operate this gear.

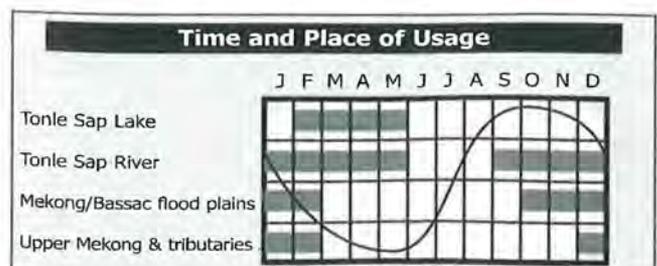
Target species

In Battambang: *trey sraka kdam* (*Cyclocheilichthys apogon*); *trey angkat prak* (*Puntius brevis*); *trey kaek* (*Morulius chrysophekadion*); *trey riel* (*Henicorhynchus* spp.); *trey chonluanh moan* (*Coilia* spp.); *trey chhpin* (*Barbonymus gonionotus*); *trey chanteas trey phluk* (*Parachela* spp.).

In Prey Veng: *trey riel* (*Henicorhynchus* spp.); *trey ach kok* (*Dangila spilopleura*); *trey chhlang* (*Mystus nemurus*); *trey chhpin* (*Barbonymus gonionotus*); *trey linh* (*Thynnichthys thynnoides*); *trey chhkok* (*Cyclocheilichthys enoplos*); *trey kes* (*Micronema* spp.).

Legal aspects

All kinds of fishing gears pushed or dragged by machines are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, G).



C L O S E - U P



Net mesh

Dragged Seine Net and Bamboo Fence in Fishing Lots

Kumnie Loh or Kumnie Pruol



Four boats pulling a river-wide seine net, Kampong Chhnang

Description

Kumnie loh or *kumnie pruol* is a typical fishing operation in fishing lots towards the end of the recession period. Smaller operations take place in the streams of various provinces, while the large operations occur in the Great Lake and the large rivers.

Small operation

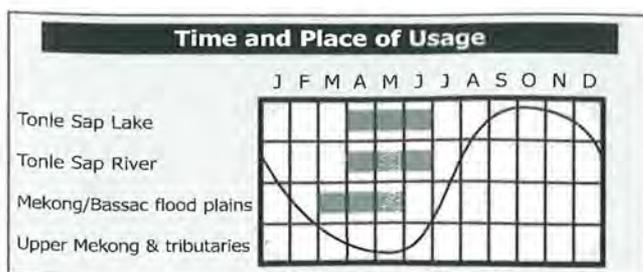
The entire (or part of) the river area belonging to the barrage fishing lot is swept (*kumnie*) with a seine net (*uon kie*, see section 7.2) or a bamboo fence (*pruol*). The fencing is made of thin bamboo sticks (10 mm) that are tied with nylon yarn to form a fence mat. A distance of 5 to 8 mm is kept between the bamboo slats. One single fence mat is up to 50 m long. The fence is usually around 2 m high. The fence mat is equipped with two rows of handles woven out of nylon yarn. The top row is 60 cm below the top of the fence and the lower row 60 cm above the bottom end of the fence. Wooden poles are used as struts during the operation, when some part of the fence is temporarily attached to it, while workers are sweeping forward with another part of the fence. The cost of the bamboo fences is R. 400.000 to 1.200.000, depending on the size of the fence.

The sweeping seine and fence are used in streams and small rivers at the end of the dry season when the water depth is at its lowest and currents are very weak. It is also used in the shallow remaining waters of pumped out river arms. Depending on the size of

the water body, two boats with engines or 10 to 15 workers pull the fencing across the riverbed through the shallow water. They carefully inch the bottom edge of the fence through the mud in order not to miss any fish (such as snakehead) that may be hiding there. The workers operate the fence from the downstream side pulling it slowly on the handles. Upstream the water body is completely closed off at a convenient place by a fence or an earth dyke. While moving the fence forward, the fish concentration in the remaining water is increasing. A high number of snakehead traps are set up close to the edge of the shore and other gears, such as *angruth* plunge baskets, smaller beach seines or cast nets may be used to catch the fish in the diminishing water area. Depending on the size of the cut-off area the fence seining operation can last for several weeks and may be undertaken in successive closed-off sections.

Large operation

These take place in the Great Lake fishing lots and in



the Tonle Sap river barrage fishing lots.

In the Great Lake lots, very large seines (now called *uon kumnie*) are pulled by a number of motorized boats in order to sweep the fenced lot area section by section. The cost of such a net alone was reported at R. 5 million minimum in Pursat.

In the river lots with barrages a very large seine is mounted on a number of boats connected by long poles or on bamboo rafts in such a way that the net reaches from bank to bank in a river or from fence to fence in a lake. It also covers the water column from surface to bottom. This mounted net needs to be moved section by section from one end of the lot to the other. In a river lot all the waters belonging to the lot in front and behind the barrage are swept. This is usually done with help of a number of boat engines, mounted on either boats or rafts. When it is done by hand, a number of rafts are anchored in the river or lake. The rafts are attached to the wall of netting (the seine) by strong ropes. With the aid of winches these ropes are pulled in, thereby slowly moving the net. This action is repeated until the entire area is swept by the net. Done by hand this may take up to a month. With boats pulling the net it can be done in 2 weeks. The fish are driven into a 'killing' pen, where a seine net, or again fences, are used for capturing them (see also section 5.5.1).

Gender aspects

Women are generally involved in fence building work. However, fence seining is undertaken only by men.

Target species

Mostly large fish, such as trey krai (*Chitala ornata*); trey sandai (*Wallago attu*); trey pra (*Pangasianodon hypophthalmus*); trey krum (*Osteochilus melanopleurus*); trey prorlung (*Leptobarbus hoeveni*); trey khman (*Hampala* spp.) and trey kolreang (*Catlocarpio siamensis*).

Legal aspects

All kinds of fishing barriers in which the distance from one bamboo slat to the next is less than 1.5 centimeter are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, H).



Kumnie lot #2, Kampong Thom.



Pulling the net in by winch



Barrier of seine netting and bamboo



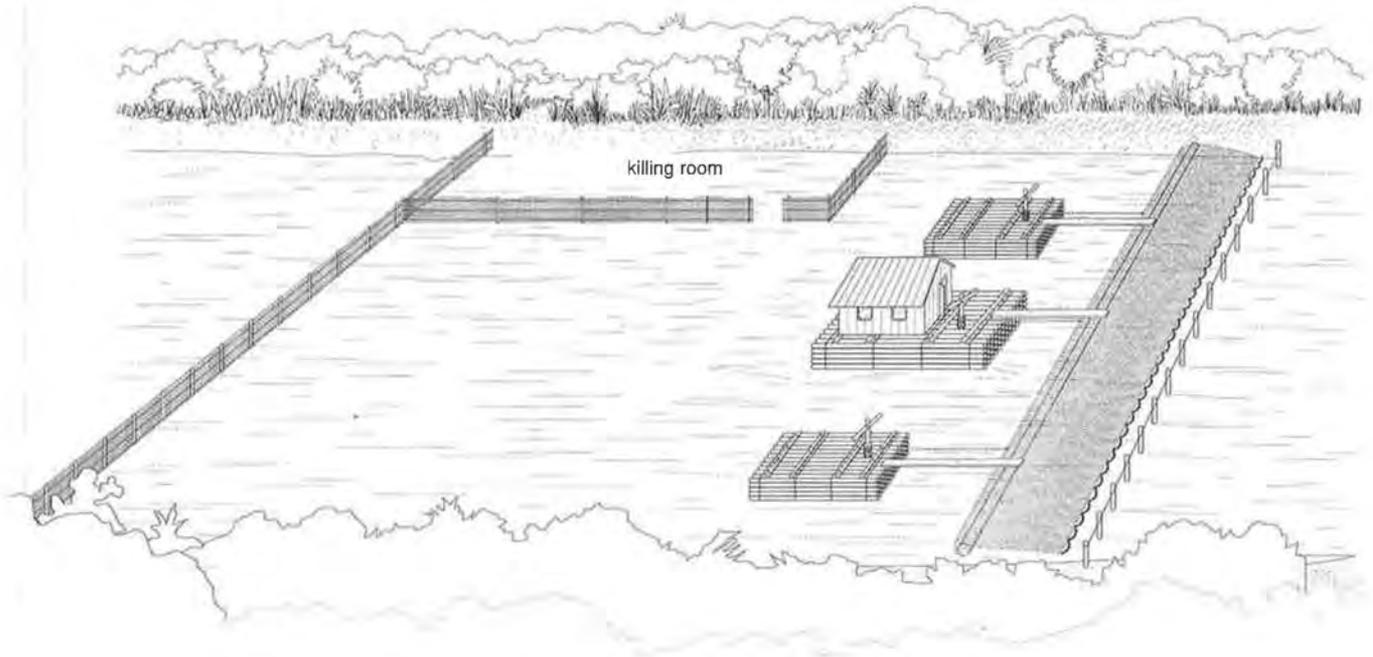
Bamboo barrier with net



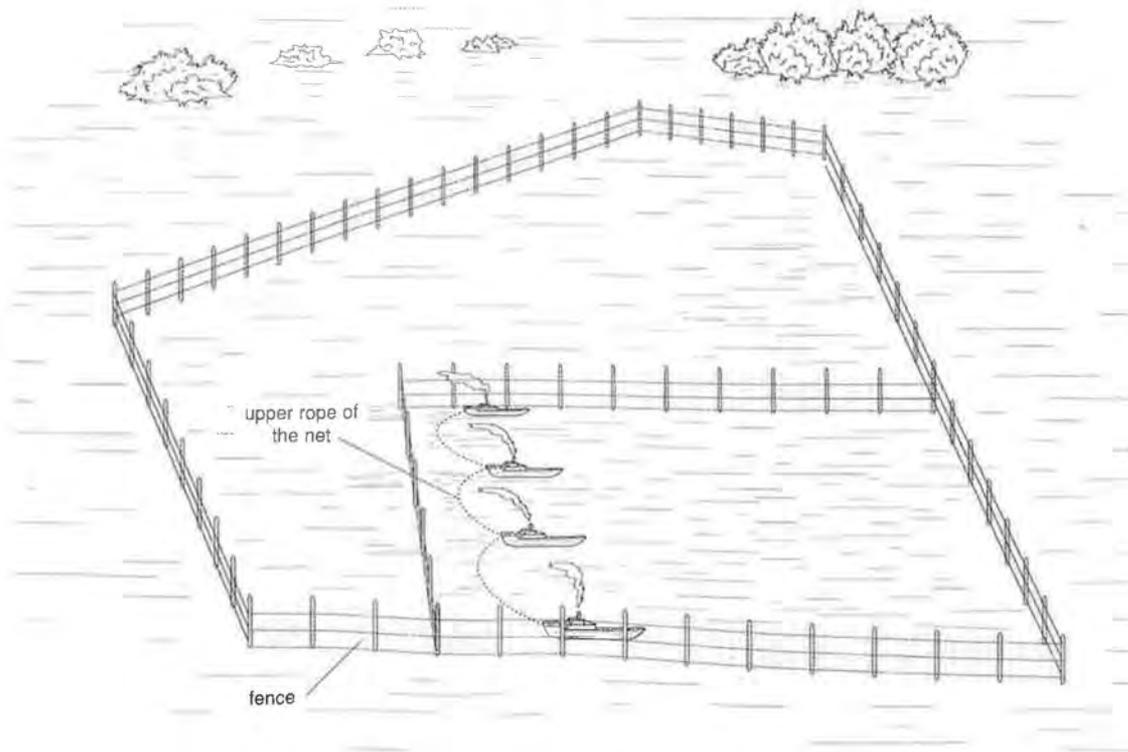
Moving the fences in a pen

Dragged Seine Net and Bamboo Fence in fishing Lots (cont.)

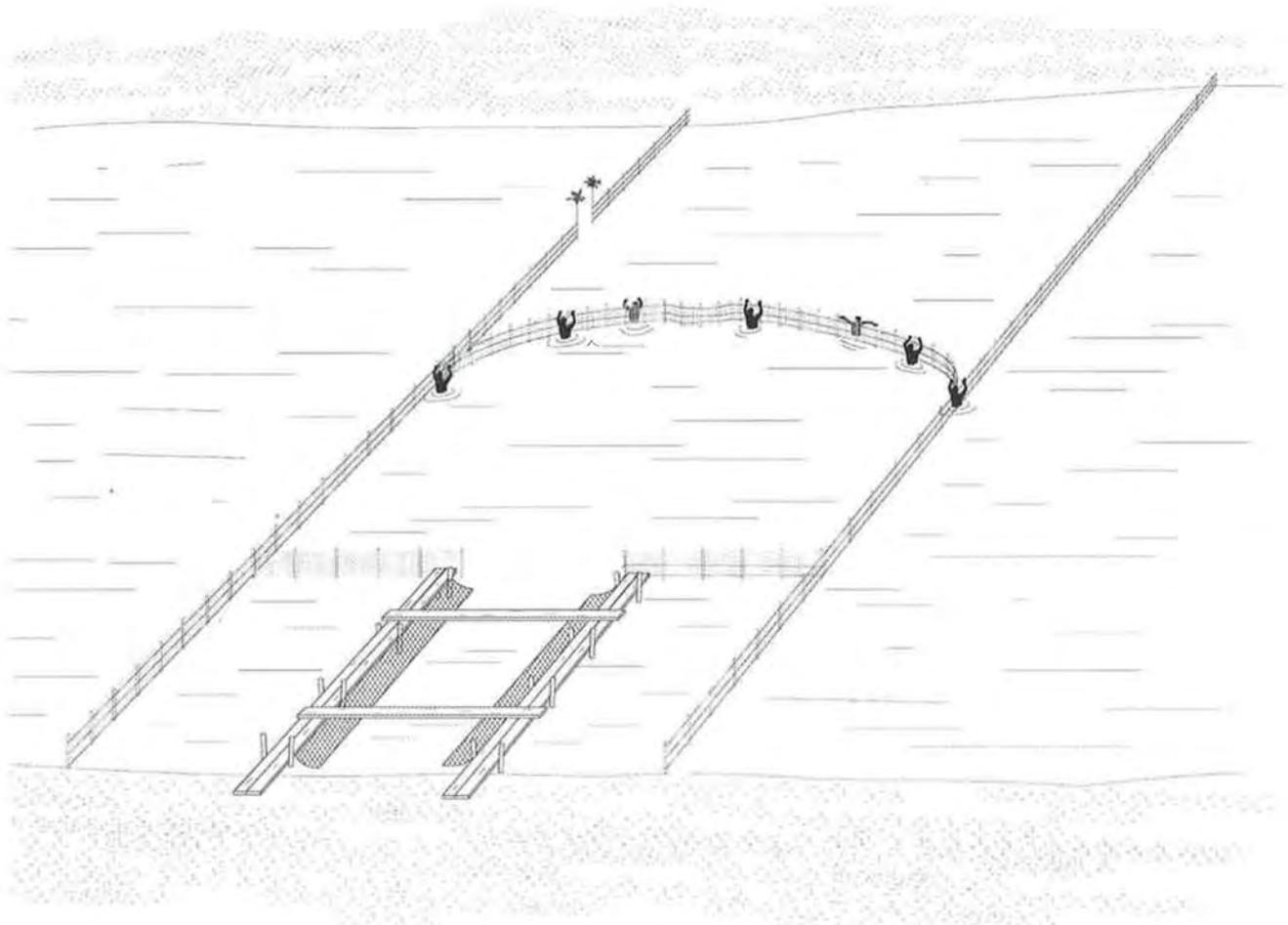
Fishing lot sweeping operation: a seine net suspended over a wooden pole is dragged by winches on anchored rafts



Last stage of Great Lake fishing lot operation: sweeping the grounds



Last stage of a sweeping operation in a stream fishing lot, using fences



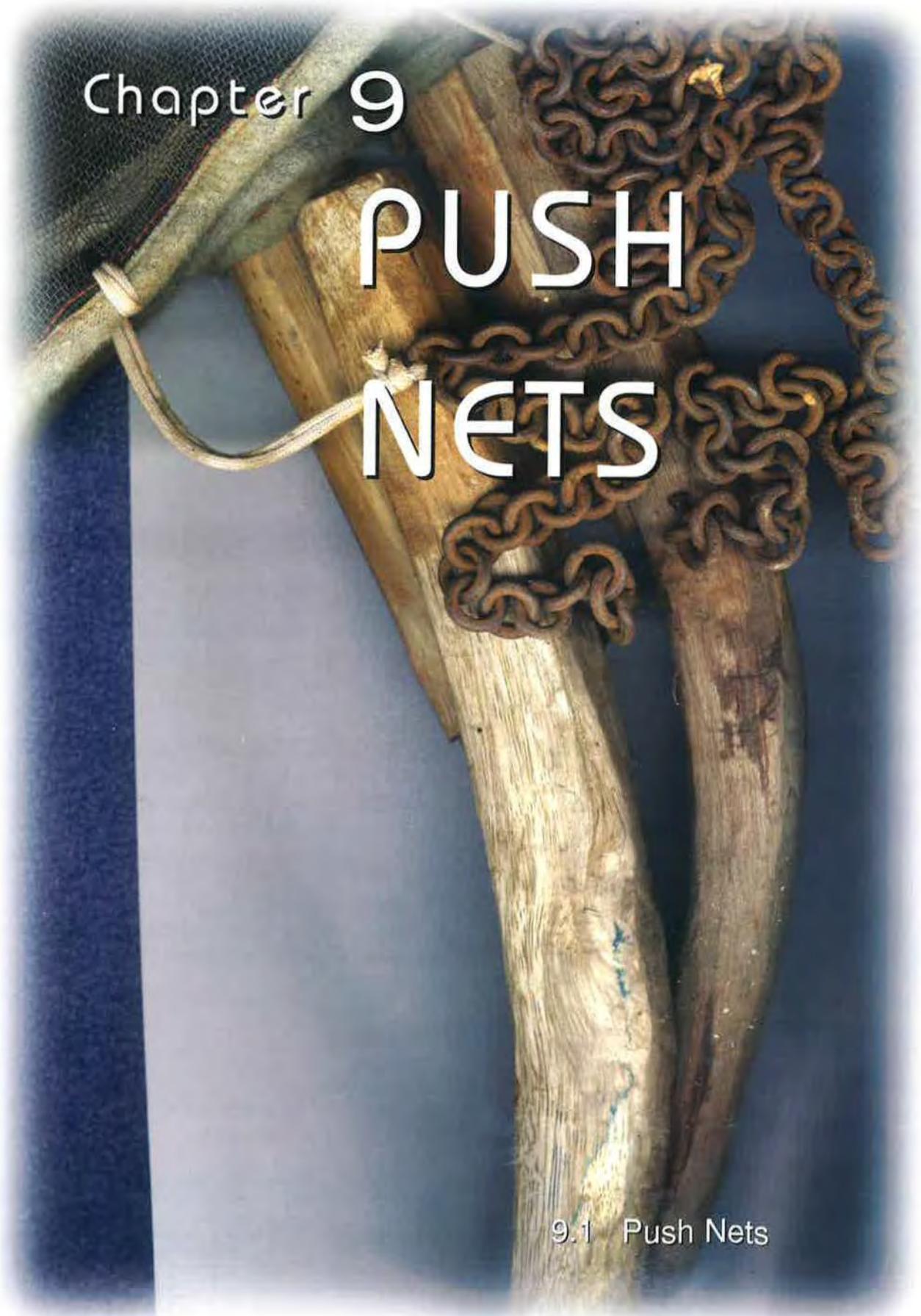
Fences are being moved in a stream in Battambang province. Note the use of the cover pot angruth'



Chapter 9

PUSH
NETS

9.1 Push Nets



Skimming Push Basket

Chok Leah

**Description**

The *chot leah* is a push basket with two fixed rods that cross each other at 2/3 of their length (195 cm). A triangle wickerwork basket with a depth of 30 cm is woven between the longer parts of the rods. The lower ends of the rods are connected by a 10.5 cm broad and 86 cm long wooden slat, which is sharpened at the front edge and stabilizes the wickerwork at the rear edge. The shorter upper parts of the crossed rods have handles for pushing the gear.

Cost

R. 25.000

Operation

Only reported from lot #1, Boeung Riel, on the Stung Sen in Kampong Thom. The *chot leah* is used in clam rich fishing grounds, by pushing the wooden 'blade' of the basket forward, scraping off the superficial layer of the bottom substrate. The gear is operated in up to 1.5 m deep waters of lakes and rivers, usually towards the second half of the dry season. Since the gear also collects stones and other sediments, the clam collecting operation is usually undertaken by two persons: one who operating the gear and one separating and

cleaning the catch. Usually the cleaning and separating work is done in a boat close to the place of operation. Occasionally, groups of push basket operators pool their catch in one boat and share the cleaning personnel. The clams are collected mainly for commercial purposes.

Gender aspects

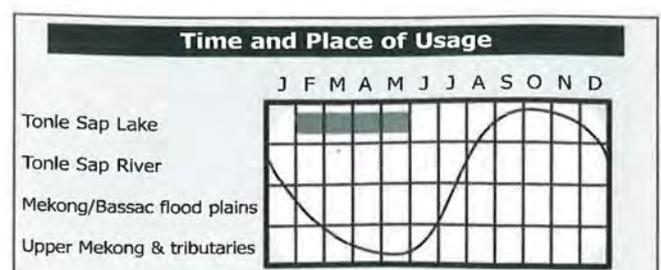
In general men operate the push basket, while women clean and separate the clams.

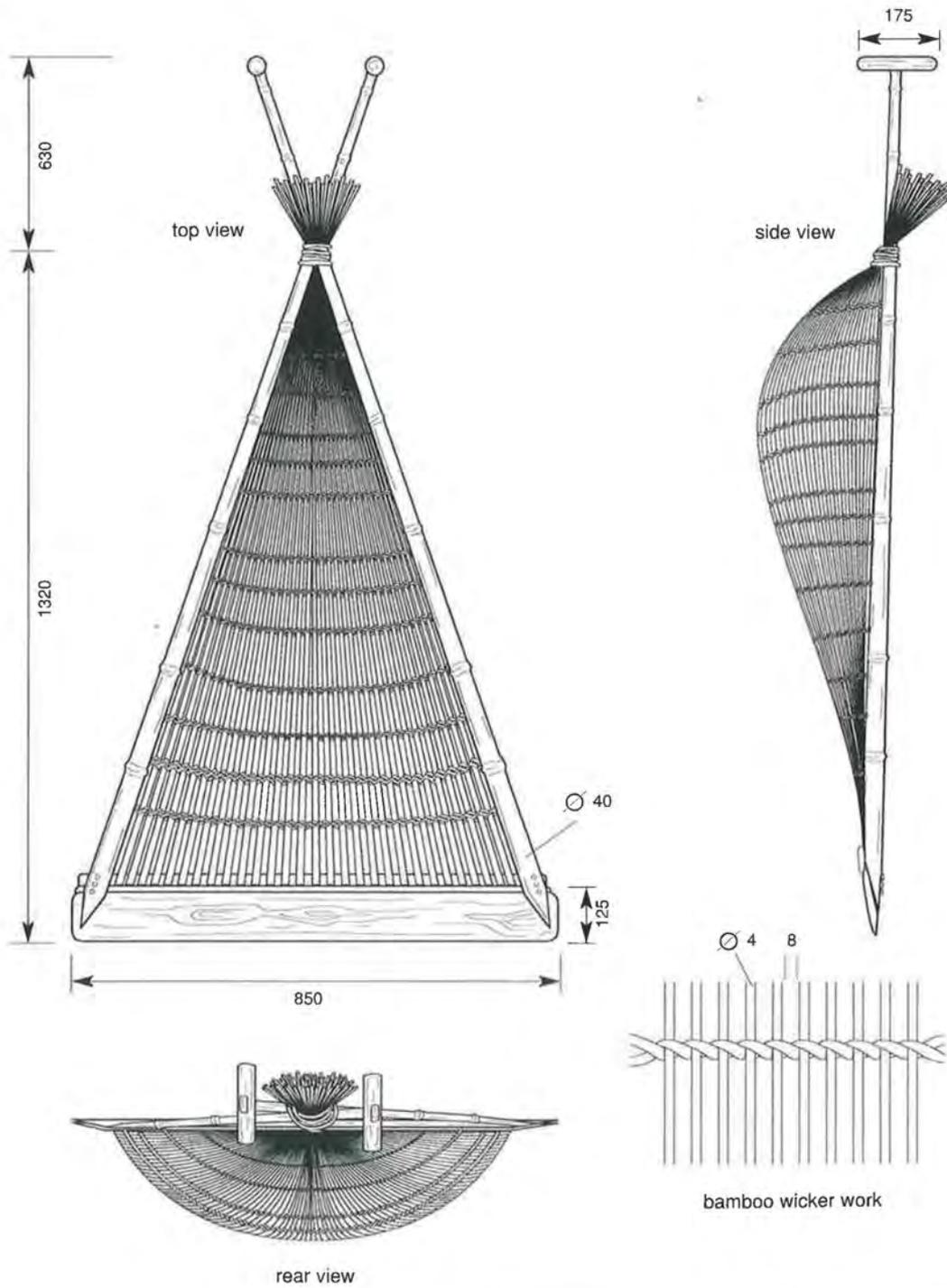
Target species

Leah / clams

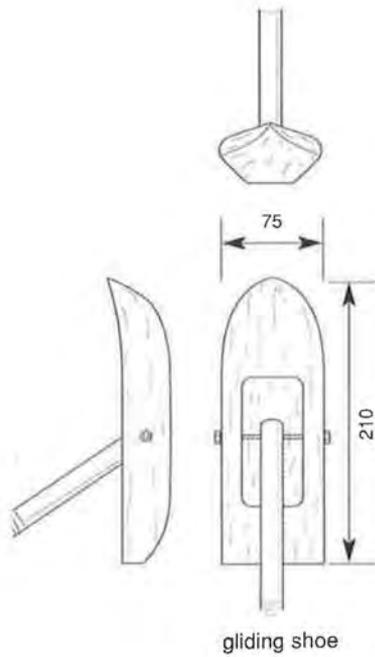
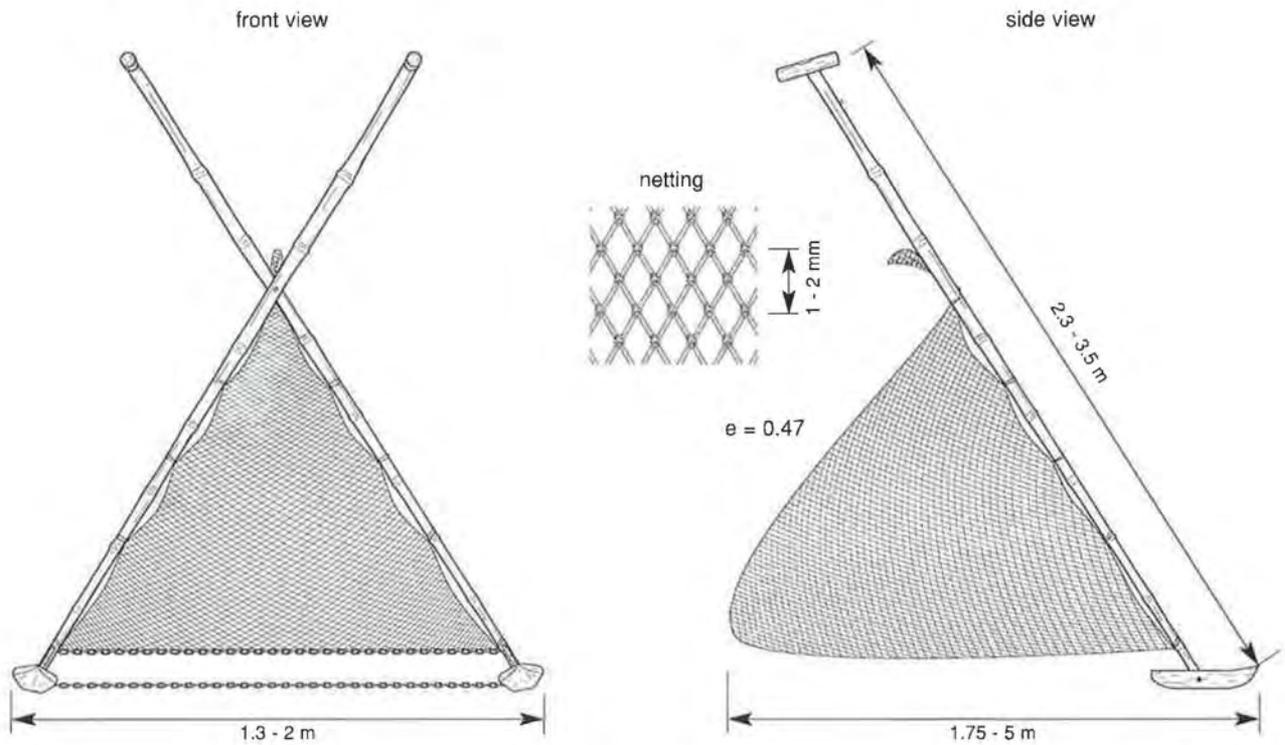
Legal aspects

Not classified / no mentioned in the law.





Sorting the clams

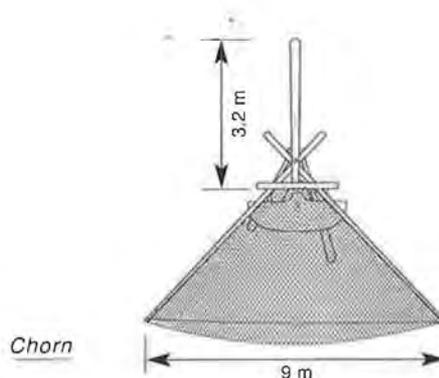
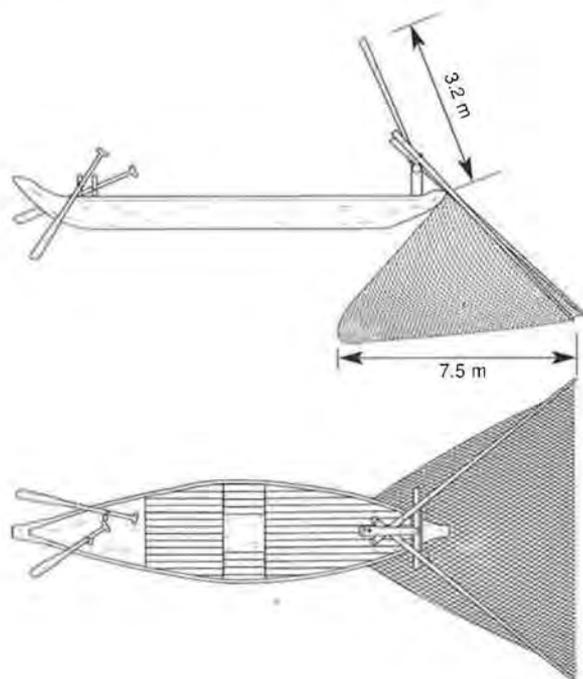


Pushnet, chheub yon / sip, mounted on the front of a boat; Siem Reap.
 លើបយន្ត / ស៊ីប

Type, Size, Cost & Season						
Province	Name used	Length in cm	Spread in cm	Mesh size in mm	Cost in R.	Season
Battambang	Chheub	350	200	1	14.000	Sep-Oct
Siem Reap	Chheub yon / Sip	900	400	1	240.000	Mar-Jun
Siem Reap	Thnornng runh	180	160	1	22.000	Dec-Apr
Kg. Thom	Chheub	175	130	2	16.000	Dec-Aug
Prey Veng	Thnornng runh	190	95	1	14.000	All year

V-shaped Push Net Mounted on a Boat

Chorn and Chorn Masin



Chorn

Description

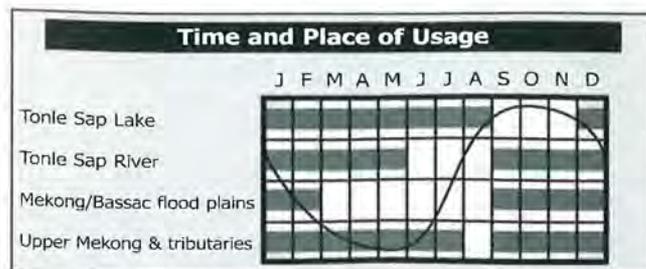
The *chorn* net is a big, V-shaped net, which is operated by means of a lever mechanism at the bow of the boat. The net itself is rigged with a nylon rope and suspended between long arms arranged in a "V" shape. The width between the distal points of the arms can vary considerably. The mesh size of the netting ranges from 10 to 35 mm. In some cases fishers use a larger mesh size at the front edge of the net in order to decrease the drag of water, when lifting it out of the water. The bag is composed by different pieces of webbing sown together in such a way that it forms a deep bag. The handle of the net is made out of a thick wooden pole

that serves as a counterweight and facilitates the lifting of the net out of the water. When used with an engine, the set-up is called *chorn masin*. The gear is gaining in popularity and was introduced in Kratie in 2000.

Operation

The *chorn* net is operated in river fisheries in different ways. In the Bassac river in Kandal and in the Mekong in Kratie the chorn is operated as a push net. Two people are maneuvering the boat with two oars in the rear, while a third fisher dips and lifts the net in the front of the boat. In the Sangke river of Battambang province (where the gear is called *chorn chaev*) the *chorn* is used as a drive-in net. The boat is positioned perpendicular to the river shore - preferably next to some floating water hyacinth mats and with a slow

Size, Cost & Season							
Province	Type	Width of 'V' in m	Arm length in m	Mesh size in mm	Depth in m	Cost in million R.	Season
Battambang	rowing	8	9	30	8	0.48	Dec-May
Battambang	engine	10	10	20	10	1.2	Jun-Aug
Kg. Chhnang	rowing	1.5-2	4	20-45	6	0.15	Sep-May
Kg. Chhnang	engine	2.5	6	10-30	8-12	0.2-0.3	Oct-May
Phnom Penh	rowing	9-9.5	7.5-9	15	7.5	0.3	Oct-Feb
Phnom Penh	engine	9	7	15-20	10	0.7	Sep-Jan
Kandal	rowing	10	9.5	10	7	0.2	Oct-Dec
Kg. Cham	engine	5-8	8-10	20	4-6	0.2-0.3	Dec-Jul
Kratie	rowing	3	2.5	20-35	2.5	0.2	Oct-Dec
Kratie	engine	6-7	7-8	30	6-7	0.1	Jun-Jul Sep-Nov





Chorn masin, Kampong Thom

water current - and the net is lowered to the bottom. Another fisher in a small rowing boat drives the fish with a long stick out of its cover and into the net. To increase the efficiency, several of these boat crews may synchronize their operations aiming to lift their nets at the same time.

Gender aspects

Men predominantly operate this gear.

Main species caught

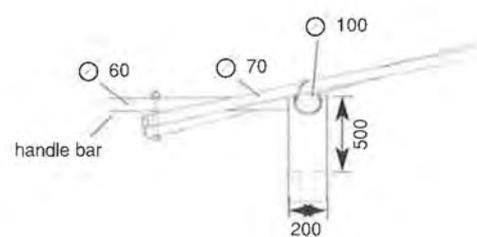
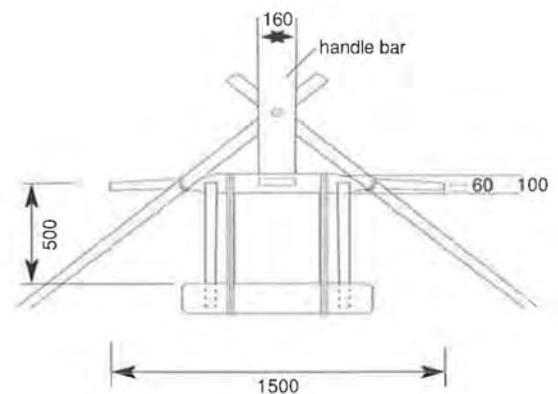
In Battambang: trey sraka kdam (*Cyclocheilichthys apogon*); trey angkat prak (*Puntius brevis*); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey slak russey (*Paralaubuca* spp.); trey chrakaing (*Puntioplites* spp.); gourami / trey kawmpheanh (*Trichogaster* spp.); trey kampot (*Chelonodon* spp., *Monotreta* spp.).

In Kampong Chhnang: trey chanteas phluk (*Parachela* spp.); trey chhkok (*Cyclocheilichthys enoplos*); trey sraka kdam (*Cyclocheilichthys apogon*); trey kantrawb (*Pristolepis fasciata*); trey chhveat (*Pangasius* spp.); trey chrakaing (*Puntioplites* spp.); trey kros (*Osteochilus hasseiti*); trey kaek (*Morulus chrysophekadion*).

In Kratie: trey chhveat (*Pangasius* spp.); trey khiang hai (*Belodontichthys dinema*); trey slak russey (*Paralaubuca* spp.); trey po (*Pangasius lamaudi*); trey kes (*Micronema* spp.); trey chhpin (*Barbonymus gonionotus*).

Legal aspects

Middle-scale fishing gear (No. 28 KOR SOR KOR, Table A II).



Chorn masin



Chapter 10 LIFT NETS

10.1 Lift Nets



Giant Lift Net

Chhnuok



Liftnet in fishing position



Lifted out of the water. The fish are being scooped up

Description

The giant lift net can be mounted on boats, a floating bamboo raft or on a small pier. In Phnom Penh it is mounted on two boats that are tied together. The raft version is very common on the Sanke River in

Battambang province and in certain areas in Kampong Cham. The land-based version can be found in the flood plains of Takeo province.

A square net rigged to a rope is mounted on its corners on the end points of two large, crossed bamboo rods. In the Sanke river of Battambang province the nets are equipped with a capture basket right in its center. Since these are quite large installations, the net works on the lever principle, balanced by counter-weights so that it can be lifted without a major effort.

The life span of these nets is a couple of years, except for the bamboo raft that needs to be replaced annually.

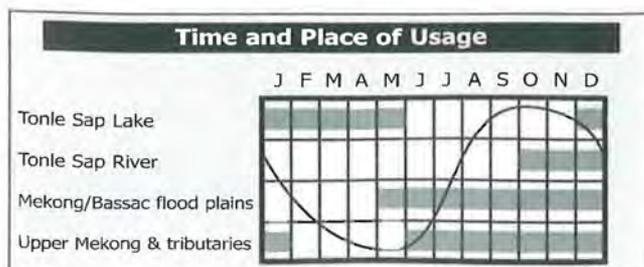
Operation of the gear

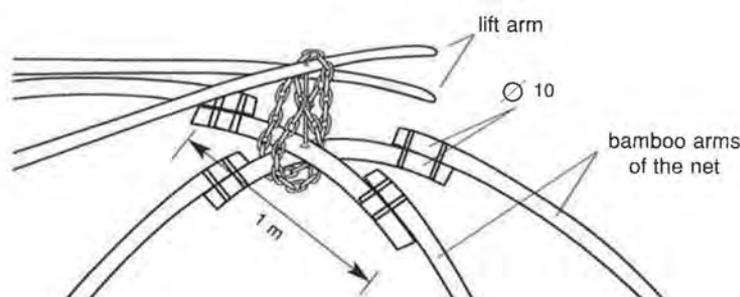
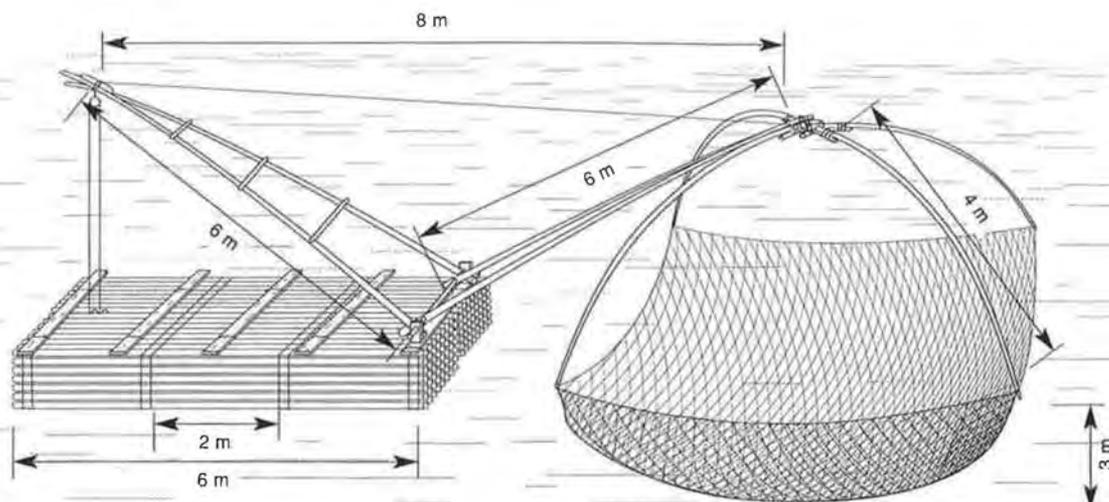
To make the net sink, a small weight (0.5 kg in Phnom Penh) is put in the apex of the net. It is lifted at short intervals by pulling down the counter-weight arm, which removes the net completely out of the water. The catch is taken out by means of a long handled scoop net. In order to reach all parts of the net, strings have been attached to a few places on the net to pull them closer and bring them within reach of the scoop net. If the net is equipped with a capture basket, the net is lifted just long enough to ensure that the fish drop into the capture basket, which has a non-return device in it.

Then the net is submerged again.

Giant lift nets often work behind a fence that faces the current in rivers running into the Great Lake, in February and March, when fish are migrating upstream out of the drying lake.

Size, Cost & Season					
Province	Mesh size in mm	Side width in m	Depth in m	Cost in million R.	Season
Battambang	15	7.5	7.0	0.65 - 3.00	Dec-May
Phnom Penh	20	8.0	3.2	0.30	Oct-Dec
Takeo	25	3.5	3.0	0.10	
Kg. Cham	15	6.0	3.0	0.5 - 2.00	May-Dec
Kratie	20	3.8	3.2	0.35 - 0.40	Jun-Jan





Giant liftnet behind a fence that faces the river current, Battambang

Gender aspects

Mostly men operate the gear. Women and children help to collect the fish and to sell them.

Main species caught

Trey riel (*Henicorhynchus* spp.); trey chpin (*Barbonymus gonionotus*); trey ach kok (*Dangila spilopleura*); trey slak russey (*Paralabuca* spp.); trey chhionh chhnoht (*Macragnathus siamensis*); trey chhkok (*Cyclocheilichthys enoplos*); trey linh (*Thynnichthys thynnoides*); trey chrakaing (*Puntioplites*

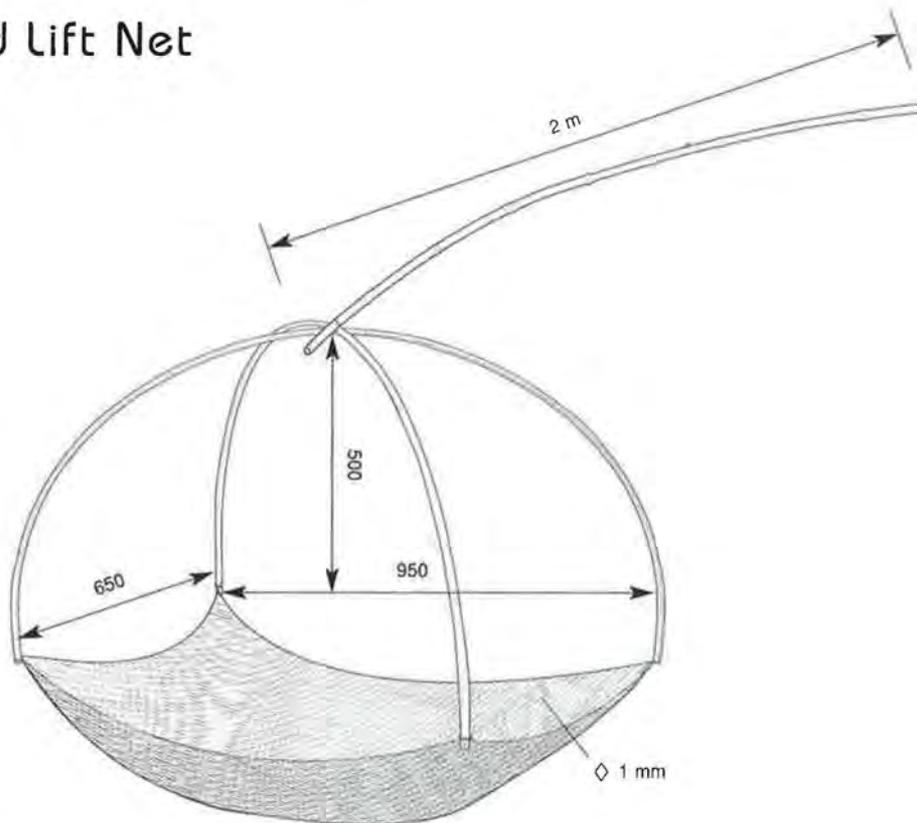
spp.); trey sraka kdam (*Cyclocheilichthys apogon*); trey kros (*Osteochilus hasseiti*); trey kanchos (small *Mystus* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); gourami / trey kawmphleanh (*Trichogaster* spp.).

Legal aspects

A raft-mounted lift net with sides shorter than 2 m is considered a family fishing gear. If sides exceed 2 m it is a middle-scale fishing gear (No. 28 KOR SOR KOR, Table A II).

Hand-held Lift Net

Chhnuok Sre



VARIATION

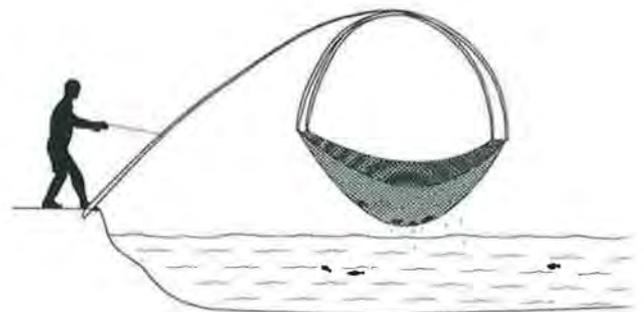
Chhnuok sre / ឈ្មួកស្រែ

Hand-held lift net for use in rice fields

Portable lift net or dip net. Essentially a rectangular piece of netting (ca. 65 x 95 cm) with two flexible, bow-shaped bamboo slats attached diagonally to the corners. The mesh size is 1 mm. On the cross-over point of the slats a 2 m long pole handle is fixed. The gear costs R. 3.000.

The hand liftnets are placed in a few selected locations. To attract fish, rice bran is sprinkled on top of the center of the net. The gear is dipped into and lifted from the water by means of a long flexible bamboo pole. The pole functions as a lever. It is supported either by the fisher's leg, or put in a special hole in the ground or on a stand. Due to the surface tension of the water, lifting the net requires overcoming considerable resistance, which slows the lifting movement and may allow the catch to escape. It is therefore essential that the net is lifted as quickly as possible.

The portable lift net is not used very frequently anymore. Popular locations for operation are the irrigation canals next to rice fields, or quiet bays of rivers and streams where fish seek shade and shelter. It is operated in the ricefields from September to March. The target species are small rice field fish and shrimp. Frequently, this gear is used just to catch some fish for the next meal; it is rarely used for commercial purposes. Women and children frequently use the lift net; men seldom. It is classified in the law as a family fishing gear.



Use of a hand-held lift net.

Chapter 11

COVERING DEVICES

11.1 Basket Traps

11.2 Edge Traps

11.3 Grid Traps

Plunge Basket or Cover Pot

Angruth

Description

The *angruth*, a bell-shaped plunge basket, is made of bamboo sticks from a big, carefully selected bamboo stem. The stem must be soaked in water for one week before it is split into fine sticks, that are sharpened at one point and carefully polished. Taking advantage of the stability and firmness of the bamboo nodes, the points are carved to between 4 and 5 cm below a node. This part of the node remains (and is not polished off) and serves as support to fix the lowest and biggest stabilizing ring. Before assembling the basket the sticks are toasted, giving them their stability, durability and characteristic dark color. The 75 to 94 bamboo sticks are fixed with rattan fibers to two main and 2 or 3 complementary stabilizing rings that define the size of the area covered on the ground and the opening on top to remove the fish. Between the stabilizing rings additional woven rows of wire are inserted to cope with the force and pressure exercised during its operation. The interior diameter of the upper opening varies between 12 and 20 cm, while that of the capture opening of the basket is between 42 and 69 cm. The height varies from 45 to 62 cm. The *angruth* is one of the most popular fishing gears and is often for sale in fishing gear shops. Its lifespan is estimated to be 4 to 6 years.



inundated grasslands. Turbid waters are preferred. Once a selected area is covered the fisher feels with one hand if there are fish inside. Fish caught are stored in a fish basket that is carried along. To enhance efficiency, the *angruth* is frequently used by a group of fishers forming a line in which everybody is sticking his / her basket with relatively high frequency into the shallow water, thus giving the fish little opportunity to escape.

Gender aspects

Angruth is constructed and used by men and women. Family or peer groups frequently cooperate in its operation.

Target species

Snakehead (*Channa* spp.); trey andaing / catfishes (*Clarias* spp.); trey sandai (*Wallago attu*); trey chhlang (*Mystus nemurus*); trey kranh (*Anabas testudineus*); trey kantrawb (*Pristolepis fasciata*); trey kros (*Osteochilus hasselti*); trey kanchos (small *Mystus* spp.); trey chhpin (*Barbonymus gonionotus*), and also eels and frogs.

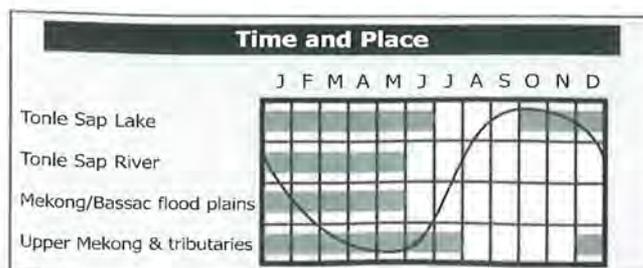
Legal aspects

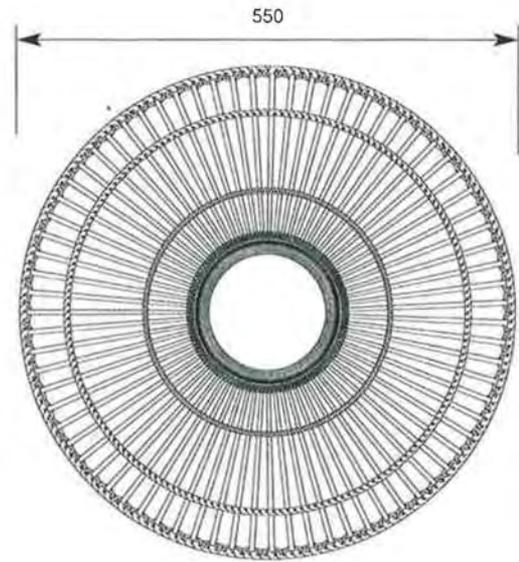
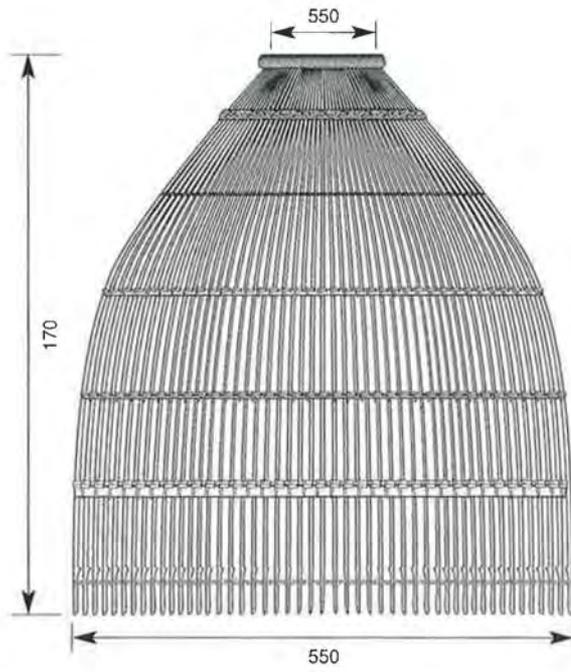
Classified as a family fishing gear (No. 28 KOR SOR KOR Table A I).

Size, Cost & Season					
Province	Height in cm	Diameter capture opening (cm)	Diameter hand opening (cm)	Cost in R.	Season
Battambang	60	69	19	30,000	Oct-May
Siem Reap	46	44	13	15,000	Nov-Apr
Pursat	45	42	15	9,000	Mar-Jun
Kg. Thom	62	55	16	20,000	Jan-May
Kg. Chhnang	60	55	15	20,000	Mar-May
Phnom Penh	53	52	14	9,000	Mar-May
Kandal	54	60	16	9,000	Jan-May
Takeo	60	65	20	5,000	Jan-May
Kg. Cham	48	50	12	16,500	Dec-Jul
Kratie	55	50	14	35,000	Mar-Jul

Operation

The *angruth* is a classical dry season fishing gear, being used in the remaining water bodies or swamps after the floods have receded. The basket is rapidly stuck in the ground at places where fish are suspected, (indicated for instance by a cloud of mud stirred up by a fish), while wading through shallow water (usually less than 50 cm deep) or slightly



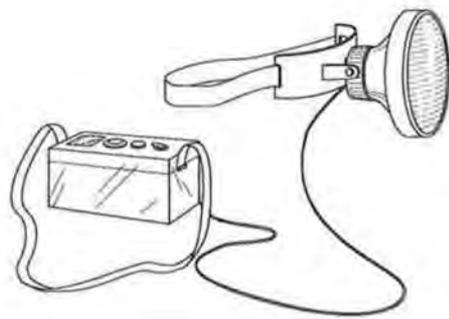


Cover pot, showing the open top



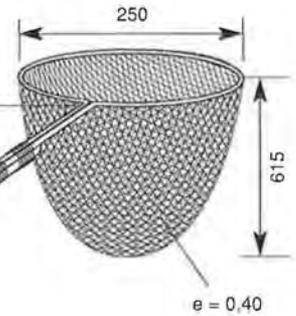
Group of fishers with angruth

Frog Cover Net



10 - 20 m

Lup Kongkaep



Description

The *lup kongkaep* consists of a wooden or bamboo pole up to 2.3 m long, attached to a circular iron frame holding a net. A rectangular piece of netting with a mesh size of 15 mm is rigged to the 4 mm thick iron frame (with a diameter of 250 mm). The bottom end of the net is simply closed by means of a string.

Cost

R. 45.000

Operation

The frog cover net physically resembles a handled scooping net, however, as the Khmer word 'lup' indicates, it is used as a covering device. This device is probably widely known in some provinces, but only a report from Kampong Thom exists, where it is used during the rainy period and in particular during or shortly after a rainfall. Preferably, it is used at night in combination with a light carried on the head. The small portable battery is attached to a belt hanging around the shoulders. The hunter carefully listens to frog sounds in order to roughly locate them. With the light the area is carefully searched. The frog does not move once it is illuminated and the hunter can easily put the net over it. It is then removed by hand and stored in a basket carried on the waist. Frequently, peer groups or families join in frog catching. The frogs are sold alive.



Young fisher showing luk konkaep, Kamponh Thom

Gender aspects

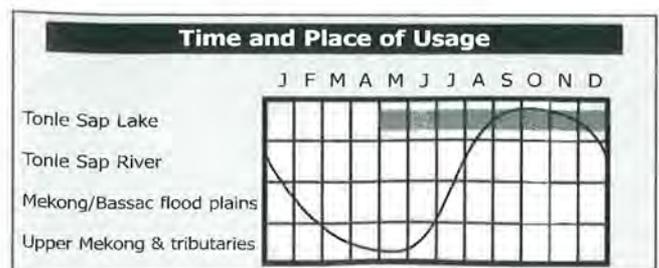
Men, women and children make and use the *lup kongkaep*.

Target species

Frogs / kongkaep (*Hoplobatrachus rugulosus*).

Legal aspects

Not mentioned in the fishery law.



C L O S E - U P



Bamboo, a material used in the majority of Cambodian fishing gears and installations

Cast Net

Samnanh

**Description**

The normal *samnanh* cast net consists of two basic parts: the net and the lead line at its edge. The lead line is directly rigged to the body of the net. Most nets have a hand line, but this is not essential for its operation. Nowadays most nets also have capture pockets at the inferior edge of the netting. A net like this is sometimes called a *samnanh proyung* cast net. The chain sinker rigged to the edge of the netting is suspended inside the webbing with 5 to 30 cm long strings. The result is 20 to 35 cm deep pockets. Its mesh size is generally between 15 mm and 30 mm. In a shrimp-rich province like Takeo mesh sizes as small as 7 mm are widely used.

Cast nets are very carefully constructed in order to attain the right shape, which allows it to unfold in a circle, when thrown out. By inserting systematically a certain number of additional meshes after a number of rows, the webbing takes on a circular form.

Though rarely found, in the most sophisticated cast nets the mesh size varies in different parts of the netting. The bigger meshes are located in the upper part of the netting close to the hand line, while the smallest meshes are used in the capture pockets. This construction facilitates a swifter sinking of the net, as the larger meshes provide less resistance in the water. It is reported that ethnic Cham fishers are the most expert fishers using the biggest cast nets.

A 3 m long net has circa 2.5 kg chain along its rim,

whereas a 7 m long net needs a chain of some 7 kg. The lifespan of a net is about 3 years.

Cost

R. 47.000 to 150.000, depending on the size of the cast net.

Operation

The proper handling of a cast net requires a lot of practice. The net needs to be divided well over both hands (and sometimes even over one shoulder) before it is cast accompanied by a twisting movement of the body. It is operated either from a boat or from the shore of the river or while wading through shallow water. It is used during the whole year. The fisher casts the net as soon as he spots a fish or a promising movement in the water.

The cast net with a pocket and hand line is the classical type of cast net. Once cast, due to the weight of the lead line, the net opens in a circle and sinks down to the bottom, covering the fish located in the area below the net. As soon as the net lies on the ground the fisher carefully hauls the net by means of

Time and Place of Usage	
	J F M A M J J A S O N D
Tonle Sap Lake	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
Tonle Sap River	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
Mekong/Bassac flood plains	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■
Upper Mekong & tributaries	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■



Cast netting in group. Kamponh Cham

the hand line and the net folds into a bell-like shape with the lead line scratching over the bottom surface. The fish are caught in the pockets during the hauling process. Any kind of fish is targeted.

Cast nets without pockets usually do not have a hand line. They are basically used like a frisbee and the fisher dives into the water after the net is thrown. In this case the cast net functions just like a cover pot. The fisher first makes sure that the lead line is properly closing off the covered area on the bottom surface. Then he explores with his hands if there is a fish trapped under it. If successful, the fish is squeezed and pushed to the edge of the net and taken out.

Similar to other covering devices, efficiency is increased by fishing in groups. Fishers position themselves around a selected water area and coordinate the casting of their nets, trying to cast the net as close as possible to the other nets without interfering with them. The fishing success is higher since fish have less opportunity to escape.

As reported from Pursat and Kampong Chhnang province, fishermen also may throw boiled rice or rice bran mixed with clay into the water in order to lure the fish into the potential capture area. In Pursat and Siem Reap roots of trees are put in the water to attract in particular trey damrey (sand goby / marbled sleeper (*Oxyeleotris marmorata*)). The method is locally called

dak kul. The net is then cast over these and the fisher dives down to collect the fish trapped under the net. Palm (*Borassus flabelifer*) or reang (*Barringtonia asiatica*) tree roots with holes in them are used.

Gender aspects

Women are commonly involved in weaving and repairing, but to a much lesser degree in fishing with cast nets, except for helping by rowing the boat.

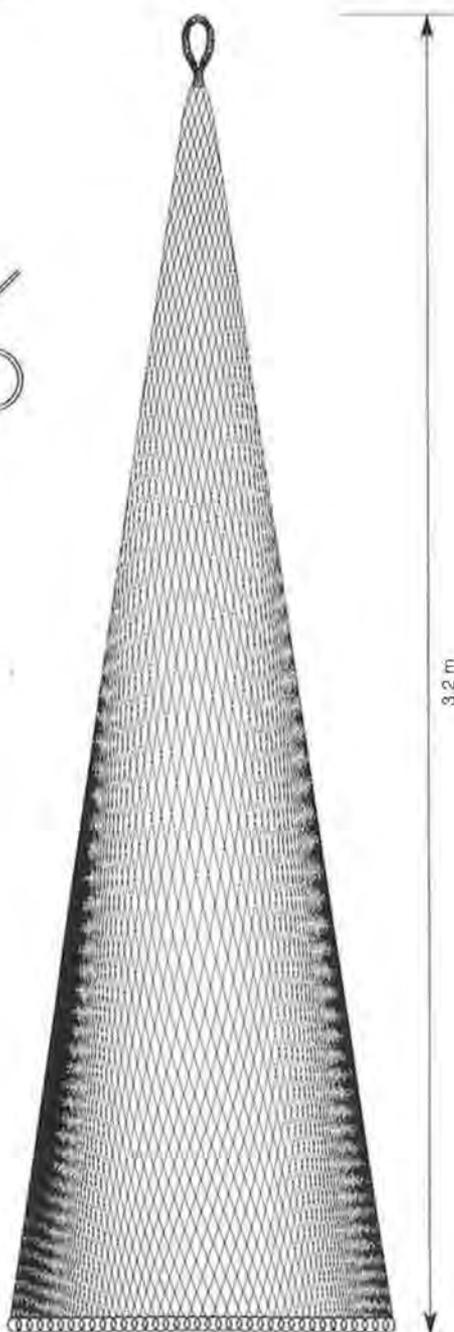
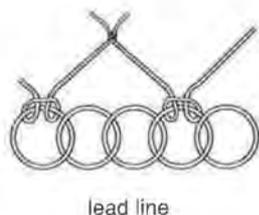
Main species captured

Any fish may be targeted, depending on the fishing ground and the type of cast net used. Species that significantly contribute to the catch in the various provinces are: trey riel (*Henicorhynchus* spp.); trey slak russey (*Paralaubuca* spp.); trey chhlang (*Mystus nemurus*); trey chhpin (*Barbonymus gonionotus*); trey chhkok (*Cyclocheilichthys enoplos*); trey chrakaing (*Puntiplit-es* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey kawmpheanh (*Trichogaster* spp.); trey sandai (*Wallago attu*); trey chhlonh chhnoht (*Macrognathus siamensis*); trey kantrawb (*Pristolepis fasciata*); trey kranh (*Anabas testudineus*); trey ach kok (*Dangila spilopleura*); trey kaek (*Morulius chrysophekadion*); trey pruol / trey kralang (*Cirrhinus microlepis*); trey khman (*Hampala* spp.); trey krai (*Chitala ornata*).

Legal aspects

Classified as family fishing gear if less than 5 m long and middle-scale fishing gear if over 5m (no. 28 KOR SOR KOR Table A I and II).

Cast Net (cont.)



Insertion of additional meshes	N° of rows
	5
	18
	24
	30
	33
	51

VARIATIONS

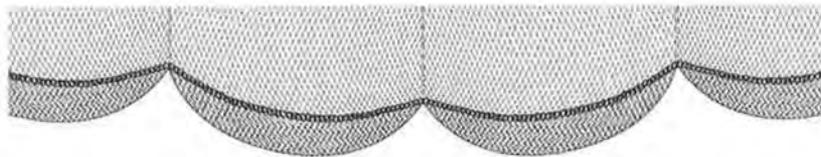
Samnanh lak / សំណាញ់ធំ
Big meshed cast net

The *samnanh lak* cast net is characterized by its big mesh size and the lack of capture pockets. However, it is equipped with a hand line. The 5 to 6 m long netting is made of nylon monofilament (Ø 1.5 mm yarn) with uniform mesh size of 80 to 140 mm. At its edge the net carries an iron chain weighing up to 7 kg. The cost of the gear is about R. 40.000.

The *samnanh lak* is only reported from Stung Treng, Ratanakiri and Kratie, where it is used in rivers with rocky bottoms and rapids mainly during the dry season. The gear is in fact thrown like a cast net, but functions as a gill net. When the net falls, fish trying to escape become entangled or gilled in the meshes.

Commonly, two fishers operate this net from a boat: one pilots the boat from the rear, while the other watches out for a suitable place and moment to cast the net from the bow. Once the net is cast, the pilot has to stop the boat by paddling backwards in order to allow the net operator to haul in the net.

Main fish species captured in Stung Treng are: *trey kaek (Morulius chrysophekadion)*; *trey chhkok (Cyclo-cheilichthys enoplos)*; *trey pawa mook moi (Labeo erythropterus)*; *trey pava mook pee (Bangana behri)*.



castnet pockets



Big meshed castnet - samnanh lak

Samnanh touch / សំណាញ់តូច

Small cover net

This small mesh net has a diameter of approximately 60 cm, and is framed by a circular chain. Similarly, a piece of netting may be framed by the rim of a bicycle wheel.

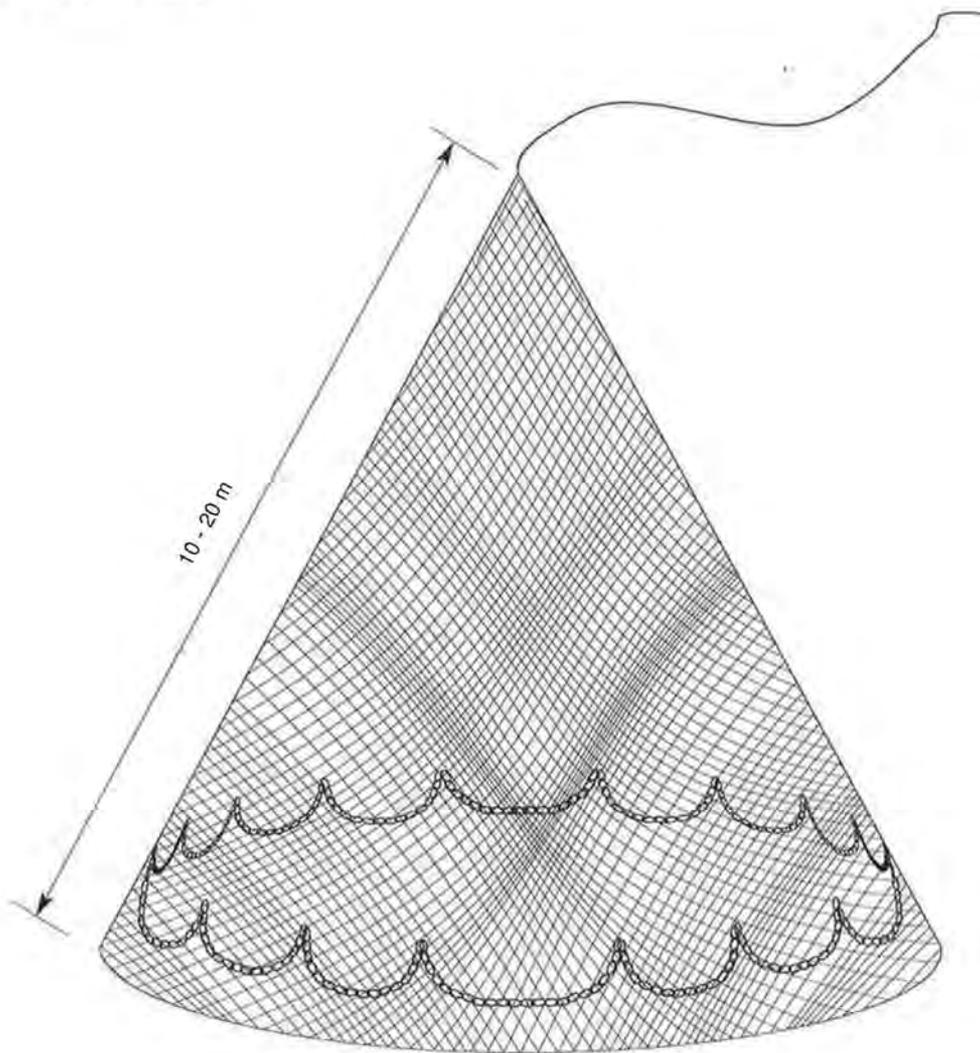
The cover net with chain is used under water in places with a high fish density during the recession period. The fisher plants a sturdy stick in the bottom and dives down, while holding on to the stick under water. Then, he covers more or less blindly an area of the bottom and feels with his hands if any fish or aquatic animal is trapped. The wheel net is used like a cover pot, angruth, in shallow and muddy waters. Boys have been seen using these gears.



Small cover net - samnanh touch

Giant Cast Net

Chayra



Description

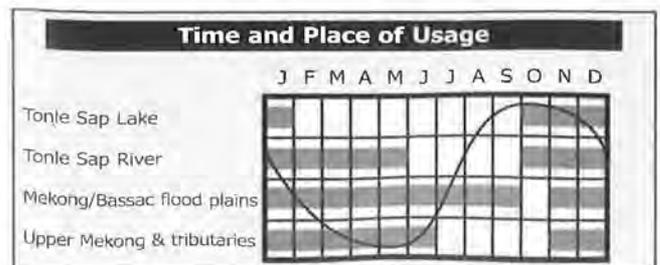
The construction of the *chayra* is basically the same as the normal cast net, except that it is much bigger. It can be up to 50 m long with a circumference of over 300 m. The rim of the net carries a chain of sinkers and is doubled up to form pockets, like is done in most small castnets. The lifespan of the net is some 4 years.

Operation

Compared to normal cast nets, which are easily manipulated by hand, larger 'cast' nets can only be operated by hanging them from a boat, being too large to be cast. In this way it becomes possible to set them out and haul them, even if they are of considerable size. The *chayra* is exclusively used from boats. The spreading, however, must be undertaken in a different way from that achieved by hand casting.

This large cast net is used in areas with considerable strength of current during the period the flood is receding; the current greatly affects the way the net

Size, Cost & Season				
Province	Length in m	Mesh size in mm	Cost in million R.	Season
Battambang	7.5	20	0.17	Oct-Jan
Kg. Chhnang	15 - 20	15 - 40	0.5 - 0.7	Oct-May
Phnom Penh	10 - 14	20 - 40	0.4	Oct-Jul
Kandal	12 - 15	30 - 50	1 - 1.2	Nov-Jul
Takeo	15	40	0.1 - 0.2	Nov-Jun
Prey Veng	15 - 20	30 - 50	0.7 - 0.8	Nov-Jun
Kg. Cham	20 - 50	15 - 25	1.2 - 2.4	Oct-Jul
Kratie	15 - 18	30 - 50	0.5 - 0.6	Nov-Jun



spreads out and sinks to the bottom. According to Fily and D'Aubenton (1965) the net is put onboard of a large boat (at least 12 m long) manned by at least 3 fishers. When it is paid out, the boat must move with the current, as in this way the net can be spread out over the surface of the water. The whole operation of laying the net must be completed in 30 to 50 seconds at the most. The net then closes gradually as it sinks. If there is a strong current, the net may take about two minutes to sink and close, depending on the depth, and if there is little current it will take up to five minutes. The optimum conditions are thus a strong current and depth of 5 to 10m. As soon as the net touches the bottom, it is pulled up by the fishers and the fish are taken out.

In Kratie the chayra is occasionally operated in conjunction with an air compressor in order to scare fish out of hiding places in submerged tree root systems along the river bank and into the net.

Gender aspects

Women are commonly involved in weaving, maintaining and fishing with chayra nets. The chayra net is mainly used by ethnic Cham.

Main species caught

In Battambang: trey riel (*Henicorhynchus* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey linh (*Thynnichthys thynnoides*); trey kros (*Osteochilus hasselti*); trey kawmphleanh (*Trichogaster* spp.).

In Kampong Cham: trey ke (*Pangasius conchophilus*); trey khlang hai (*Belodontichthys dinema*); trey chhlang (*Mystus nemurus*); trey chhpin (*Barbonymus gonionotus*); trey chrakaing (*Puntio-plites* spp.); trey prama (*Boesemania microlepis*); trey kes (*Micronema* spp.).

In Kratie: trey kes (*Micronema* spp.); trey sandai (*Wallago attu*); trey chhlang (*Mystus nemurus*); trey prama (*Boesemania microlepis*); trey khlang hai (*Belodontichthys dinema*); trey ke (*Pangasius conchophilus*).

Legal aspects

The "chayra" is classified as a middle-scale gear (No. 28 KOR SOR KOR Table A II).



Giant castnet being paid out, Tonle Sap River, Kampong Chhnang



Chapter 12

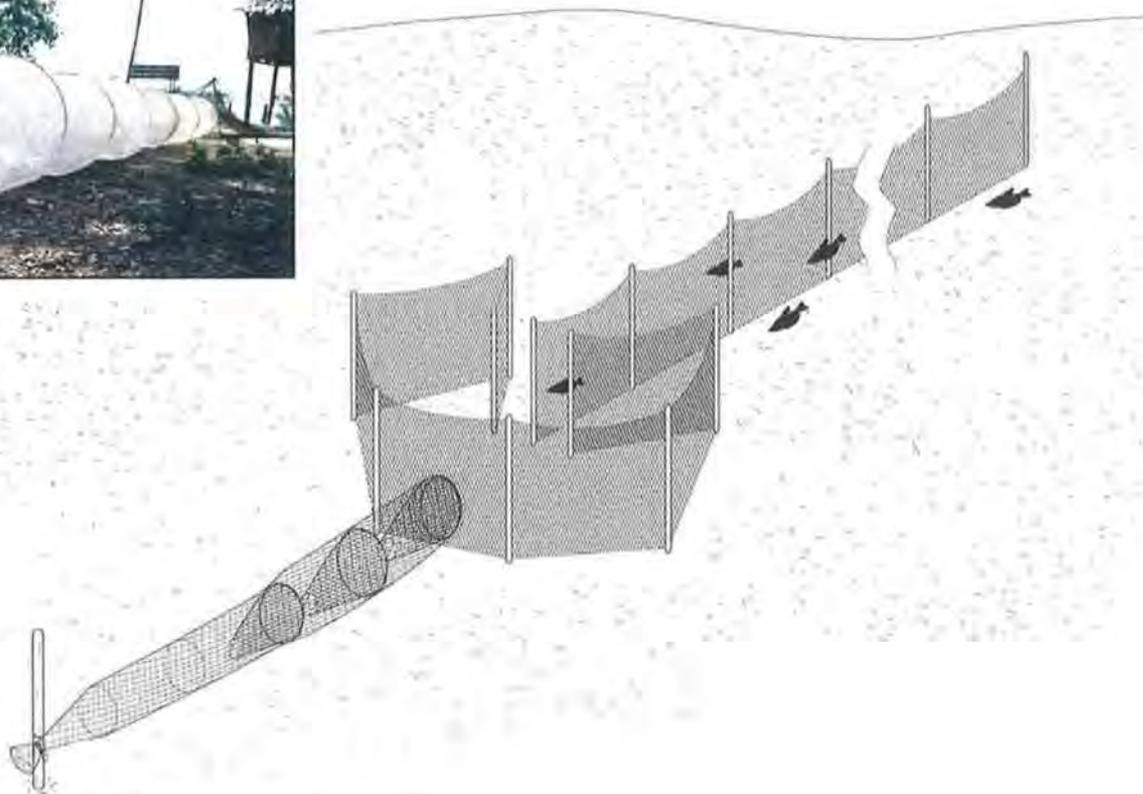
BAGNETS

12.1 Fyke Nets

12.2 Bagnets

Fyke Net Made of Mosquito Netting

Lu Sbai Mong



Description

The *lu sbai mong* fyke is very common in Kandal, Prey Veng and Takeo. It consists of a long tubular net with a succession of one or more entry cones and capture rooms made exclusively of mosquito netting (1 mm² meshes). A number of bamboo or iron rings give shape to the entry cones and the tube net. The hoops are connected to poles driven into the bottom in order to keep them in an upright position. At the end of the tube net a knotted string keeps the net closed.

Wings of variable length (5 to 300 m) are added; their height is between 2 and 3 m. The length of the tube net is 10 to 50 m. A rectangular entry space (5 x 2 m) is narrowed down to connect with the first circular (Ø 2 m) entry cone, which is 1.5 m long and narrows down to a 50 cm round opening. This gives access to a second 1.5 m long 'middle cone' with a start and end diameter of 1.5 m and 30 cm respectively. Then follows the 'killing' cone, which is initially 1 m in diameter and narrows down to a 10 cm wide opening leading into the capture room. Except for the entry of the first cone, where the netting is directly rigged to the netting walls, all other cones are kept in shape by iron rings, which are tied to the wooden poles stabilizing the net. The codend is tied to a wooden pole.

In the provinces a variety of names apply to this fishing gear: *uy, royal, lu, saiyoeun sbai mong, sai sbai mong, saiyoeun sbai*.

អ៊ុយ / រូយ៉ាល់ / លូ / សៃយ៉ែនសៃស្បមុង / សៃសៃស្បមុង / សៃយ៉ែនសៃស្ប

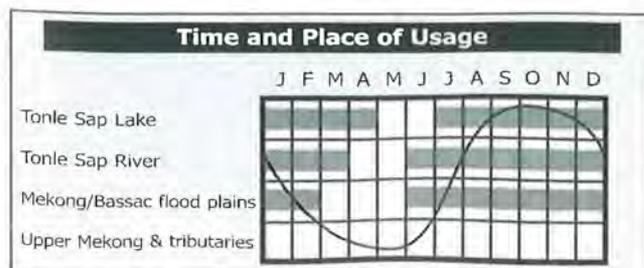
A more detailed description of the *uy* gear was given by Troeung (2000).

Cost

R. 250.000 (Battambang)

Operation

The fykes are widely used in shallow lagoons in rivers and in the floodplains where the water current is not





Lu sbai mong, Kampong Chhnang

too strong. It is used in water between 1 and 4.5 m deep. The side wings leading the fish into the mouth of the capture tube are adjusted in length and height according to the conditions of the fishing ground. Occasionally, if the fishing ground conditions allow for it, a fisher may set up two fyke nets in a row. The catch is removed from the codend by lifting it out of the water and releasing the closing knot. Troeung (2000) notes that many fry and fingerlings are caught. In Kampong Cham the gear was first recorded in 1999, but by 2001 - 2002 between 10.000 and 20.000 units were estimated to be operating.

Gender aspects

Men operate the net, but families help in construction, sorting and sale of the catch.

Main species caught

Catches all from eggs to large fish, but mainly fingerlings and small fish.

In Battambang: trey chhnnot; trey riel (*Henicorhynchus* spp.); trey riel khnawng veng (*Dangila lineata* and *cuvieri*); trey riel kanchrouk (*Botia* spp.); trey riel kantuy khmao (*Garra fisheri*); trey



Catch by lu sbai mong, Prey Veng

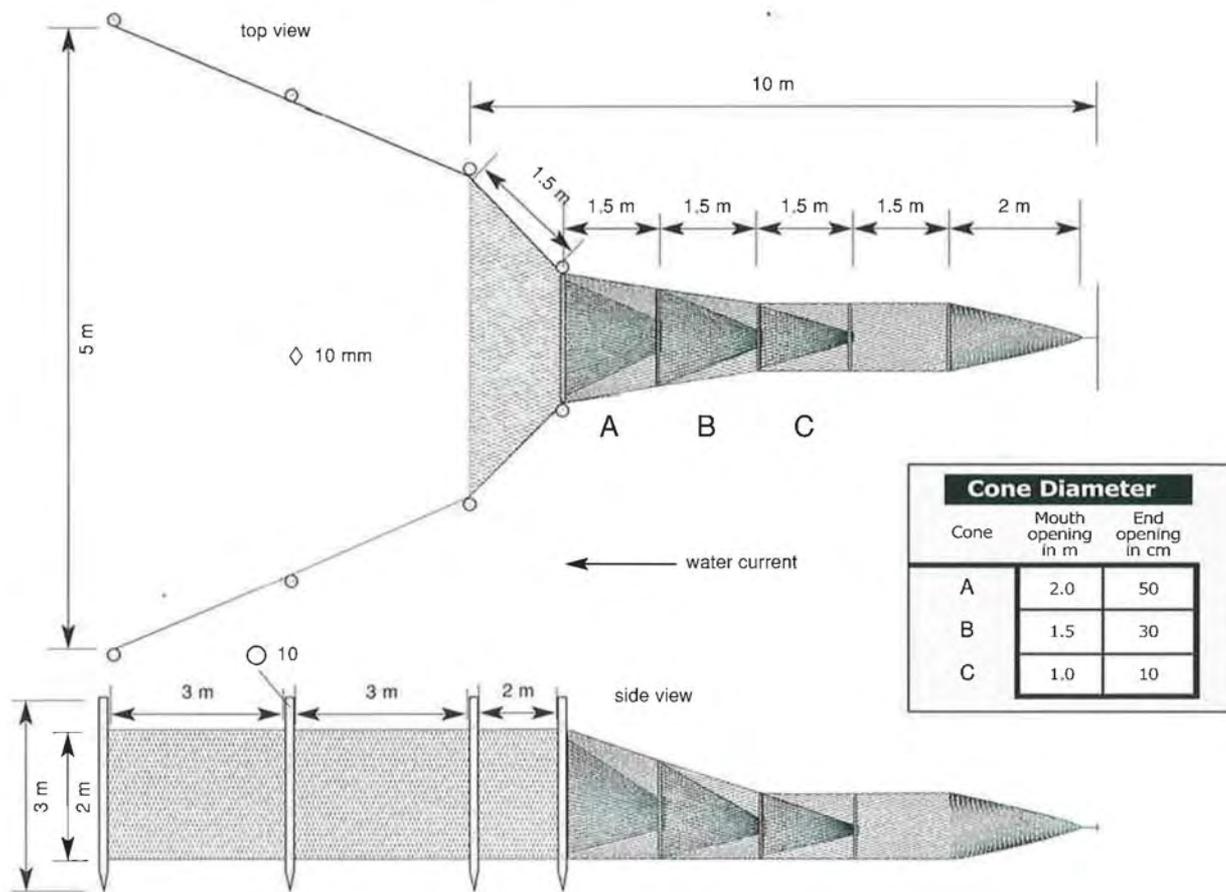
riel sraka kdam (*Cyclocheilichthys apogon*); trey riel slak russey (*Paralaubuca* spp.).

Legal aspects

This may be an illegal gear type, if the following applies: gillnets and all kinds of seines of a mesh size smaller than 15 mm are prohibited. (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, E).

Fyke Net Made of Mosquito Netting (cont.)

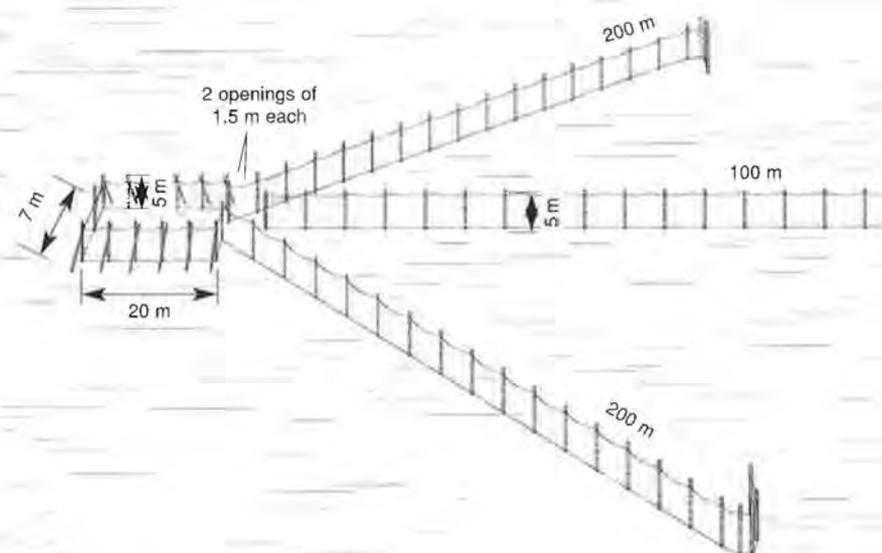
Uy



Uy operation, Battambang.

Enclosure Net with Lead Fences

Dai Trey



Description

The *dai troy* is an enclosure net that is used in many different sizes and modes according to the requirements of the fishing ground and the financial resources available to the operator. It consists basically of a lead fence, two wing fences and a pen or *dai*. The latter is a rectangular bagnet, open on top, with nets on three sides and on the bottom. The fourth side has two openings of 1.5 m formed by the three lead fences, through which fish can enter. The nets are set by stretching them between stakes driven into the bottom. While the rectangular capture room (20 m x 5 m x 7 m) uses a mesh size of 25 to 30 mm, the wings (up to 200 m long) and lead fence (up to 100 m long) only need a mesh size of 40 to 50 mm. Even if fish could swim through the meshes the leaders or wings, in practice they don't and are guided by them. It is claimed that the vibrations produced by the stretched netting in the water inhibits fish from passing through the net. The bottom of the pen consists of netting that is connected to the side panels forming a long rectangular bag.

Operation

Dai troy are operated in Battambang and Pursat in the Great Lake during the recession period. The nets are often positioned close to the mouth of rivers or streams or a head-land sticking out into the lake. The pen is

Size, Cost & Season						
Province	Length in m	Width in m	Wing length in m	Leader length in m	Cost in million R.	Season
Battambang	30	10	7 - 15	80	2.6	Dec-Mar
Pursat	20	7	200	100	2.5	Jan-Mar



Bag end of the net



Lifting the drive net towards the fish at the bag end.

emptied by lifting up the bottom net and driving the fish from the entrance to the other end of the pen, where they are taken out. Fish are sometimes actively driven along the wings and into the pen.

The number of crew members depends on the size of the operation. Small installations require 2 or 3 fishers, bigger operations will need 5 to 8 workers. Men are involved in constructing and operating the gear.

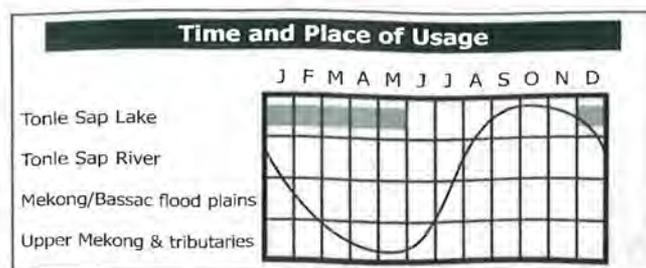
Target species

In Battambang: snakehead / troy chhdaur / troy diep (*Channa micropeltes*).

In Pursat: snakehead / troy chhdaur / troy diep (*Channa micropeltes*); snakehead / troy phtuok / troy raws (*Channa striata*); troy chhpin (*Barbonymus gonionotus*); troy pruel / troy krawlang (*Cirrhinus microlepis*); troy kaek (*Morulus chrysophekadion*).

Legal aspects

Not mentioned in the fishery law.



Big Stationary Bagnet

Loh Dai



Dai row

Description

A *loh dai* consists of two anchored bamboo rafts at the opening of the net, floating platforms or boats, a long bagnet and a boat or a floating work platform with a house positioned at the end of the bagnet. The two bamboo rafts and the boat or smaller rafts between them are linked together with bamboo poles that may serve as a sort of gangway. The distance between the rafts (up to 25 m wide) and the depth of the water determine the mouth opening of the bagnet. Above the entrance of the net another raft is positioned, holding a winch for closing and opening the net. A rope runs from the winch to the footrope and from there to an anchor a little distance upstream. The footrope of the net has a chain. The net is kept open by the force of the current and with the help of anchors. It needs to be closed regularly for maintenance or for pushing fish that have entered the net, downstream to the codend.

The bagnet can be more than 100 m long. The size of the net, as well as the size of the meshes, taper down from the mouth (mesh size 15 cm) to the codend (mesh size 1 cm). When catches are high the codend of the net is winched on to the platform with the house and emptied, or it is directly emptied into the boat of the fish buyer. When catches are low, an open-weave basket made of bamboo and rattan is attached to the last part of the bag.

Cost

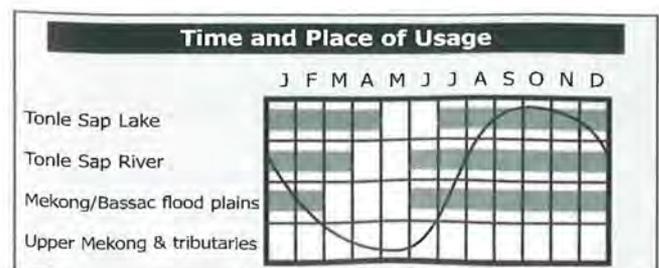
Three kinds of nets are used varying in mesh size and hence in price: from R. 335.000 to 600.000. Total equipment costs, including the three nets were on

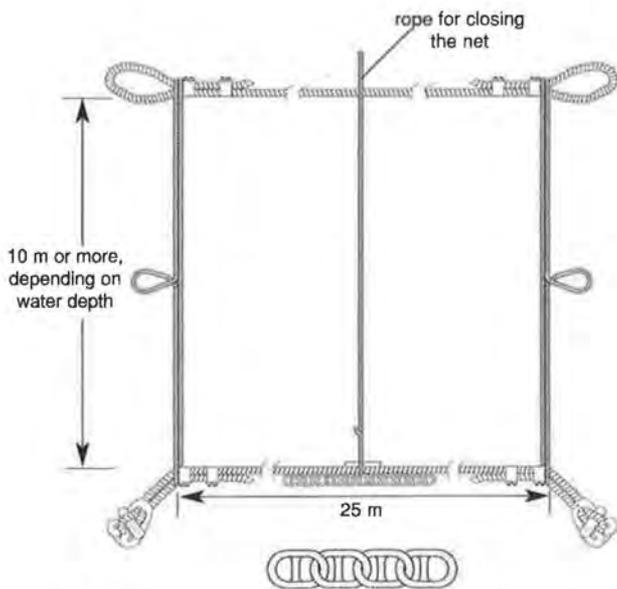
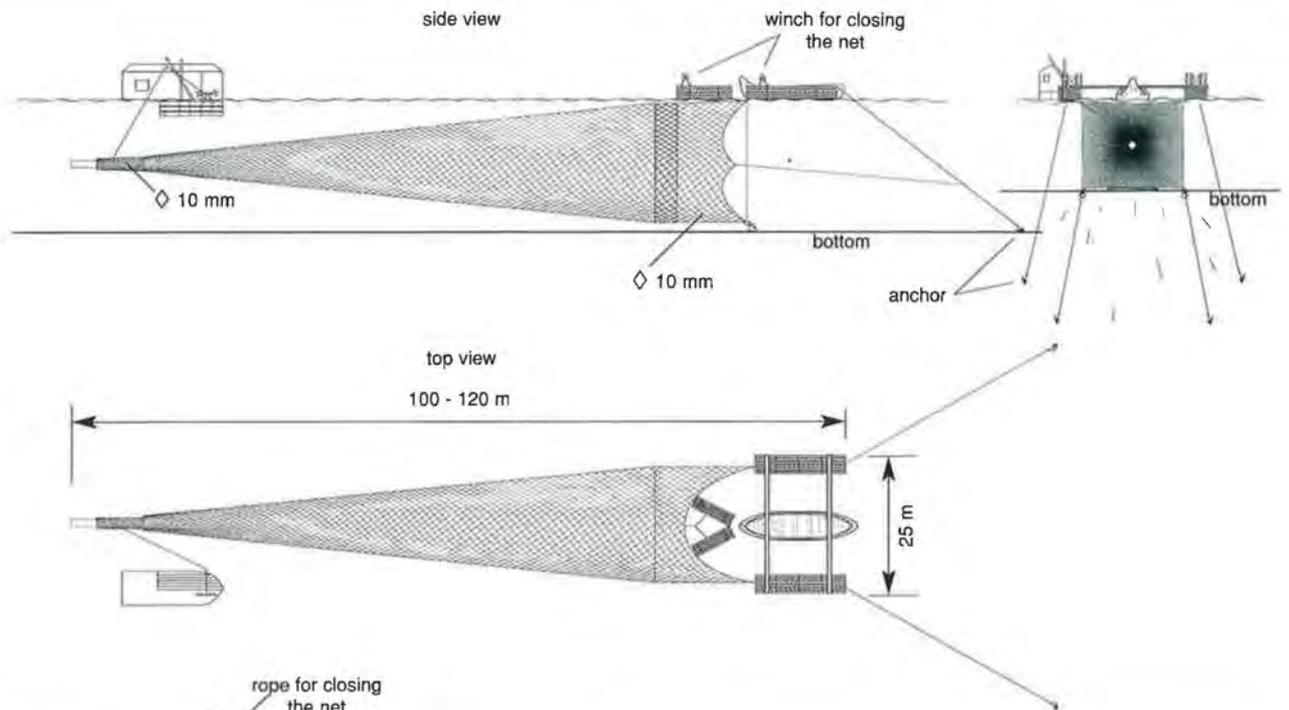
average R. 1.665.000. These figures are quoted from the study carried out on the economics of this fishery in the Tonle Sap river by Hap and Ngor (2001).

Operation

This fishery is located in the Tonle Sap river in Kandal and Phnom Penh provinces, where the river is reduced to a single, but deep, channel. *Loh dai* units are sometimes operated singly, but usually are joined with 2 to 8 others in line across the river. These rows are never broad enough to block the river, as they have to leave space for navigation. In 2003 there were 14 such rows with altogether 60 units spread out over a 30 km stretch of the river. In the past the number was higher and exceeded 100 units in 1938 - 39 (Chevey and Le Poulain 1940, Lieng *et al.* 1995).

Fish migrating from the Great Lake and upstream floodplains to the Mekong River are swept into the nets. When the migration is at its peak in the week before the full moon in January, the bags are emptied every 15 to 20 minutes day and night, and may hold 500 kg of fish or more per lift. On days with few migrating fish the frequency of lifting is much less and catches may not exceed 100 kg per day. The *loh loh*





dai fishery operates from mid October until mid March.

The main catch consists of small species dominated by trey riel (*Henicorhynchus* spp.). Much of the catch is used for making a fish paste (*prahoc*), which is widely eaten in rural households.

Gender

A *loh dai* unit is often owned by a family, which operates the gear with a number of hired hands. They tend to live in the house on the floating platform for the duration of the fishery. The women are invariably in charge of the finances and the sale of the fish, who often are women as well.

Main species captured

Trey riel (*Henicorhynchus* spp.); trey slak russey (*Paralaubuca* spp.); trey kros (*Osteochilus hasselti*); trey kanchrouk (*Botia* spp.); trey linh (*Thynnichthys*



thynnoides); trey khang hai (*Belodontichthys dinema*). In addition, more than 50 other species have been recorded.

Legal status

A "loh dai" unit is classified as a large-scale fishing gear or fishing lot (No. 028 KOR SOR KOR Table A III). These lots are auctioned by the government to the highest bidder for exclusive exploitation over a 2-year period.

Big Stationary Bagnets (cont)



Row of big stationary bagnets in the Tonle Sap river. This is locally known as the dai fishery.



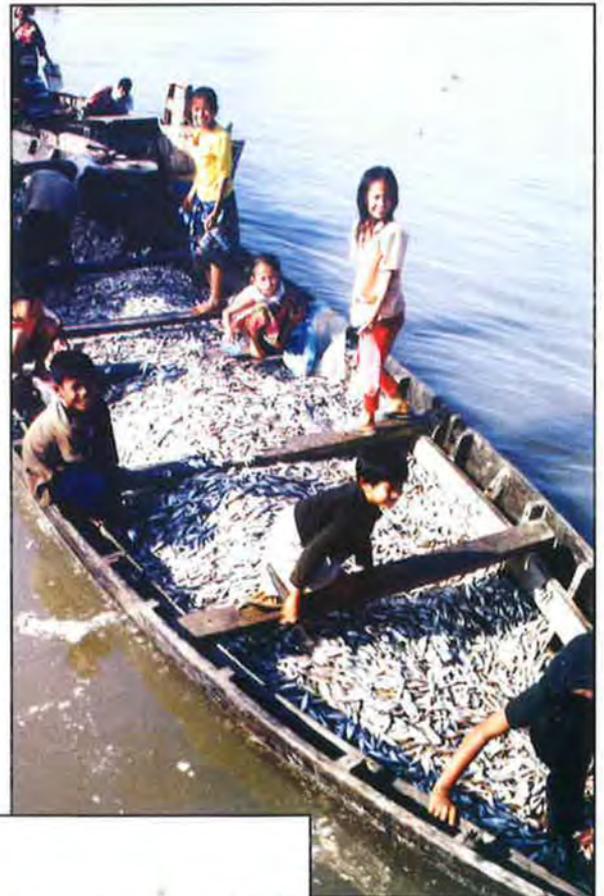
Pontoon where the catch is collected from the codend.



Fish in the bagnet are concentrated into the codend prior to hauling out.



Retrieving the codend.

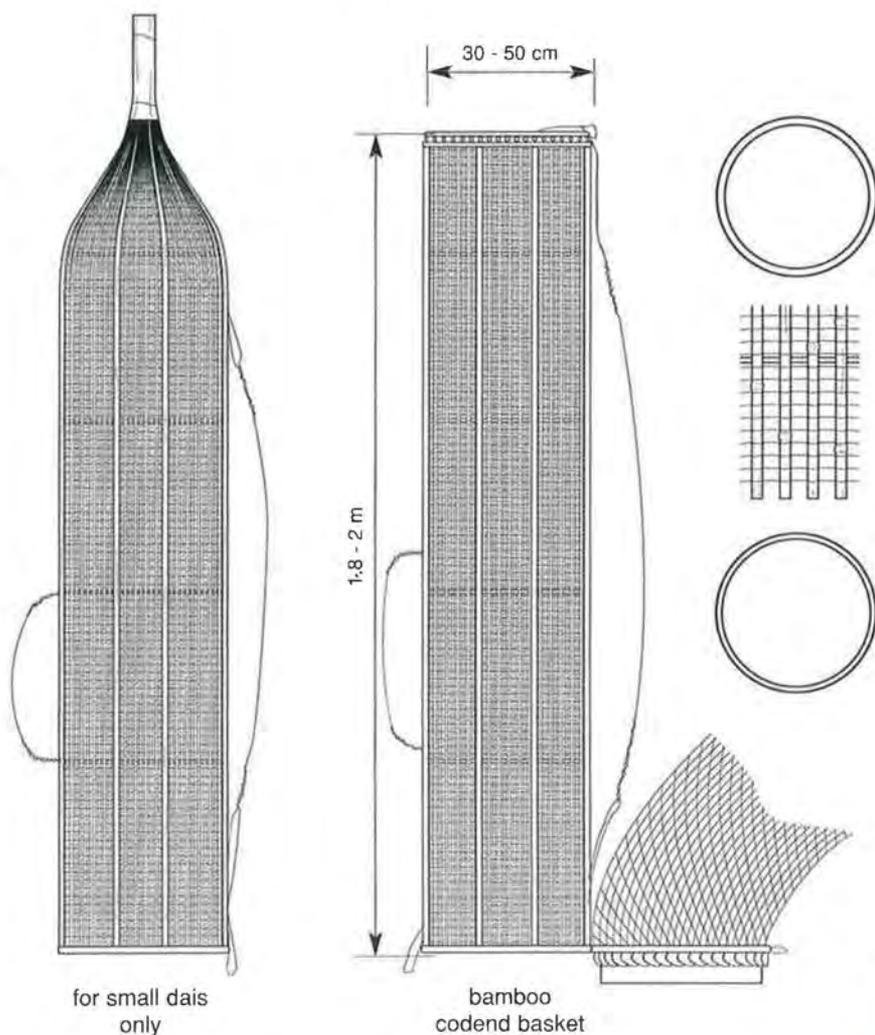


Fish are loaded into boats for taking back to the landing site, where buyers eagerly await them.



Big Stationary Bagnet (cont.)

Loh Dai



VARIATIONS

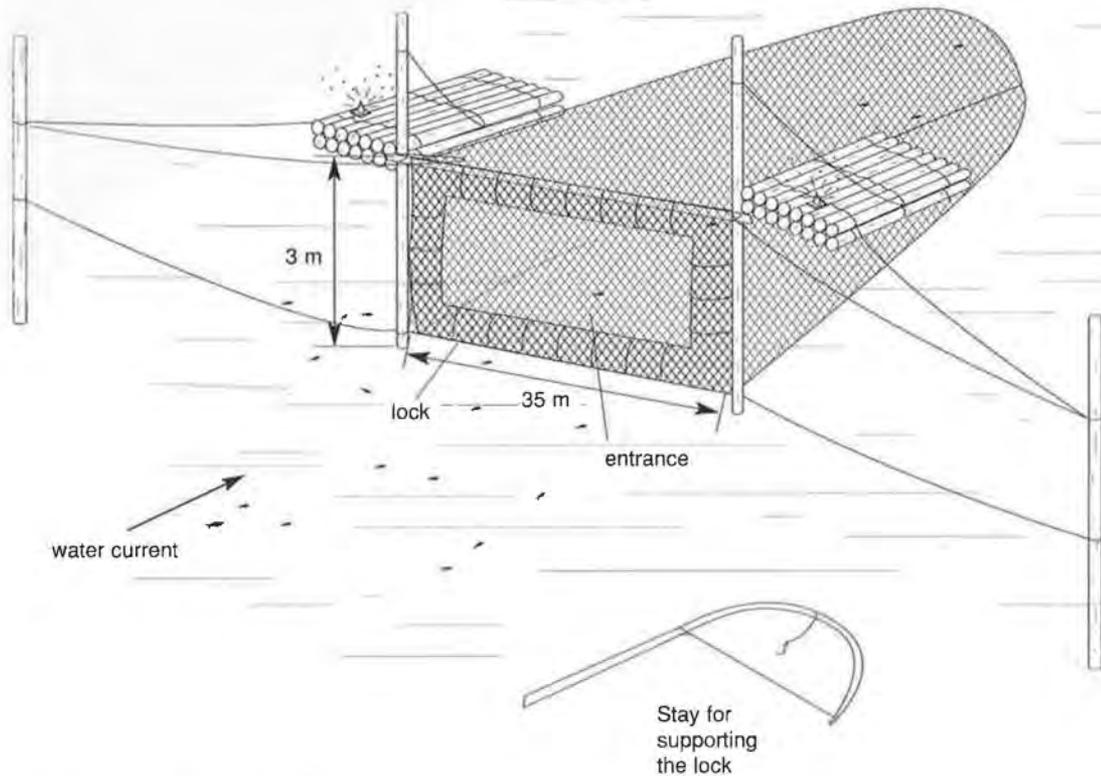
Dai trey linh / ដាយត្រីលីញ
Stationary bagnet

The *dai trey linh* is the same as the *loh dai* bagnet described above. The net can be 140 m long. It is used in Kandal and Prey Veng in the closed season from June to September under proclamation No. 0040 PROR KOR KOR SOR KOR of 1989. The location for its use is specified in Annex I of the proclamation. Recent auction prices for these fishing lots have varied from R. 2.50 to 5.55 million per year.



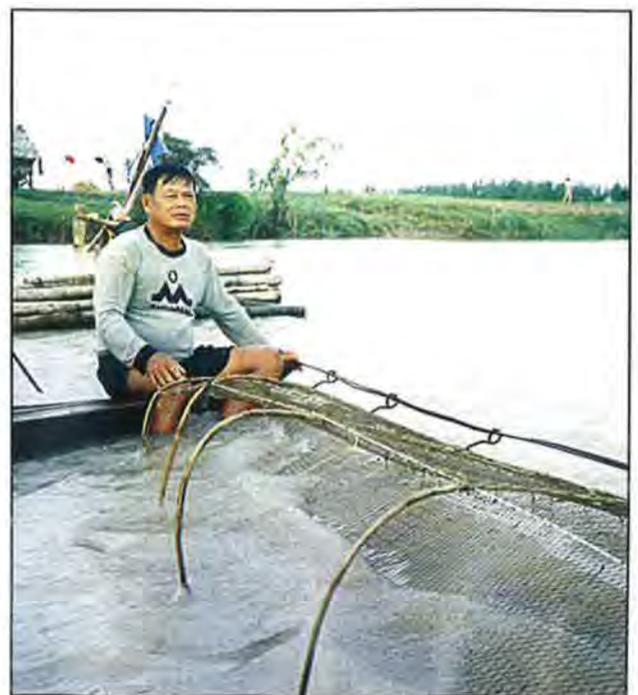
Dai codend basket being emptied. The baskets are used when fish catches are low.

Dai bongkong



Dai bongkong / ជាយបង្កង
Freshwater prawn bagnet

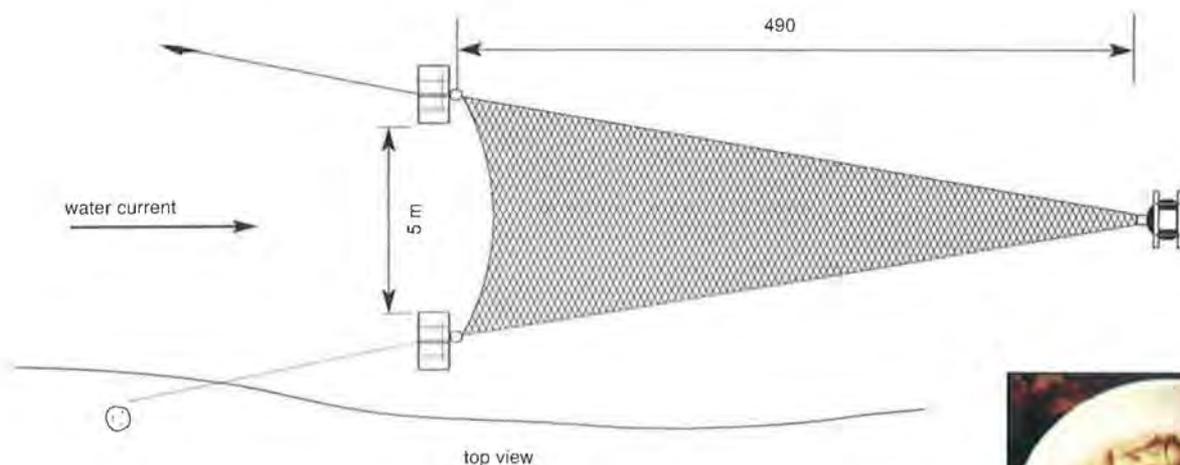
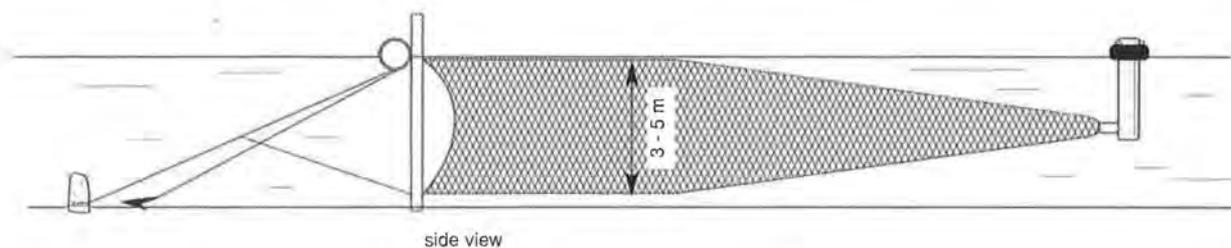
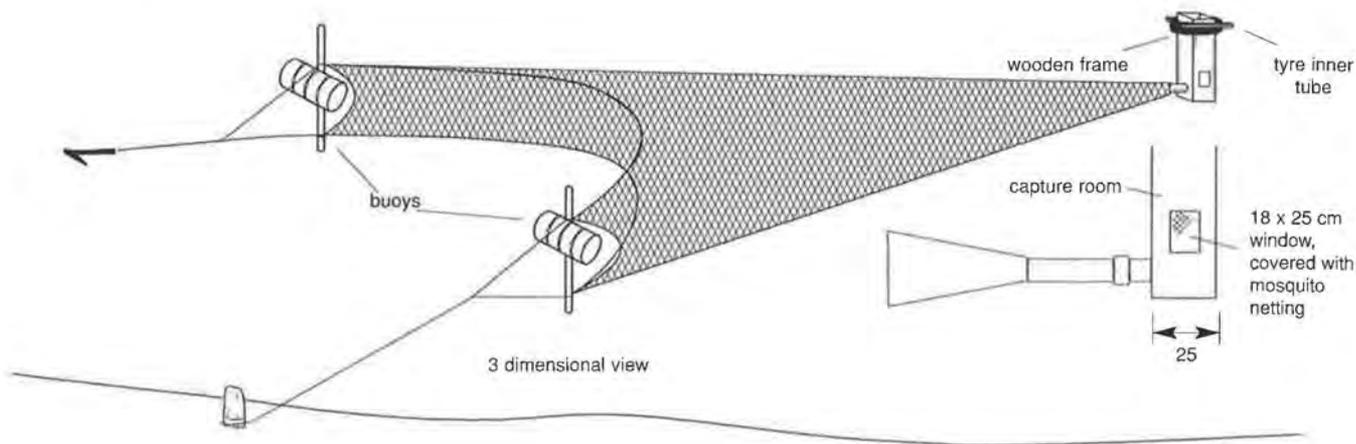
This gear has been reported from Prey Veng and Takeo. It is only 8 to 12 m long and closed at the bag end. The rectangular mouth opening is fixed by bamboo poles and has a width of 20 to 35 m and a height of 3 m. The mouth of the net has metal or bamboo stays that make it stand up and curve backward into the net. This is to prevent the giant freshwater prawns (*Macrobrachium rosenbergii*) that have entered, from leaving. The prawns are removed from the net by opening the upper part of the net. At the sides of the mouth sometimes a vertical basket trap is placed. Small rafts are tied to the poles of the mouth opening. These rafts carry lights that will attract the prawns at night. The period around the dark moon is best for fishing. This bagnet is classified in the law as a large-scale fishing gear and fishing lot (No. 028 KOR SOR KOR Table A III). Recent auction prices have varied from R. 1.1 to 15.2 million per year depending on the authorized location of the net.



Dai bongkong, Prey Veng

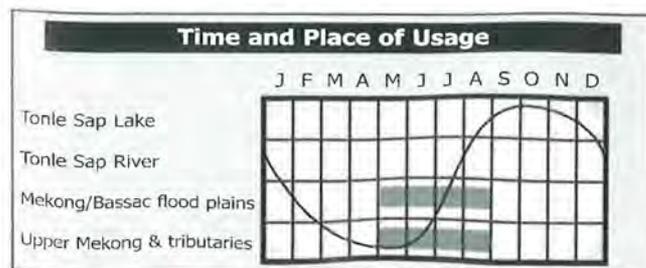
Fry Bagnet

Dai Kone Trey Pra



Description

A fry bagnet has the shape of a trawl net with a 5 m wide mouth and a length of 10 to 15 m. It is made of mosquito netting. The codend opens into the side of a vertical square metal tube, which has a closed bottom and an open top. The top sticks out above the water and is kept afloat by the inflated inner tube of a tyre. The vertical metal tube has a window covered with mosquito netting in two of its sides, which allows water that comes in through the codend to flow out of the tube. The fry tend to swim up inside



the tube to the surface, from where they are easily scooped up.

The wings of the net are attached to wooden poles that are driven into the riverbed and connected by ropes to anchors. To further stabilize the set-up an empty tank is attached to the poles as a float. The force of the water current keeps the net open.

The bagnets are installed in rows of 1 to 3 units at a distance of 5 to 40 m from the river bank. The units are attached to each other. Most rows have two units. The distance from one bagnet row to the next is 50 to 100 m.

Cost

R. 480.000 to 600.000

Operation

The purpose of this fishery is to catch fry and fingerlings of the river catfishes *trey pra* (*Pangasianodon hypophthalmus*) and *trey pra kchau* (*Pangasius bocourti*). These catfishes spawn upstream in the Mekong at the onset of the rainy season, mainly in June and July but extending into August. Enormous numbers of fry of many other species are also caught, but discarded. The catfish fry are put in hapas in the river and fed with egg yolk before being sold to aquaculture farms, mainly in Viet Nam.

The fishery is conducted mainly in the Mekong river from Kratie to the Vietnamese border and also in the Mekong delta in Viet Nam. The fishery is illegal, but continues on a large scale because it is so lucrative. In Cambodia an estimated number of 948 bagnet units operated in 1998 (Ngor 1999 and Van Zalinge *et al.* 2002).

Gender aspects

Families often engage in this fishery, camping out on the river bank near their net(s).

Target species

Fry and fingerlings of the river catfishes *trey pra* (*Pangasianodon hypophthalmus*) and *trey pra kchau* (*Pangasius bocourti*). Fry and fingerlings of many other fish species are accidentally caught in the process and discarded.

Legal aspects

The fishery was declared illegal in 1994, but can still be allowed under a research license issued by the Ministry of Agriculture, Forestry and Fisheries. It was declared illegal in Viet Nam in March 2000.



Capture rooms with tubes and frames



Capture rooms



The capture rooms of two catfish fry bagnets. One row may have from one to three bagnets ('dais')



Catfish fry are sorted directly into special net cages, placed in shallow water near the riverbank. They are fed with egg yolk.

River Barrage with U-shaped Bagnets

Thnous



Fishing lot No. 9 in Kampong Chhnang. Barrage with 3 yors, sorting platforms and pens.

Description

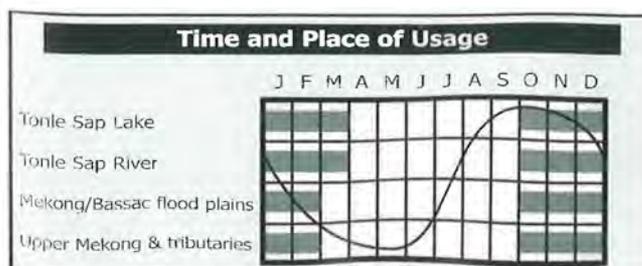
Barrages

A barrage as such is not a stand-alone fishing gear. It is one of the key elements of a larger fishing operation that comprises other key functional elements, such as *dai* bag nets, or / and *yor* / *rak* bag nets, pens, capture rooms, bamboo basket traps, aerial net traps and even live-wells for preserving the fish. The whole fishing operation associated with a barrage is a sequence of successive, complementary and seasonally adjusted fishing techniques. There are different types of barrages used in different fishing grounds, whether in bigger river arms, streams and creeks. Detailed descriptions of each legal large-sized barrage operation in the fishing lots around the Great Lake and especially in Kampong Chhnang are provided by Fily and D'Aubenton (1965).

Each *thnous* barrage bag net is of unique construction, size and shape according to the physical conditions of the fishing ground. The construction elements are exactly the same as described for the *yor* / *rak* operation, see below. The *thnous* barrage closes off the entire width of a river channel. A navigation gate that is by law at least 4 m wide, allows for the passage of smaller, locally used boats. The barrage is made of large wooden poles, sometimes, entire tree trunks, driven vertically into the riverbed at intervals of 2 to 4 m and strengthened by horizontal beams and supporting struts at an angle of 45 degrees. On the upstream side of this framework a screen of bamboo fencing is fixed, extending across

the whole length and breadth of the barrage. This fencing is made out of bamboo strips about 10 mm thick and spaced 8 to 10 mm apart. Depending on the width of the river channel the barrage is equipped with 1 to 4 specific inlets or mouth openings leading to particular capture facilities. These can be *yor* nets, *dai* nets, pens or capture chambers. The entire installation is assembled using rattan, wire and nylon ropes. Pens and capture rooms - as used traditionally - were directly connected to the barrage by means of a short connecting tube with a no-return device. The bag nets used nowadays are connected to a capture platform, which is generally closely linked to one or more pens and live-wells. Live-wells are usually boat-shaped and made of wooden poles and bamboo fencing, which generally rise above the water surface by more than 1.5 m.

Once the barrage has been completed a ceremony is held to pray for good fortune. A spirit house is placed on top of it and is supplied with food items and drinks that are regularly refreshed.





Yor operation: moving the fish towards the pen, Prey Veng



Yor operation: moving the fish towards the pen, Kampong Thom

VARIATION

Yor / យ៉រ

Rak / រ៉ាក់

The yor or rak fishing installation consists of a wooden barrage crossing a river and a long bag net, whose codend is lifted on to a floating platform located next to it. The barrage is 8 to 10 m high and blocks the entire river, which in Kampong Thom is between 80 and 100 m and in Kampong Chhnang between 100 and 350 m wide, but usually smaller in other provinces. The barrage is made out of strong wooden poles or even entire tree stems including supporting poles and vested with bamboo fences and sometimes covered with mosquito netting. The bag net attached to the opening in the barrage fence is U-shaped (i.e. open on the top side), 2 to 3 m wide, 4 m deep and between 50

and 120 m long. In Kampong Chhnang the mesh size varies from 40 mm near the entrance to 15 mm near the capture room. Sometimes, the latter part is made of mosquito netting. A wooden or bamboo framework maintains the net in operational position. Sometimes horizontal bamboo poles are arranged next to each side parallel to the bag net to serve as gliders for a net lifting beam during the fishing operation.

In small barrages in Battambang sometimes a bamboo basket is placed directly behind the opening in the barrage, in which the fish are collected. This system is called *prueh sab* (see photo).

River Barrage with U-shaped Bagnets (cont.)

Cost

Yor / Rak: R. 3.500.000 to R. 4.000.000

Operation

Barrages are commonly found on rivers and streams, but the really large barrages are mainly found in the fishing lots situated in the Tonle Sap river delta, which stretches from the mouth of the Great Lake to about 35 km north of Phnom Penh. The delta is an area, where the Tonle Sap river is split into numerous branches, river arms and channels. Fishery regulations allow the erection of barrages only on certain river branches. This is to satisfy navigational requirements and for fishery management purposes. As the barrages are quite effective in capturing fish migrating from the Great Lake to the Mekong river, some river branches are left open to allow sufficient fish to survive till the next spawning season.

The barrage is used in fishing lots only during the flood recession period, mainly from November to March. In the past capture chambers were entirely made out of wood and bamboo fencing. Nowadays barrage operators prefer to use long yor bag nets.

The live-wells serve as floating cages not only to keep the fish alive, but also to transport them as floating boat cages to markets in Phnom Penh and even to the Vietnamese border.

The amount and composition of the catch of the barrage operations does not depend primarily on the width of the river channel or the type of construction of the barrage, but in some way on the depth of the water body and velocity of the water current (Fily and d'Aubenton 1965).

Yor or *rak* gears are not only used at the large barrages, they can also be found at the outlets of small streams in most of the country, although mostly in fishing lots during the recession period. Most of the *yor* operations are found in the provinces around the Great Lake and especially in Kampong Chhnang province.

During the early fishing periods the operators may use a bigger mesh size since at that time the expected catch is composed of bigger specimens and the water current is stronger. The sides of the U-shaped bag net may reach out of the water by up to 2 m, to prevent fish from jumping out of the capture area. To move fish from the bag net along to the capture chamber, workers in boats at each side of the net lift the net above the water by raising a pole that is positioned below the net, using a hand- or an engine-driven winch. The ends of the pole

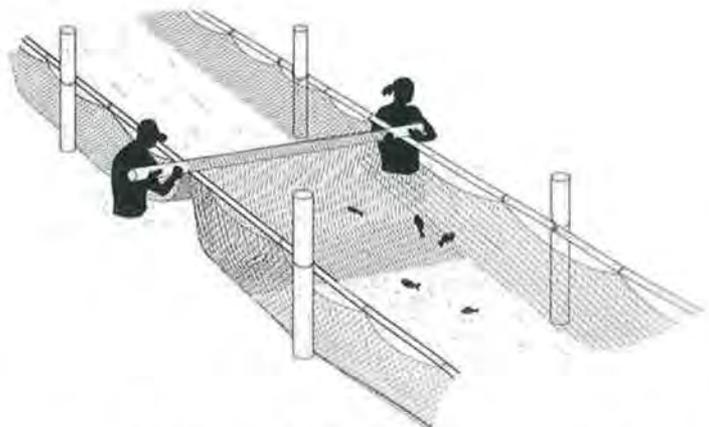


Yor leading to a pen, Kampong Thom

are usually placed on the boats (or otherwise on the gliders along side of the net as described above). By moving the pole from the mouth of the net to the capture chamber the fish are pushed along. The fish are sorted into large and small specimens by means of a large meshed piece of netting, and guided into live-wells or taken out and sold to fish traders. The frequency of this exercise depends on the strength of the migration. Every *yor* operator has a live-well to keep the higher valued fish to sell convenient.

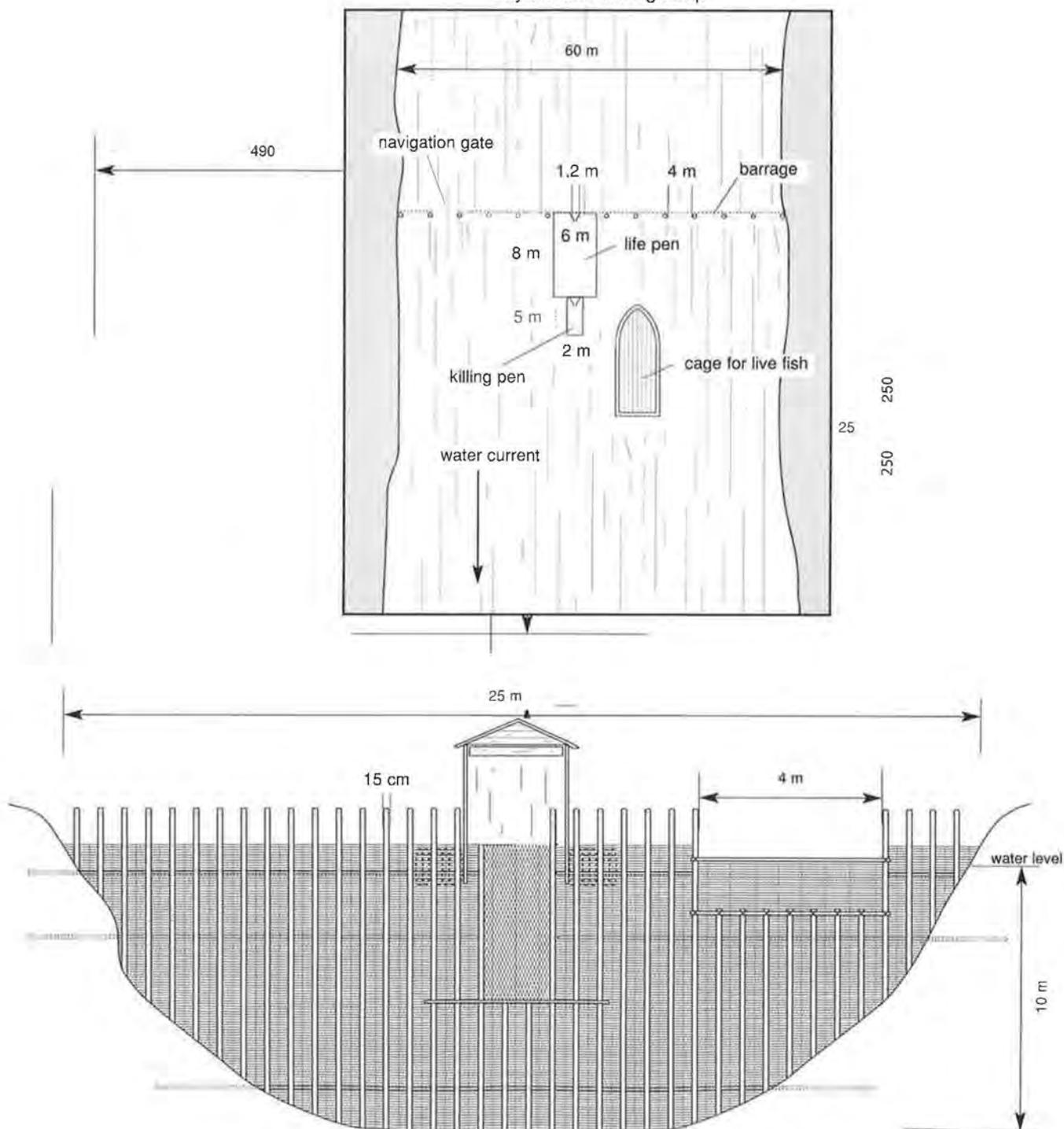
Gender aspects

Only men are engaged in constructing and operating the gear.



Yor operation: moving the fish towards the capture chamber

Lay-out of a barrage trap



Main species caught

In Kampong Chhnang (1998 - 99): trey chhkok (*Cyclocheilichthys enoplos*); trey riel (*Henicorhynchus* spp.); trey pra (*Pangasianodon hypophthalmus*); snakehead / trey chhdaur / trey diep (*Channa micropeltes*); trey linh (*Thynnichthys thynnoides*); trey krum (*Osteochilus melanopleurus*); trey khlung hai (*Belodontichthys dinema*); trey kaek (*Morulus chrysophekadion*).

Legal aspects

Classified as large-scale fishing gear in the law (No.

028 KOR SOR KOR Table A III) to be auctioned off once every two years. Each lot has a "burden book" that specifies the details of the location, timing and operation.

All kinds of fishing barriers in which the distance from one bamboo slat to the next is less than 1.5 centimeter are disallowed (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, H).

River Barrage with U-shaped Bagnets (cont.)



Barrage with yor in Kampong Chhnang



Barrage with yor on a small river



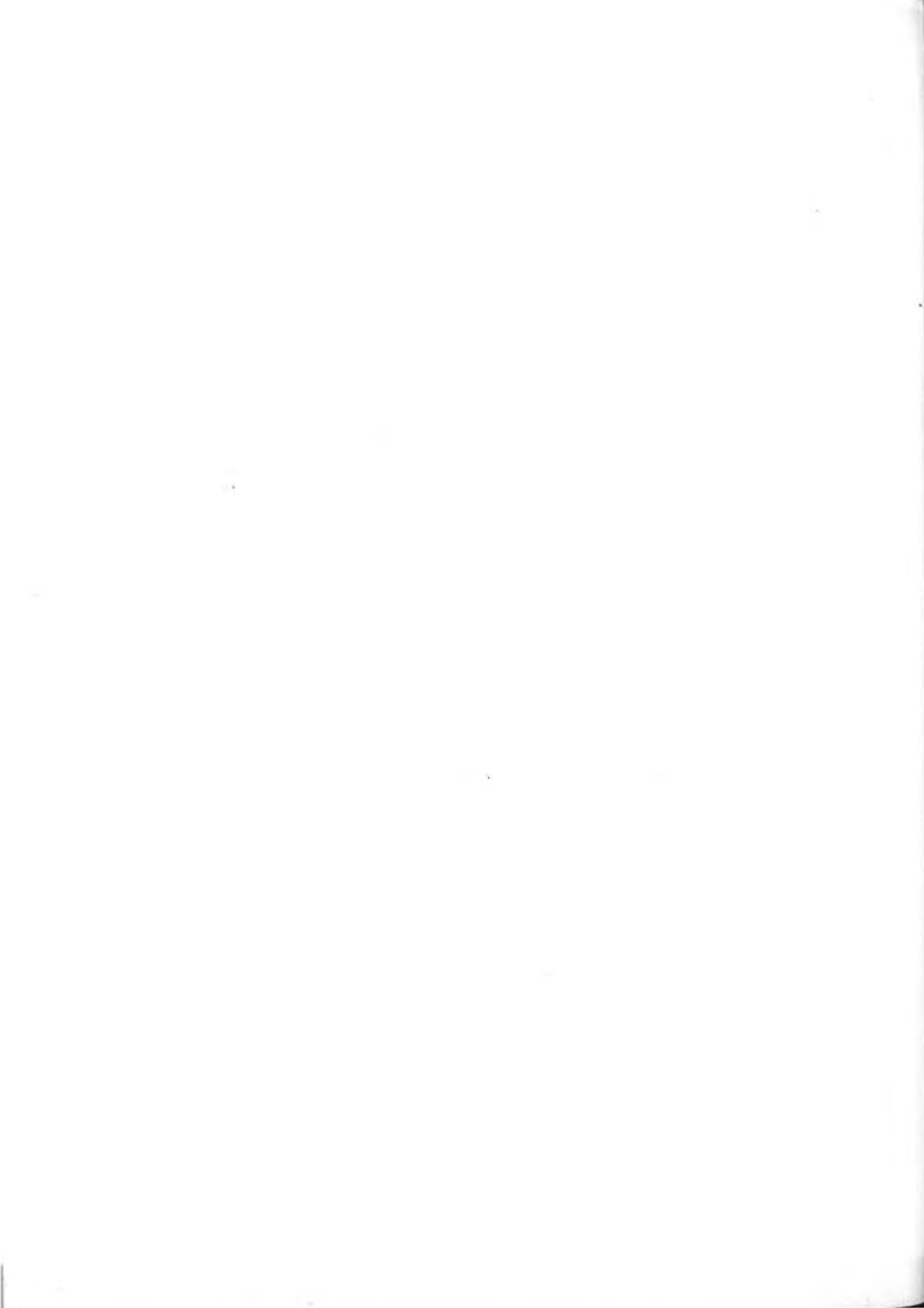
Barrage with yor entrance. Note the spirit house on top of the barrage and the navigation gate on the right. In the foreground right is a cage with dead fish. It is kept there to produce a smell in the water downstream of the barrage to attract catfish, which will be caught when the river is swept 'kumnie'.



Yor leading to a pen, Kampong Thom



Bamboo basket placed directly behind the barrage called pueh sab on the Sangke River in Battambang



Chapter 13

ANAESTHETIC METHODS



- 13.1 Fishing with Explosives
- 13.2 Fishing with Poisons
- 13.3 Electro-fishing

Explosives

Kroeuung Phtuh



Photo: J. Adden, courtesy Fauna Fibra International



One-armed fisher in Stung Treng

Description

Dynamite and hand grenades are illegally used in fishing. Explosives are thrown into schools of fish or into pools where fish congregate. The explosion stuns the fish that subsequently drift to the water surface from where they can be scooped up. If the explosion damages the air bladder, the fish sink to the bottom of the river and fishers have to dive to retrieve the fish. This type of fishery is indiscriminate and destroys fish eggs, larvae, juveniles and adults alike, as well as fish habitats.

Operation of the gear

Like in other countries that have been affected by armed conflicts, the use of explosives for fishing was rampant in Cambodia during that time. The peace process, the reintegration of soldiers into civil society and the lesser availability of weapons have strongly contributed to the reduction of the use of explosives in fishing. It is not uncommon in the upstream parts of the Mekong and its tributaries to observe fishermen with lost fingers or even hands and parts of their arms as silent testimonies of explosive fishing. Explosives have been used at any time of the year, but more so in the dry season. Their use also depends on the availability

of the explosives and absence of law enforcement.

Gender aspects

Only men have been reported to use explosives for fishing.

Target fish species

Any kind of fish.

Legal aspects

The use of "explosives and explosive stuff" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, A).

Fishing with Poisons

Bompul Trey



Poison used in Stung Treng

Description

Two types of substances are used for chemically knocking out fish: agro-industrial pesticides and chemicals broadly known as 'ongtrin', fish poisons contained in natural fibers and plants. A cactus like plant without thorns, called *choeung loat dai* has been traditionally used for fish poisoning. It is commonly planted around pagodas as a natural fence. The plant grows up to 2 m high with the stem reaching a diameter of 15 cm. All parts of the plant, except the roots, are chopped into small pieces and used in fresh condition for fishing. A report by Dy Phon (2000) mentions another 16 plant species, of which the leaves, roots, bark, fruit or seeds can be used for poisoning fish.

Carbide is a chemical that produces a foul smelling gas when mixed with water. Plastic bags containing small amounts of carbide are sometimes used to scare fish out of small bodies of water into a canals that lead the fish to traps (see section 16.2.1).

Cost of the gear

Depends on the doses applied and the size of the operation.

Operation

Agro-chemical poison is used preferably in closed off

water bodies towards the end of the dry season, when fish concentration is higher than in the flooded season and no escape into unspoiled water layers is possible. Poisons generally force fish to come to the surface. As soon as fish appear they are scooped up. The use of agro-chemicals can be very harmful. Poisening and death are occasionally reported from rural areas as a result of eating fish captured with poisons.

In the case of plant poisons, the chopped particles of the *choeung loat dai* are spread into the closed off water body and moved around with a paddle in order to increase the mixing and leeching out of the poison. As soon as fish get dizzy and start stranding on the shore they are collected by means of a hand scoop net or even by hand.

Gender aspects

Not known.

Target fish species

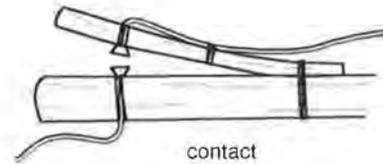
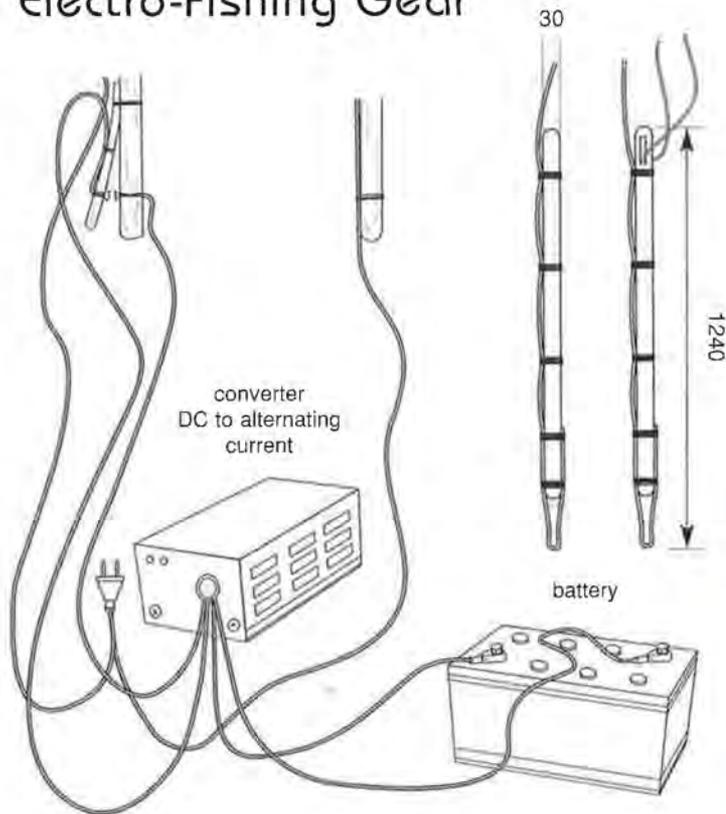
All fish affected by poisons.

Legal aspects

The use of "all kind of poisons" is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, A).

Electro-fishing Gear

Chork Trey



Electro-fishing, Kampong Chhnang

Description

The gear consists of a source of electric current, generally a battery or in bigger operations a generator, a converter and two iron rods: one functioning as the anode (positive electrode), the other as the cathode (negative electrode). The rods have insulating wooden handles. When switched on, an electric field is established in the water between the electrodes. The stretch of water where the current may be effective depends on the power output. This is locally called the 'hot' method. The "cold" method is used in deep water (up to 8 m) to capture demersal fish. Bare copper wires are attached to lead sinkers which penetrate a little into the mud. The generated current forces the bottom fish out of the mud. The fish then float up toward the surface, from where they are collected with a scoop net.

Cost

R. 70.000 to 200.000. Electricity may also be generated from a multipurpose motor.

Operation

The electrical field is strongest right between the two electrodes. Fish in the marginal zones may get frightened and escape. Inside the effective part of the electrical field the fish swim toward the anode and become stunned. Then they begin to sink and must therefore be caught immediately. For this reason the

anode is often made into a scooping device with which the fish can be easily gathered. Electric fishing can be undertaken either by wading through shallow water or from a boat. It is frequently used close to obstacles and inundated vegetation, where fish are hiding and other gear may not be used so easily and successfully. The "hot" method is applied throughout the year. However, electro-fishing in deep still waters (the "cold" method) takes place from December to June only.

Being suitable for fast action, electro-fishing gear is very popular with poachers penetrating into fishing grounds prohibited to them, such as the fishing lots and conservation areas.

Gender aspects

Only men have been reported to use this gear.

Target species

Mainly snakehead (*Channa* spp.), but any other fish present will be affected and caught.

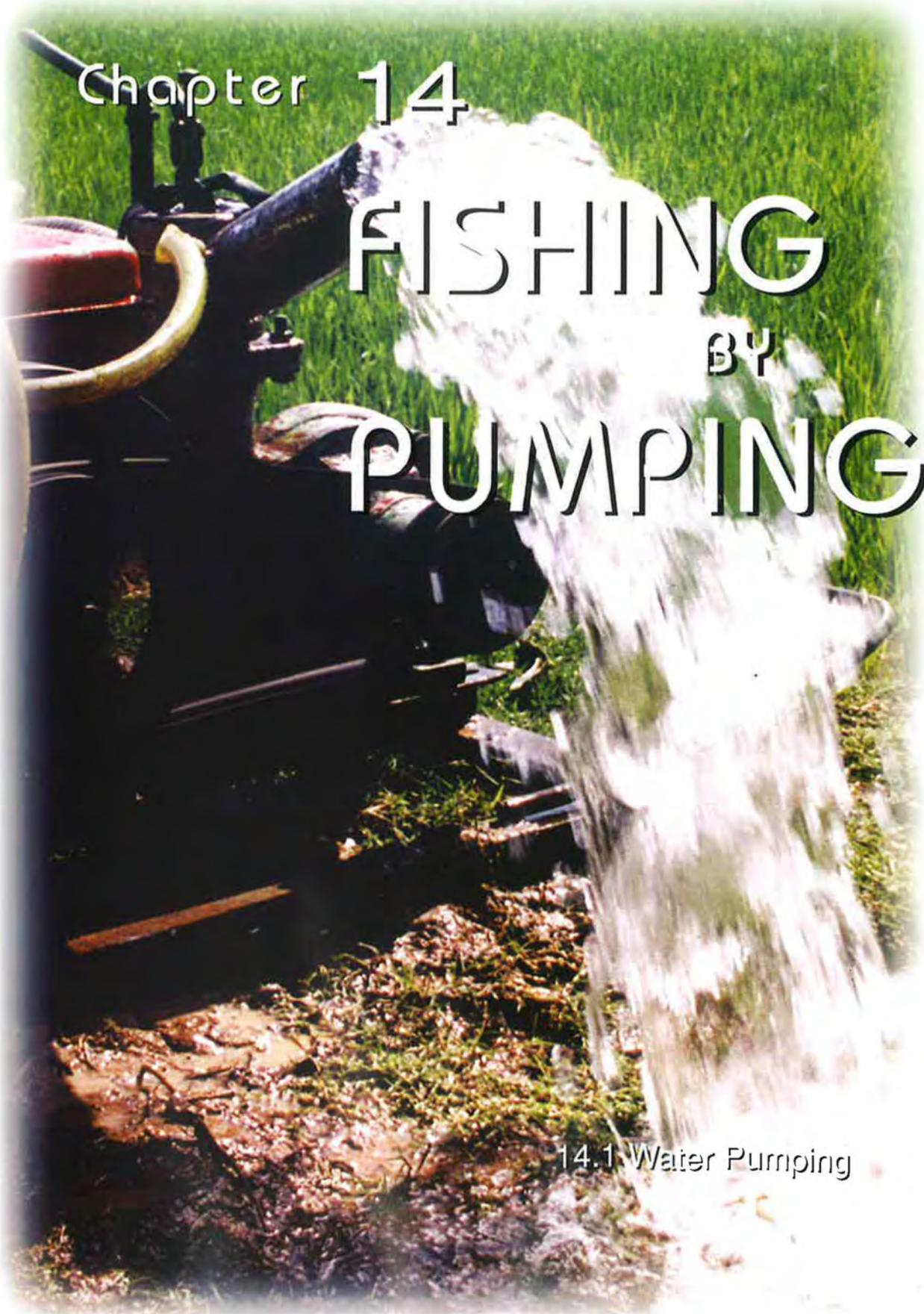
Legal aspects

The use of electrocuting fishing gear is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, A).

Chapter 14

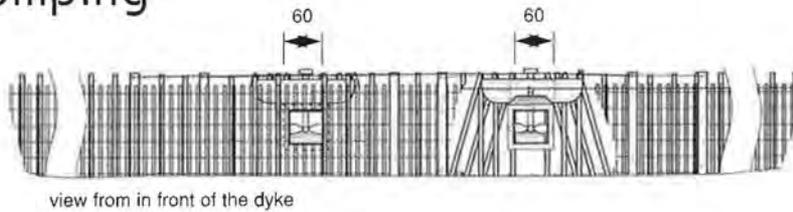
FISHING
BY
PUMPING

14.1 Water Pumping



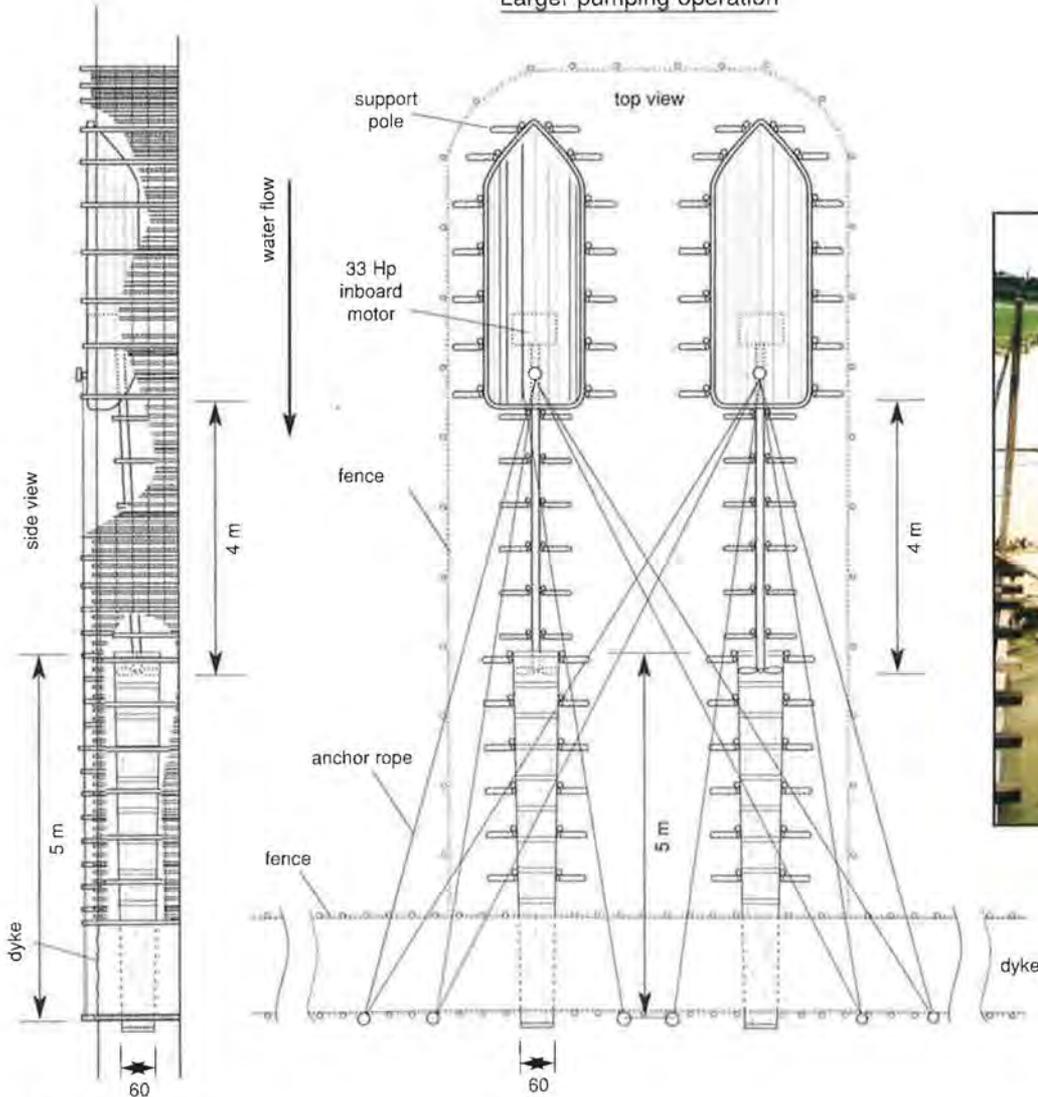
Water Pumping

Buom tuk / Baet tuk



view from in front of the dyke

Larger pumping operation



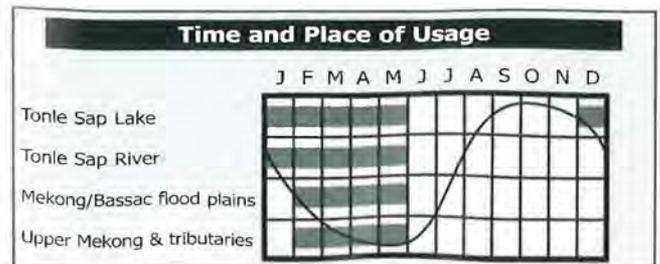
Prek Da stream, Battambang

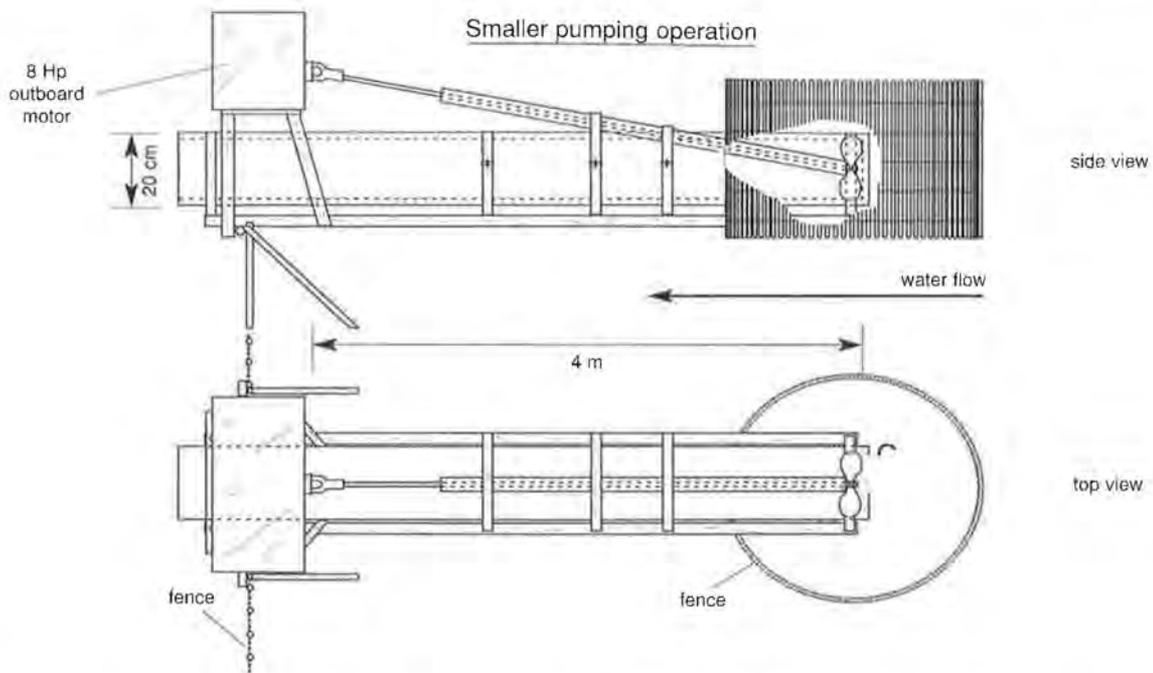
Description

Water pumping is a wide spread fishing strategy in the dry season. Engine operated water pumps (*buom remreus tuk*) are used in larger areas, such as recession ponds or smaller lakes or cut-off parts of streams and rivers, while small hand bails, buckets or plates (*baet tuk*) are used in small water bodies.

In this fishing technique a stretch of a canal or other water body is closed off by setting up two mud dykes at a distance of between 5 to 20 m from each other. At a water depth of, for instance, 70 cm, each of the dykes should have a height of 1 m. These dykes are located in the same places each year, which facilitates rehabilitation.

When the dykes are initially erected, an entrance gap in each dyke is left to be closed off later. About a week before sealing off the dykes completely, some brushwood is placed between the two dykes. This provides the fish with an attractive refuge in an otherwise clean irrigation canal. Once the gates are





sealed off the enclosed water is bailed out with mechanical water pumps, simple buckets or handled swing pumps suspended in tripods.

Operation

At the end of the dry season, when the water level in recession ponds, rivers or canals does not drop any more by natural means, the water is pumped out of many areas. The water body must be closed off or disconnected from corresponding water bodies in order to avoid the refilling of the pumped out area. Frequently, brushwood is put into a depression to lure fish from surrounding waters before the depression is closed off by means of mud dykes. Such an operation in an isolated pool is often called brush trap pool, *beer* or *phan don*, see section 15.1.1.

Once the area is dried out (i.e. pumped out to mud level) many of the remaining fish species suffer asphyxiation. However, some species such as snakehead (*Channa* spp.) are only marginally affected by the lack of oxygen, being partial air-breathers. A number of other gears are used to sieve through the mud and gather the fish, such as handled sweeping nets made of mosquito netting, sweeping fences, plunge baskets, cast nets, as well as eel forks and hand rakes. Occasionally, whole village populations undertake 'pilgrimages' to recession ponds to pump them out and collect the fish together.

This type of fishing operation is occasionally found as part of fishing lot operations as a final stage of the fishing season. Then pumping is used to lower the water levels in sometimes kilometer long river stretches to improve the efficiency of traps and sweeping gear.

Gender aspects

Women and children are involved in this type of fishery in small water bodies or recession ponds close to their villages. In fishing lot operations women are rarely involved.

Main species caught

Snakehead / trey phtuok / trey raws (*Channa striata*); trey andaing / catfishes (*Clarias* spp.); trey kranh (*Anabas testudineus*); trey kanchos (small *Mystus* spp.); trey chhlang (*Mystus nemurus*); trey kawmphleanh (*Trichogaster* spp.); trey kamplieu (*Kryptopterus* spp.); trey ta aun (*Ompok* spp.); trey chhpin (*Barbonymus gonionotus*); trey kros (*Osteochilus hasselti*); trey chhlonh chhnoht (*Macrogathus siamensis*); trey antong (*Monopterus albus*).

Legal aspects

Even though the practice is widespread and common, the law forbids all kinds of pumping and bailing water out of a water body and the drying out of any part of the fishery domain (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, B).



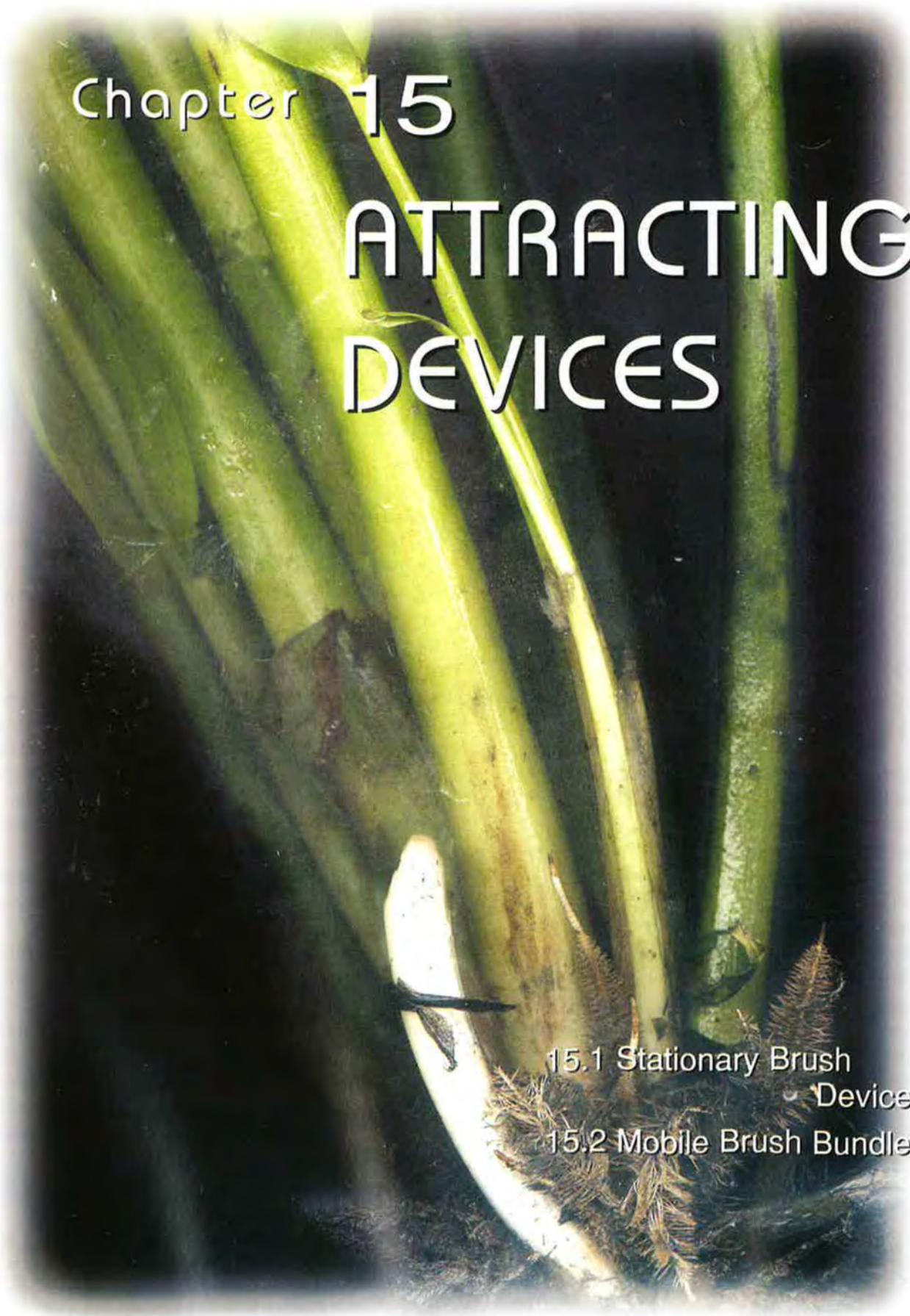
Prek Doung Mea stream, Battambang

Chapter 15

ATTRACTING
DEVICES

15.1 Stationary Brush
Devices

15.2 Mobile Brush Bundles



Brush Park

Samrah



Description

The use of the *samrah* brush park is very popular. Any kind of bushes or tree branches are cut from the nearest available source, usually the flooded forest. In Takeo province, where there is virtually no flooded forest left, the demand for tree branches has led to a trade in brush wood between the up-lands and the floodplains that even crosses the border with Vietnam. A description of the *samrah* in Kampong Chhnang has been given in Sam (1999).

The branches are set out next to each other close to the riverbank or inside a lake or recession pond in water depths of 1.5 to 8 m. In small lakes and ponds they are set up preferably in a round shape, while in river environments they stretch out along the riverbank. A fence is put up to prevent the brush from being washed away by the current. The fence is made of wooden poles, which are driven into the riverbed around the edge of the brush park at distances of around 5 m from each other. The size of brush parks can vary considerably. Individual fishermen may use small ones: 15 to 20 m long and 5 to 8 m wide. Fishing lot operators or financially more powerful fishing entrepreneurs may operate brush parks that are as large as 1 ha and more. In the Great Lake Tonle Sap huge brush parks of several hectares have been reported (Pursat). At harvest time the brush park is surrounded by a seine or gill net (mesh sizes 15 to 30 mm).

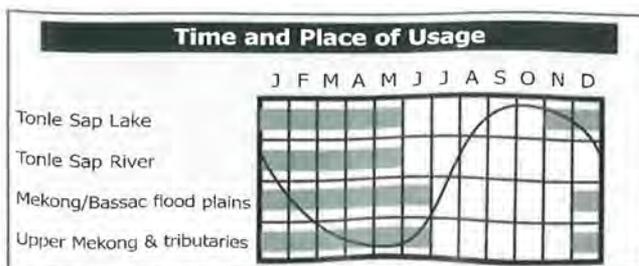
Cost

Depends on the size of the park. In addition considerable informal payments have to be made, as the practice is illegal.

Operation

The brush park is operated during the second half of the flood recession period (February to May) in river segments, where the current is not too strong. After demarcating the chosen location by wooden poles the brush and tree branches are placed evenly inside. Fish seeking shelter are attracted to the brushwood aggregations. To collect the fish a long seine net is put around the park. Then the brushwood is taken out starting with the brushwood next to the net. When a brush-free space has been created, the net is moved close to the remaining brush. Divers make sure the footrope stays on the bottom. They also collect those fish that may hide in the mud. The headrope is fixed to the wooden poles as high as possible above the water surface to prevent fish from jumping over the net. Eventually the seine is pulled ashore, if this is possible, or the fish is taken out of the net with hand-held scoop nets or with baskets. Depending on the size of the operation the fishing crew can be quite large.

Smaller brush parks may be set up and fished out two or three times a month. The very large-scale parks in the Great Lake are fished out only once per season, where the gathering of fish resembles the sweeping





Last stages of the operation



Part of the catch

operations carried out in the lots taking up to 2 weeks to complete. Boiled rice or other kinds of bait are often put inside the smaller brush parks in order to make them more attractive. Fish catches increase from February to March and peak April. They drop off drastically in May.

Gender aspects

Women may occasionally help to fish out brush parks.

Main species caught

In Kampong chhnang: trey riel (*Henicorhynchus* spp.); trey chhkok (*Cyclocheilichthys enoplos*); trey chhlang (*Mystus nemurus*); trey sandai (*Wallago attu*); trey chhdaur / trey diep (*Channa micropeltes*); trey pra (*Pangasianodon hypophthalmus* / spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey kraï (*Chitala ornata*); trey krum (*Osteochilus melanopleurus*); trey po (*Pangasius larnaudi*).

In Battambang: trey riel (*Henicorhynchus* spp.); gourami / trey kawmphleanh (*Trichogaster* spp.); trey pra (*Pangasianodon hypophthalmus* / spp.); trey khman (*Hampala* spp.); trey prama (*Boesemania microlepis*); trey chhdaur / trey diep (*Channa micropeltes*); trey chhlang (*Mystus nemurus*).

In Pursat: snakehead / trey phtuok / trey raws (*Channa striata*); trey chhpin (*Barbonymus gonionotus*); trey sandai (*Wallago attu*); trey ta aun (*Ompok* spp.); trey andaing / catfishes (*Clarias* spp.); trey kros (*Osteochilus hasselti*); trey chhlang (*Mystus nemurus*).

In Prey Veng: trey kantrawb (*Pristolepis fasciata*); trey chhlang (*Mystus nemurus*); trey sandai (*Wallago attu*); trey ta aun (*Ompok* spp.); trey slat (*Notopterus notopterus*); trey riel (*Henicorhynchus* spp.); trey chhpin (*Barbonymus gonionotus*).

In Kratie: trey riel (*Henicorhynchus* spp.); trey chhlang (*Mystus nemurus*); trey chhpin (*Barbonymus gonionotus*); trey ach kok (*Dangila spilopleura*); trey chhdaur / trey diep (*Channa micropeltes*); trey kanchos (small *Mystus* spp.).

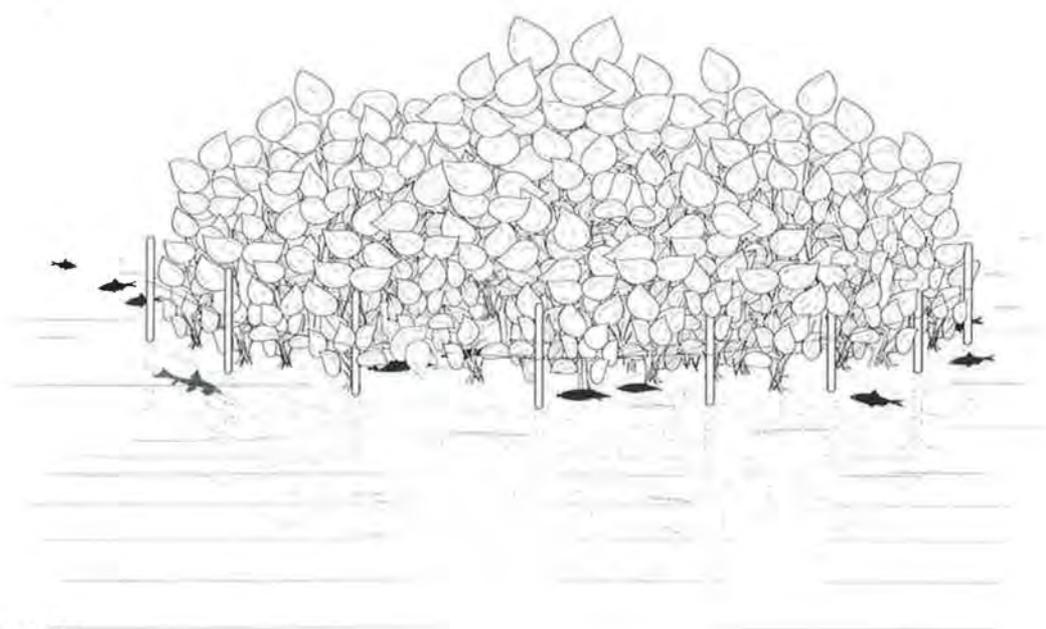
Legal aspects

The use of "samrah" brush parks is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, C).

Brush Park (cont.)



Water hyacinth park

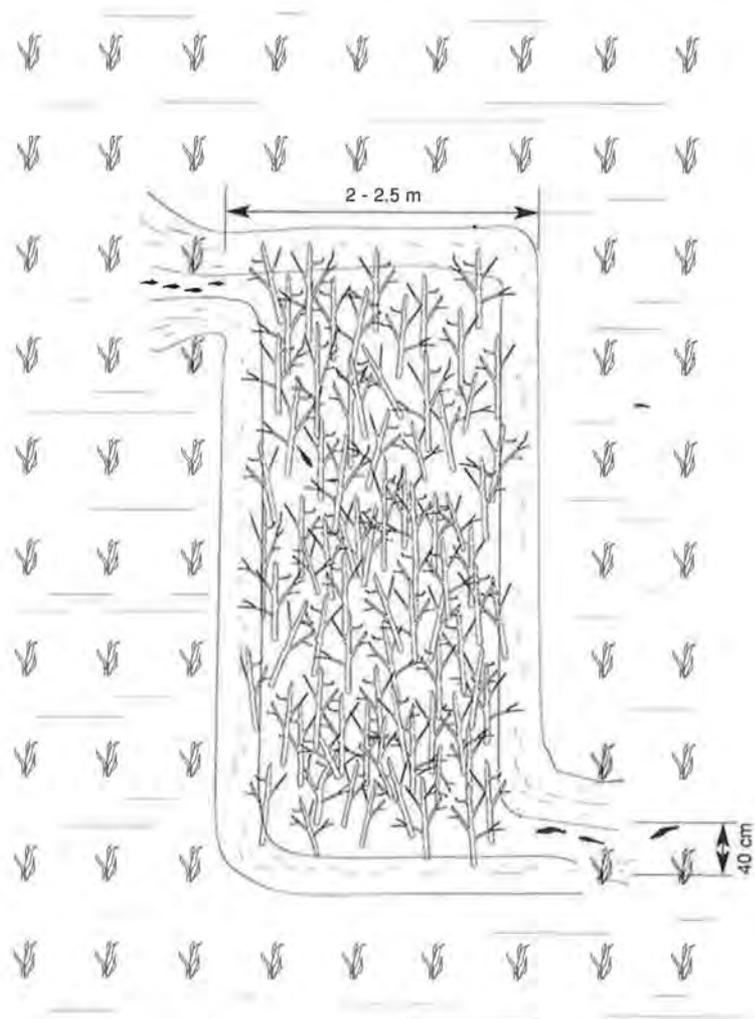


VARIATIONS

Samrah komphlork / សម្រាស់កំព្លោក
Water hyacinth park

Although water hyacinth is generally considered an obstacle to navigation, it is used in many different ways in fisheries and in agriculture. In the *samrah komphlork* the fish is attracted by the shade of the floating water hyacinths. Wooden poles are set up in the same way as for the above mentioned *samrah*, with a nylon rope connecting them at the level of the water surface. The fishing operator collects free-floating water hyacinth

plants and transfers them to the demarcated area until it is completely covered. Usually, this type of brush park also has some brushwood on the bottom. *Samrah* also commonly carry some water hyacinth on top. The *samrah komphlork* is operated in the same way as the *samrah*, mainly between February and May.



Brushpark pool in rice field



Beer / ប៊ែរ
Brush park pool

Brush parks are made to attract fish in naturally occurring depressions in small lakes, canals and rice fields. Sometimes holes are specially dug or deepened for this purpose. They can measure 3 to 15 m in length, 2 to 5 m in width and can be between 1 and 2 m deep. In some cases the water is pumped or bailed out of them twice a month. Depressions in rice fields are fished once per season. This fishery takes place in the flood recession period, from December to May.

Brush Bundle Basket

Chhneang Tram



Bamboo filled basket trap, side view



Front view

Description

The *chhneang tram* is a large open wickerwork basket (it resembles a big spoon), filled with brushwood to attract fish. Many different sizes and shapes, as well as materials used for its construction, are found. Common characteristics are that it is open on top and in front, where two long bamboo handles are fixed. The rear end, the bottom and the lateral walls are made of wickerwork, from either bamboo or rattan fibers. In some simple baskets, the rear wall consists of mosquito netting. In Takeo province the basket has a cover on top of the rear end. In the latter a small drop door for the removal of the catch is found. In some provinces the handle is attached to a small winch via a 20 to 40 m long rope, which helps negotiating steep banks. The basket is filled with brushwood preferably from the 'snai' tree (*Grewia sinuata*), but also other wood, including bamboo, is used. The branches must be soaked for three days in the water before they are usable. Lifespan of this gear is usually about 2 years.

Cost

R. 10.300 to 45.000.

Operation

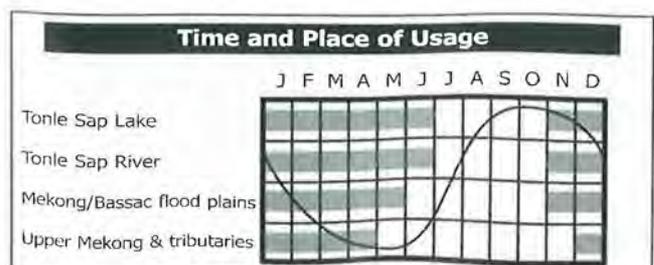
As a passive gear the brush bundle basket is typically operated in rivers and streams, where water currents are not too strong, even so the basket may be secured with poles. It is used mainly during the flood recession period. Once the gear is set up, the fisher only needs to check on the catch once every 2 to 5 days. Depending on the size of the basket 2 to 3 people are needed to lift the gear out of the water and on to the shore. Reports from Kampong Cham suggest that catches are higher during full or new moon periods. Information from Kampong Thom indicates that in hot climatic conditions more fish will seek refuge in the brush bundles than in cooler times.

To remove the fish, the basket has to be lifted quickly on to the shore in order to prevent any fish from escaping from the brushwood. For the same reason people like to put the gear close to the shore, so that by lifting the handles immediately the front part of the basket comes out of the water. Usually fish are removed through the door in the rear wall.

Gender aspects

Usually men undertake the construction and operation of this gear.

Size & Season					
Province	Length in m	Height in m	Width in m	Length of handle in m	Season
Battambang	2.00	0.80	0.7 - 2.10	0.80	Nov-May
Pursat	1.83	0.88	1.26	1.14	Feb-Jun
Kg. Thom	1.80	0.91	1.20	0.85	Feb-May
Kandal	1.67	0.38	0.3 - 1.20	0.80	Nov-Jan
Takeo	2.10	0.85	1.60	0.62	Nov-Feb
Kg. Cham	4.00	2.10	1.50	2.00	Dec-May
Kratie	2.30	1.80	1.80	1.70	Dec-Apr





Pulling out the basket trap.



The rear is made of mosquito netting.

Main species caught

In Battambang: trey riel (*Henicorhynchus* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*); trey angkat prak (*Puntius* spp.); trey kanchos (small *Mystus* spp.); trey kranh (*Anabas testudineus*); trey sraka kdam (*Cyclocheilichthys apogon*); trey kawmphleanh (*Trichogaster* spp.); trey kantrawb (*Pristolepis fasciata*).

In Kampong Cham: trey riel (*Henicorhynchus* spp.); trey chhlang (*Mystus nemurus*); trey kaek (*Morulius chrysophekadion*); trey chrakaing (*Puntioplites* spp.); trey kanchos (small *Mystus* spp.); trey chhkok (*Cyclocheilichthys enoplos*).

Legal aspects

Classified as middle-scale fishing gear (No. 028 KOR SOR KOR Table A II).



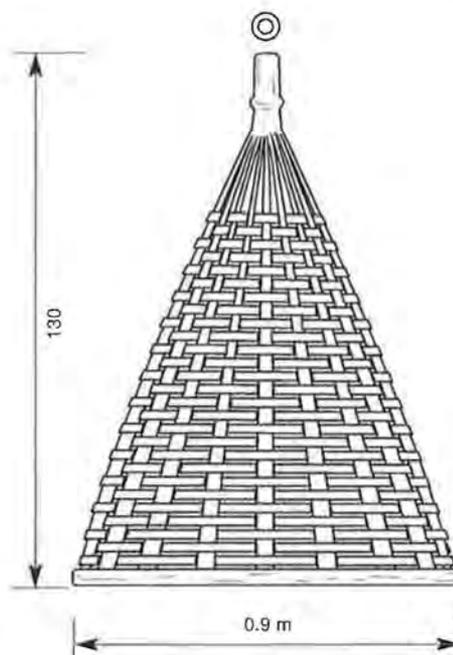
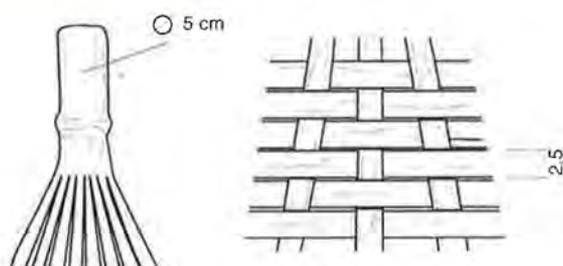
Takeo version with drop door for removal of the catch.

Brush Bundle Trap

Kansom



'Kansom' trap, Takeo



Description

The *kansom* trap consists of a conical basket trap filled with brushwood. A number of baskets are set out, attached to each other by a bottom long line.

The base for the basket is a thick bamboo stem with a diameter of 5 to 8 cm, split into 16 slats above a node. The node forms the peak of the basket. The bamboo slats are interwoven to form a 115 cm long basket cone with an opening diameter of 70 cm. Before the basket is filled with brushwood a stone sinker with a weight of 3 to 5 kg is placed in the peak of the trap. Two crossing nylon ropes secure the brush from falling out of the basket. At the intersection of the two ropes a snood (6 to 8 m long, depending on the depth of the water) links the trap to the main line. The distance between the snoods is usually 10 m and the entire long line may be as long as 200 m, hosting up to 20 traps.

Cost

R. 2.500 to 3.000

Operation

The use of *kansom* brush traps has been reported only from Takeo province. They are operated in rivers and streams during the flood recession period. The traps are operated like a long line, whereby the number used is limited by the size of the boat on

which the traps are transported. The trap is lifted as quickly as possible in order to prevent fish from escaping. Once on board, the trap is shaken until all of the catch has fallen into the boat.

Gender aspects

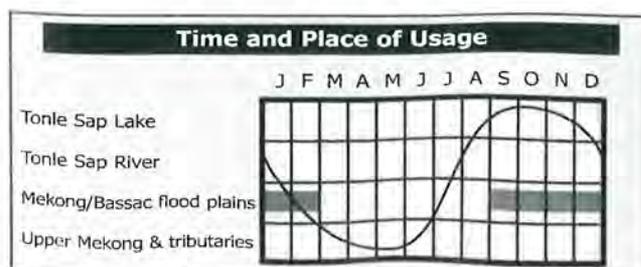
Commonly men undertake the construction and operation of this gear.

Main species caught

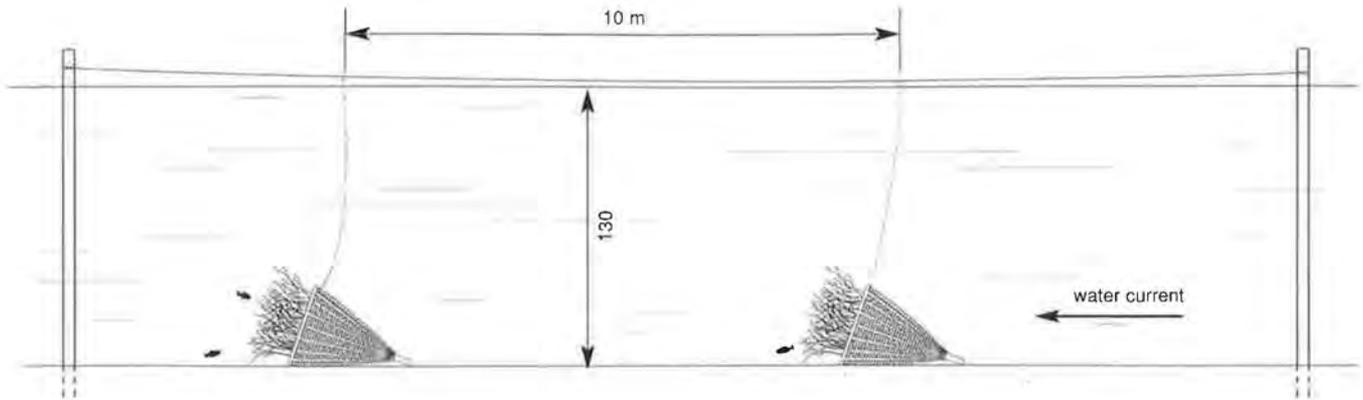
Mainly small fish, such as trey kanchos (small *Mystus* spp.); trey chhlonh chhnoht (*Macragnathus siamensis*); trey kchoeung (*Macragnathus* spp.); trey kanchrouk (*Botia* spp.) and small shrimps.

Legal aspects

The use of "samrah" brush parks is prohibited (Fiat Law on Fishery Management and Administration, No. 33 KRO.CHOR Chapter 2, Article 17, C).



Brush bundle trap / Kansom



VARIATIONS

Kansom kampeh / កង្កែបកំពិស Brush bundle for shrimp

The fishery for shrimp in the Great Lake is an important one, much more so than the other two fisheries mentioned in this section. As the name suggests, a brush bundle trap for shrimp is made of small branches and twigs tied into a bundle (Ø 25 cm at the base, 90 cm long). The bundle is attached by means of a nylon rope to a floating wooden stick indicating the location of the bundle.

The *kansom kampeh* is typically operated in open waters of the Great Lake and the Tonle Sap river from June to February, when small shrimps are abundant. The brush bundles are set out, each marked with a wooden float, usually in a straight line and at a distance of 10 to 15 m from each other.

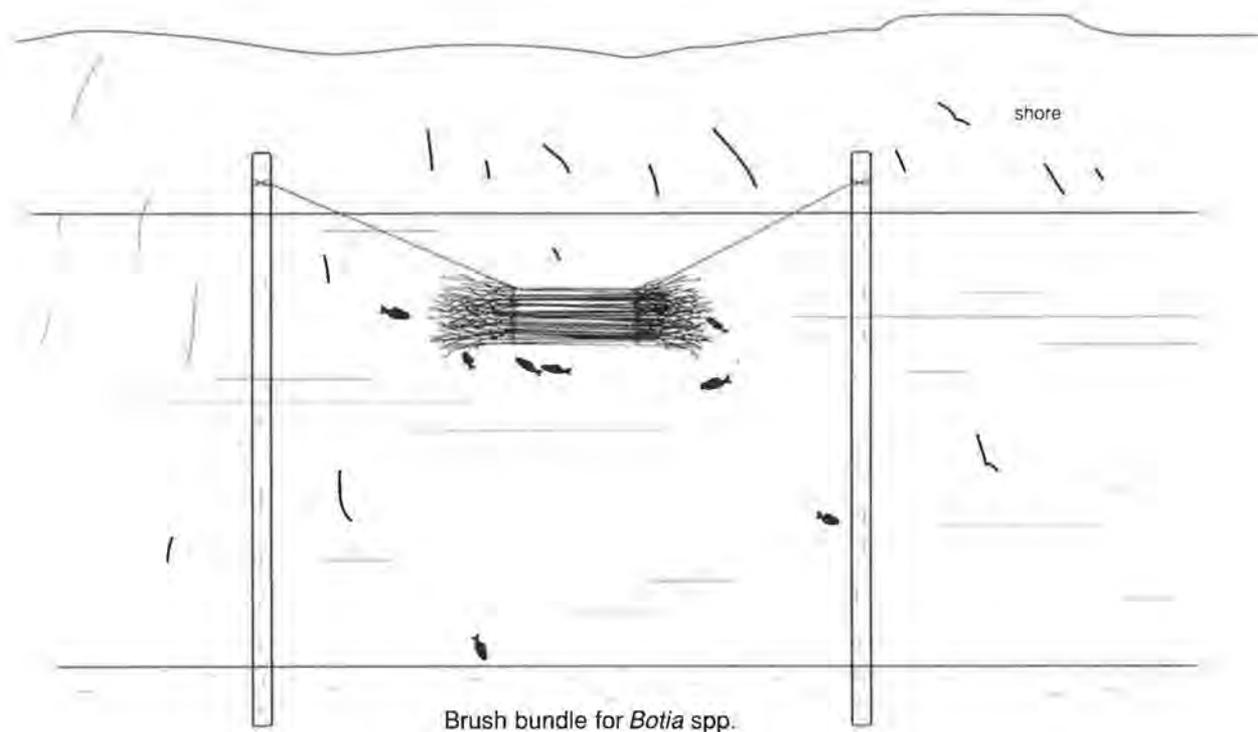
The fishing operation is carried out by two or three fishers or a family in a boat. The brush bundle is smoothly lifted, while at the same time a scoop net is slipped below it. It is then entirely lifted out of the water and shaken to let the shrimp drop out into the scoop net. One fishing unit may operate as many as 80 brush bundles at a time. Small carid shrimp are the target species.



Brush bundle for shrimp



Brush Bundle Trap (cont.)



Kansom trey kanchrouk / កង្កែបត្រីកក
Brush bundle trap for *Botia* spp.

Brush bundle trap for *Botia* spp. is made out of branches of the 'snai' (*Grewia sinuate*) or 'thalaem andaek' / 'tuk' (*Ixora cuneifolia*) trees. The branches, at base \varnothing 2 cm, are cut to a size of 90 to 110 cm length and dried in the sun for 10 days. The leafless branches are then laid out over two parallel nylon ropes and rolled up until they form a bundle with a diameter of 25 to 30 cm.

This type of fish attracting device has only been reported from the river fishery in the Mekong River in Kratie and Phnom Penh during the early recession period from October to January. The brush bundles are attached to poles driven into the river bottom (1.5 to 2 m deep), either individually or

arranged between two poles in a long line parallel to the shore. Usually a fisher operates several of these brush bundles, checking them twice a day. The fisher lifts the bundle out of the water with one hand and positions a big scoop net under the bundle with the other hand. Once the fish are shaken out, the bundle is put back into the water. During heavy rains fishing operations stop.

There is no gender discrimination in construction or operation of these bundles. Fish are collected by any household member, commonly just before a meal to provide fresh fish for eating. The target species is trey kanchrouk (*Botia* spp.).

Chapter 16

FISH SCARING DEVICES

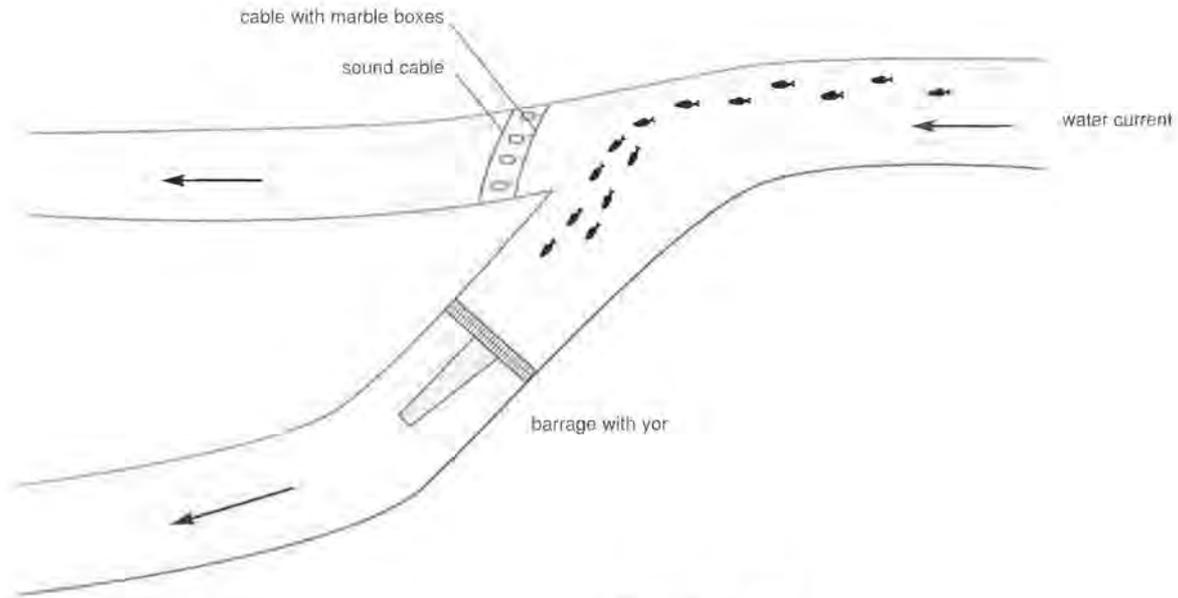
16.1 Acoustic Frightening
Devices

16.2 Olfactory Scaring

16.2 Physical Frightening
Devices

Marble Box

Paot Dak Kone Kli



Description

This scaring device is a metal box (normally used in markets to store and transport cookies) with glass marbles inside. The box is firmly closed and attached with a rope of circa 2 m to a stone anchor on the river bottom. The movement of the box in the water makes the marbles roll against the metal. The resulting noise apparently scares fish away.

Cost

R. 3.000 - 5.000 per box

Operation

The use of marble boxes has been reported from barrage fishing lots in Kampong Chhnang province. The Tonle Sap river is the one of the most important migration routes in the country for long-distance migratory fish species. Only some branches in the delta of the Tonle Sap river are auctioned off as fishing lots for barrage operations. To induce migrating fish to swim up the river arm where the barrage is located, some lot operators put a series of marble boxes across the river arm that does not belong to the fishing lot. The distance between the boxes is around 10 m. Instead of individually anchored boxes, the boxes may also be set out on a long line. The sharp metal sounds produced by the sequence of marble boxes functions as a sort of acoustic wall directing the migrating fish into the fishing lot river branch.

Gender aspects

Not reported.

Target species

Migrating fish.

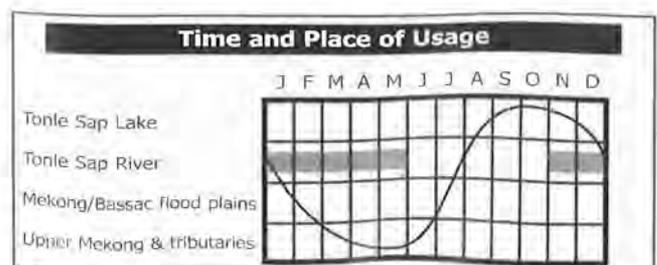
Legal aspects

All kinds of strings extending in the water and various tactics which make the fish startle are prohibited in all kinds of fishing in the inland fishery domain (No. 33 KRO CHOR, Chapter 2, Article 17, I).

VARIATION

**Ksae kaap or Ksae luoh / ខ្សែកាប ឬ ខ្សែលួស
Sound cables**

The *ksae kaap* was used before the less costly "marble box" was invented. It consists of a strong electric cable (Ø 5 mm) tightened diagonally across the riverbed from one shore to the other. Sometimes two parallel cables are used to increase the efficiency of the device: one about a meter above the river bottom and the second one close to the water surface (although they must be deep enough not to hamper navigation). The water flowing past produces a dull sound that frightens the fish away and forces them to go in the desired direction.



Scaring Device Using Carbide Gas

Thmor S'oi



Pieces of carbide stones.

Description

Like fish attracting devices, fish scaring devices are not independent fishing gears, but are auxiliary strategies to increase the fish catch of another gear or operation.

The use of carbide gas is an effective fish scaring strategy under specific circumstances. A calcium carbide stone produces acetylene gas when water is added: $[CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2]$. Acetylene is a colorless, smelly gas. The Khmer name for carbide translates as 'stink stone'.

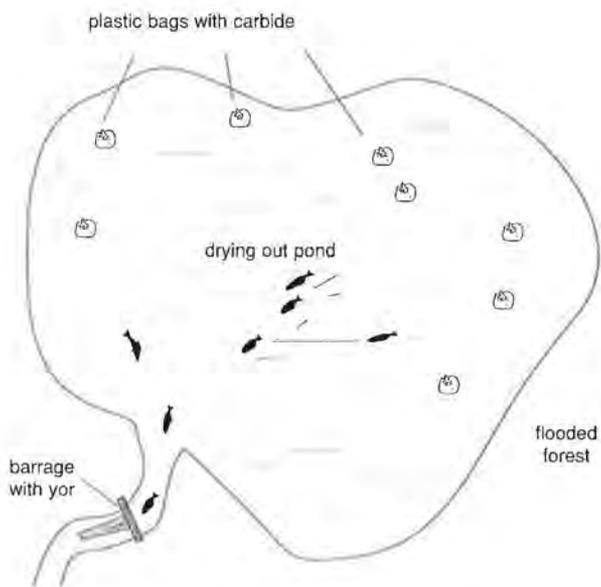
Cost

In Phnom Penh the market price for 1 kg of carbide is R. 3.000.

Operation

Carbide is occasionally used to scare fish out of a recession pond to a main river channel that will be fished with a major fishing gear. The operation takes place at a critical time during the flood recession.

At peak flooding no lakes or ponds are visible in the floodplains. Once the water starts receding these become visible again. Before a pond disconnects from a permanent water body as the result of the falling water levels, the fish are chased out of it into the river channel that is fished in large-scale fishing operations. For this purpose, slightly wet carbide stones are enclosed in small plastic bags. The carbide slowly develops toxic acetylene gas that escapes through the bag opening that is tightened with rubber bands. The plastic bags are distributed in such a way that the polluted water forces the fish in the direction of the fishing operation.



Carbide is used to chase fish out of a drying out water body into a permanent one that will be fished out.

Anecdotal information has it that fish will not come back to a pond in the year following the poisoning of the water because of the lingering smell.

Gender aspects

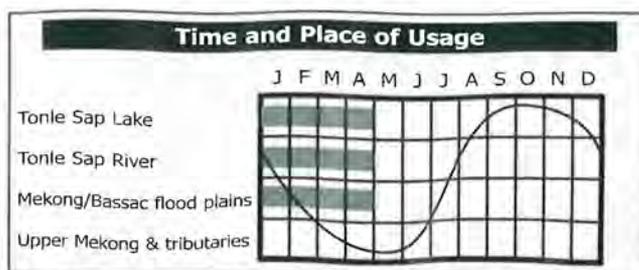
No female involvement in this type of scaring device has been reported.

Target fish species

The less migratory fish species, the 'black fish'.

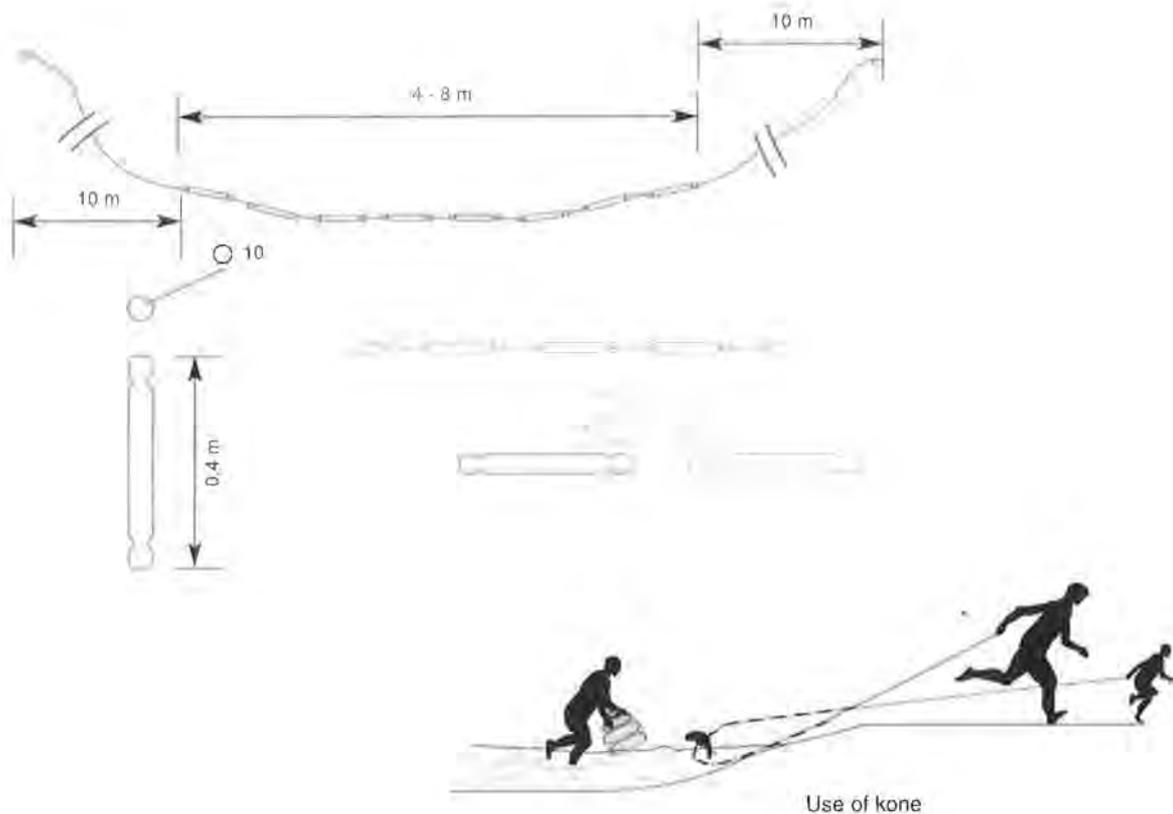
Legal aspects

The law says: "all kinds of string extending in the water and various tactics, which make the fish startle", are prohibited for all kind of fishing in the inland fishery domain (No. 33 KRO CHOR, Chapter 2, Article 17, I).



Mud Chain

Kone



Description

This is basically a mechanical frightening device. In terms of its operation it is a dragged gear.

The *kone* consists of 8 to 20 wooden sticks (40 cm long and with a diameter of 35 mm), linked by a nylon rope (\varnothing 1.5 mm) forming sort of a chain. The wooden elements are carved from a hard and heavy wood. The 4 to 8 m long wooden chain has a 10 m long rope at each end for pulling the chain.

Cost

People make it themselves from material found locally.

Operation

This gear has only been reported from Takeo province and even there it is apparently not in use any more. Thus, it may be considered a historical fishing gear. It was used in shallow water bodies, streams, irrigation canals and rice fields. Two persons, one at each side, used to haul the 'mud chain' through shallow waters or watery mud. The surface layer of the bottom surface was stirred up producing cloudy water. Any fish occurring in the area swept by the 'mud chain' would be stirred up, thereby revealing its location, facilitating capture either by hand, with the help of a plunge basket

or with another kind of covering device, used by one or more fishers accompanying the chain operators.

Gender aspects

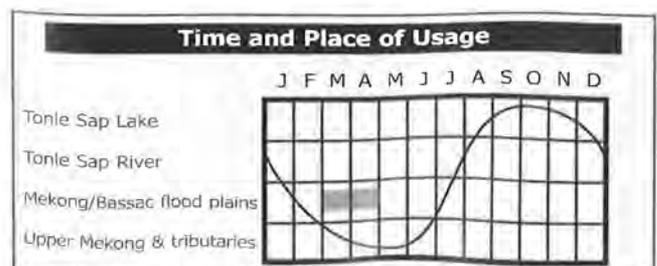
Reportedly, women and children were predominantly involved in this fishing operation.

Main species caught

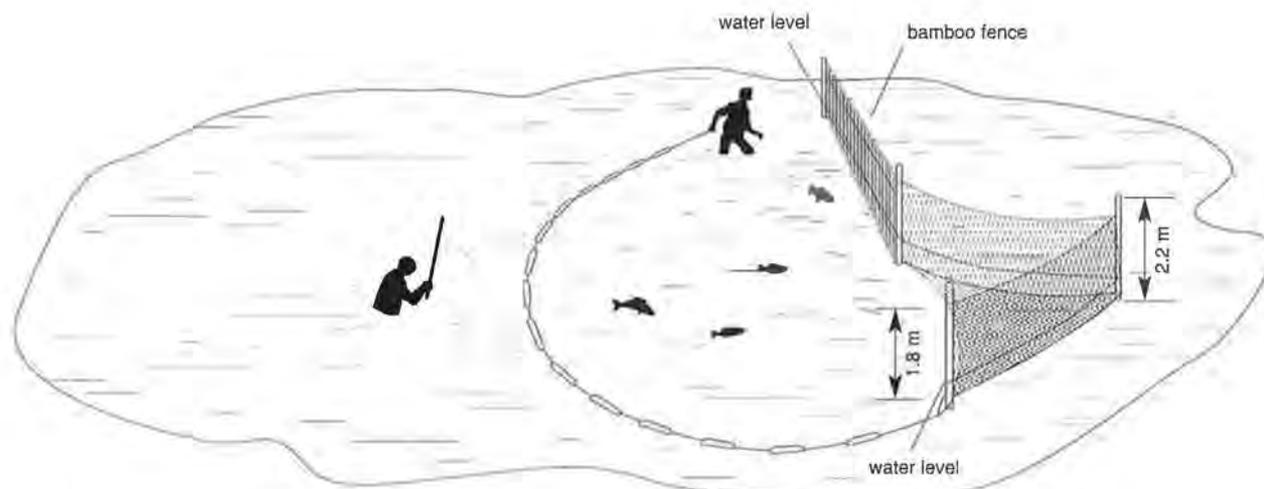
Snakehead / trey phtuok / trey raws (*Channa striata*); trey andaing / catfishes (*Clarias* spp.); sand goby / marbled sleeper / trey damrey (*Oxyeleotris marmorata*).

Legal aspects

Not classified / not mentioned in the law.



Chorvor



VARIATION

Chorvor / ចរវរ

Mud chain with V-shaped net

The fishing method using a mud chain with V-shaped net was reported from Siem Reap province. The V-shaped net is a simple bagnet with two side panels (10 m long and 1.8 to 2 m tall) connected to a bottom panel. It is open on top. The sides are held up with the help of bamboo poles in water of 0.8 to 1.2 m deep. The triangular bottom net is fixed with a ring to each of the entrance poles and can therefore be lifted up, when the fish have entered. The mesh size is 40 mm. A 2 m long bamboo fence is attached to one of the sides. The mud chain is anchored at the other arm and is as described above.

One fisher drags the chain in a wide circle around until he meets the short fence at the other arm.

Another fisher hits the water to scare the fish. The stirred up fish are driven into the V-shaped net, which is then closed by lifting the bottom net. Once the operation is completed, the fishers remove the net and move to a different location.

This is a cheap fishing method (R. 30.000) that can be carried out quickly by 2 or 3 fishers. It is done in small lakes, ponds and streams, from February to May. The main species caught are: snakehead / trey phtuok / trey raws (*Channa striata*); trey andaing / catfishes (*Clarias* spp.); trey kranh (*Anabas testudineus*); trey kanchos (small *Mystus* spp.); trey khnawng veng (*Dangila lineata* and *cuvieri*).

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Abbreviations

Symbols

Measurements

Abbreviations

- R. = Riel, the Cambodian national currency. The dollar exchange rate was on average R. 3.800 for 1 US\$ at the time of writing.
- spp. = species. Mostly used when one Khmer name stands for a group of closely related species.

Symbols

- ∅ = diameter
- ◇ = mesh size

Measurements

Measurements in drawings are in mm, except where specified otherwise.

- mm = millimeter
- cm = centimeter
- m = meter

- kg = kilogram

E = hanging ratio. Determines the opening of the meshes or the looseness in the webbing. The looseness of the webbing has a great influence on the catchability of the net. $E=L/L_0$ = Length of rope on which a net panel is mounted (L) / Length of stretched netting hung on the rope (L_0), (Prado 1990).



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