

# A review and synthesis of capture fisheries data in Thailand

## Large versus small-scale fisheries



In collaboration with



**A REVIEW AND SYNTHESIS OF CAPTURE FISHERIES  
DATA IN THAILAND  
LARGE VERSUS SMALL-SCALE FISHERIES**

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## FOREWORD

Fisheries play a significant role in Thailand in terms of sustaining food security and contributing to the local and national economies. The consumption of fish in Thailand (per person) is double that of the world average, highlighting the general preference for fish as a source of protein in Thailand. During the period 2001 to 2003, Thailand was the second largest global exporter of fishery commodities (in terms of value), highlighting the importance of this sector in the Thai economy.

This report examines the current status of production and participation in large-scale and small-scale fisheries in Thailand. It also looks at both the marine and inland capture fisheries of the country and capture fisheries out of Thai waters by Thai fishing boats.

The main conclusion of this report is that inland capture fisheries are considered to be underestimated by a factor of at least five, suggesting considerable undervaluation of this resource. Furthermore, a large proportion of Thailand's reported marine capture production comes from outside the country's exclusive economic zone (EEZ) and is estimated at around 41 percent. The main fishing grounds for this production are within the EEZ of Indonesia and Myanmar. Inland capture fisheries are possibly overlooked in terms of food security and probably make a larger contribution to food security than the marine capture fisheries, especially as a significant proportion of the latter is targeted at the production of fish feed and animal feed.



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# TABLE OF CONTENT

	<i>Page</i>
FOREWORD .....	iii
THAILAND'S CAPTURE FISHERIES .....	1
INLAND FISHERIES .....	2
NATIONAL FISHERIES STATISTICS .....	6
REVIEWED GROSS PROVINCIAL PRODUCT (GPP) SURVEY IN THE FISHERIES SECTOR .....	9
FRAMEWORK FOR PREPARATION OF A NATIONAL SYNTHESIS ON INLAND CAPTURE FISHING IN THAILAND .....	10
DATA SETS USED IN THE ESTIMATION .....	11
INLAND CAPTURE FISHERIES PRODUCTION ESTIMATION .....	11
PARTICIPATION IN INLAND FISHERIES SECTOR .....	12
SAMPLING OF FISHING HOUSEHOLDS .....	12
DISTRIBUTION OF HOUSEHOLD PRODUCTION .....	12
AN ESTIMATION OF INLAND CAPTURE FISHERIES PRODUCTION .....	18
POTENTIAL SOURCES OF ERROR IN THE GPP PROCESS .....	19
MARINE FISHERIES .....	20
REPORTED DATA .....	21
DISPOSITION OF PRODUCTION .....	27
FISHING UNITS (BOATS AND CREW) .....	27
THAI CAPTURE FISHERIES OUTSIDE THE NATIONAL EEZ .....	29
EEZ OF INDONESIA .....	29
NORTH OF SUMATRA ISLAND, IN THE STRAIT OF MALACCA AREA .....	30
THE SOUTH CHINA SEA, IN NATUNA ISLANDS AREA .....	30
THE ARAFURA SEA .....	30
EEZ OF MYANMAR .....	30
JOINT VENTURE PROGRAMME .....	30
Fishing Access Programme .....	31
SUMMARY AND SYNTHESIS .....	33
CAPTURE FISHERIES — REPORTED DATA .....	33
CAPTURE FISHERIES — ESTIMATED DATA .....	33
INLAND CAPTURE FISHERIES .....	33
MARINE CAPTURE FISHERIES .....	34
Capture fisheries outside the national EEZ .....	35
SYNTHESIS .....	35
REFERENCES .....	38
APPENDIX I — INLAND FISHERIES PRODUCTION .....	40
APPENDIX II — INLAND FISHERIES .....	43
APPENDIX III — CALCULATION — MARINE CAPTURE FISHERIES .....	45
MARINE PRODUCTION OF LSF .....	45
MARINE PRODUCTION OF SSF .....	46
APPENDIX IV — CALCULATION — INLAND CAPTURE FISHERIES .....	48
INLAND FISHERIES PRODUCTION AT FRESHWATER LANDING PLACES .....	48
INLAND FISHERIES PRODUCTION FROM FRESHWATER NATURAL RESERVOIRS .....	49
INLAND FISHERIES PRODUCTION FROM POND TRAPS .....	50

## TABLES

		<i>Page</i>
Table 1	Fish and seafood consumption per capita per year (kilogram) .....	1
Table 2	Population, economic contribution of inland captures fisheries and habitats important for inland capture fisheries production .....	3
Table 3	The major systems of inland fisheries habitats in Thailand included in the analysis	4
Table 4	Total inland capture fisheries (1 000 tonnes) in Thailand from 1981 to 2005 .....	7
Table 5	Average, median household production of all sampled households and average household production of small-scale and middle-scale to large-scale fishing households and inland fisheries production estimation (tonnes) .....	17
Table 6	Reported and estimated production from inland capture fisheries .....	19
Table 7	Gear-based division between large-scale and small-scale fisheries .....	21
Table 8	Landed production of marine capture fisheries by fishing gears in Thailand 2004 ..	23
Table 9	Landed production and value of marine capture fisheries by species in Thailand, 2004 (values in 1 000 Baht) .....	24
Table 10	Disposition of marine production by type of fish and type of fish processing plant, 2004 (tonnes) .....	26
Table 11	Quantity of trash fish used for fish meal production, 1987 to 2004 (tonnes) .....	27
Table 12	Cost and income of marine capture fisheries sectors in Thailand .....	28
Table 13	Number of fishing units, households and fishers of marine capture fisheries in Thailand .....	28
Table 14	Number of Thai boats fishing in the EEZs of other coastal states, 2006 .....	29
Table 15	Production of marine capture fisheries outside of Thai waters, 2004 .....	31
Table 16	Sensitivity analysis of estimated inland capture figure using biomass estimates ....	34
Table 17	Summary of Thailand's capture fisheries divided into large- and small-scale fisheries .....	36

## FIGURES

	<i>Page</i>
Figure 1 Map of 25 major river basins in Thailand .....	5
Figure 2 Fisheries production by sector, 1985 to 2004 .....	6
Figure 3 Production and value of 12 important species of inland capture fisheries obtained from natural reservoirs, freshwater landing places and pond traps, 2003 .....	8
Figure 4 Composition of inland capture fisheries by species 2004 .....	9
Figure 5 Total households and fishing households in Thailand and by region .....	12
Figure 6 Distribution of fishing household in Thailand .....	13
Figure 7 Distribution of household production of total 2 215 sampled fishing households .....	14
Figure 8 Distribution of production of sampled households .....	14
Figure 9 Distribution of household production by region .....	15
Figure 10 Distribution of production of sampled households divided into four regions .....	15
Figure 11 Distribution of production of sampled households based on the utilization of production .....	16
Figure 12 Distribution of production of sampled households divided into two groups based on amount of fish caught .....	16
Figure 13 Production of top five fishing gears of marine capture fisheries by subsector, 2004 .....	21
Figure 14 Composition of marine capture production by subsector, 2004 .....	22
Figure 15 Production and value of top 15 species group (by production) of marine capture fisheries for the LSF subsector, 2004 .....	22
Figure 16 Composition of marine capture value by subsector, 2004 .....	25
Figure 17 Production and value of the top 15 species group (by production) of marine capture fisheries for the SSF subsector, 2004 .....	26

# THAILAND'S CAPTURE FISHERIES

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Fisheries play a very important role in food security in the Kingdom of Thailand as a food and income supplier and in the Thai economy as a provider of valuable export products. The average per capita consumption of fish in Thailand during the period 2000 to 2003 was 30.85 kg/year (Table 1). This is significantly higher than the world average of 16.3 kg/year (Table 1) and reflects the importance of fish in food security, as well as the general preference for fish as a source of protein in Thailand.

**Table 1** Fish and seafood consumption per capita per year (kilogram)<sup>1</sup>

Area	Year			
	2000	2001	2002	2003
Thailand	30.6	31.3	30.9	30.6
East & Southeast Asia	25.3	26.7	26.3	26.0
World	16.2	16.5	16.3	16.1

Fisheries are also important in the local and national economies and in the country's international trade and the development of fisheries in Thailand has been heavily influenced by the global market. This is reflected in the rapid development of trawl fisheries in

the 1970s, targeting shrimp for export and also in the relatively fast development of purse seine fisheries in the early 1980s, targeting pelagic species. As a result, during the period 2001 to 2003, Thailand was the second largest global exporter of fishery commodities.

There are two main fisheries sectors in Thailand, namely the capture fishery sector and the fish culture sector. For capture fisheries, the fishing gears employed both in marine and inland fisheries are many and varied, with the type of gear employed largely determined by the size of the fisheries being exploited, i.e. small-scale fisheries (SSF) and large-scale (commercial) fisheries (LSF). This report presents a detailed picture of the current status of SSF and LSF production of Thailand, as well as of participation in the country's marine and inland capture fisheries.

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<sup>1</sup> FAO, *FAOStat Data – Food Supply* (3 March 2006 [cited 29 May 2006]); available from: <http://faostat.fao.org>

## INLAND FISHERIES

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Inland capture fisheries are an important sector of many local economies in Thailand and are considered to be important in sustaining the livelihoods of many rural communities. They are also important sources of domestic fish consumption. The importance of the inland fisheries sector has been highlighted in many reports and its significance in providing food security and generating local income is frequently highlighted.<sup>2</sup> The present official statistics report a contribution of inland fisheries production to domestic fish supply of around 200 000 tonnes per year, which is less than 10 percent of total fisheries production (from 1994 to 2005). The most recent national census in the agricultural sector throughout the country (2003) showed a high participation rate of Thai people in inland fisheries activities, with the main purpose of these fishing activities being for household consumption.

Inland capture fisheries production in Thailand is carried out nationwide and in a traditional way. As in many other countries in the region, it is difficult to collect data for statistical records when large numbers of people participate in traditional fishing activities. Hence, the inland capture fisheries production reported has not been reliable and does not reflect the true status of this sector. It is believed that the figures for inland fisheries, especially production figures, are underestimated and thus undervalued.

Even though the figures for production and value in this sector are not high, it is still an important sector for local economies. The proportion of the population participating in this sector, and the various habitats they can access for freshwater fisheries resources in each region of the country are presented in Table 2. The results show that an average of 14 percent of the households in Thailand conducts inland fisheries activities. The major system of inland fisheries habitats is shown in Table 3. There are four major types of inland fisheries habitats. This detailed habitat information is also linked to the detailed fishing habitat information of an agricultural census.

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<sup>2</sup> Coates (2002); Pawaputanon Na Mahasarakarm (2007); Blake and Pitakthepsombat (2006); Hortle and Suntornratana (2008).

Information on the inland capture fisheries sector in Thailand is usually presented in normal statistical formats and has been since the foundation of DoF. Even though there are many research surveys and studies, both published and ongoing, on inland fisheries in Thailand, most of them deal with specific locations and hence can be of only limited use in supporting a national fisheries statistics system and in obtaining a clear picture of the inland sector as a whole. The collection and compilation of inland capture fisheries statistics in Thailand started about 40 years ago and these activities may now be considered routine activities of DoF.

**Table 2** Population, economic contribution of inland captures fisheries and habitats important for inland capture fisheries production

Region	Population	Households and percentage of fishing households	GPP inland capture fisheries (US\$/year)	Major freshwater resources
Central (including Bangkok)	20 689 566 (2005)	7 413 300 (3.2%)	32 350 842 (2005)	<p>The Central region occupies most of the area of the Chao Phraya Basin. Almost all of the mountainous part of northern Thailand is drained to the Chao Phraya river through the Ping, Wang, Yom and Nan rivers. The low-lying floodplain and delta of the Chao Phraya river in the Central Plain generate a huge amount of freshwater fish.</p> <p>Apart from the Chao Phraya river and its large lowland floodplain and delta area, large dams and reservoirs, including natural swamps in the Central Plain, are other important freshwater fisheries utilized by the rural people in this region.</p>
North	11 883 517 (2005)	3 768 261 (17.9%)	86 064 311 (2005)	The four river basins of Ping, Wang, Yom and Nan in the north, the Salween river basin in the northwest and the Mekong river in the northeast are all important river systems with abundant fish. Large dams, reservoirs and human-made waterbodies in all provinces generate fish production.
Northeast	19 953 411 (2005)	5 036 322 (31.8%)	154 356 259 (2005)	The Mekong main stream along the border between Thailand and Lao PDR and large tributaries of the Mekong are other important resources. Many of the Mekong tributaries are dammed and many weirs are found along the river and streams for fishing purposes.
South	8 516 860 (2005)	2 484 891 (14.5%)	52 120 955 (2005)	Fisheries resources are more limited on peninsular Thailand. Important inland fisheries habitats are small river basins and large freshwater lakes and a few large dams.
<b>Total</b>	<b>61 043 354</b>	<b>18 702 774 (14.5%)</b>		

**Table 3** The major systems of inland fisheries habitats in Thailand included in the analysis

Environment	Detailed information related to habitat and fisheries	Area (ha)	Source
Rivers and streams	<ul style="list-style-type: none"> <li>• River length includes perennial and seasonal flow of main rivers and streams.</li> <li>• There are a total of 25 major river basins in Thailand (Figure 1).</li> <li>• These river systems are important for inland fisheries production.</li> </ul>	More than 56 137 km.	GIS database ESRI, Thailand
Inundated plains	<ul style="list-style-type: none"> <li>• An inundated plain contains an area of riparian vegetation which is important for migratory species as it is a crucial habitat for spawning, nursing and also performs as a dry season refuge.</li> <li>• This habitat is important for fisheries production, especially in the rainy season.</li> <li>• Production in the floodplain area is found during the rainy season when the velocity in the main channel is very strong. The floodplain area generates high fisheries production.</li> </ul>	No details.	
Swamps, marshes, lakes, reservoirs	<ul style="list-style-type: none"> <li>• Considered to be good habitats for stock enhancement.</li> <li>• Sizes range from 0.01 to more than 1 000 ha.</li> </ul>	<p>28 956</p> <p>3 198</p> <p>342 826.5</p>	<ul style="list-style-type: none"> <li>• Virapat <i>et al.</i> (2000)</li> <li>• GIS database ESRI, Thailand</li> <li>• Database of water bodies from FITC (2005) which specific to reservoir and public pond</li> </ul>
Wet rice inundated paddy fields	<ul style="list-style-type: none"> <li>• Important habitat for many species that are highly tolerant/adapted to low oxygen and static water conditions.</li> <li>• Flooding of two to three months can provide a good environment for fishes to mature.</li> </ul>	Estimated at 3 100 000 ha.	Virapat <i>et al.</i> (2000)

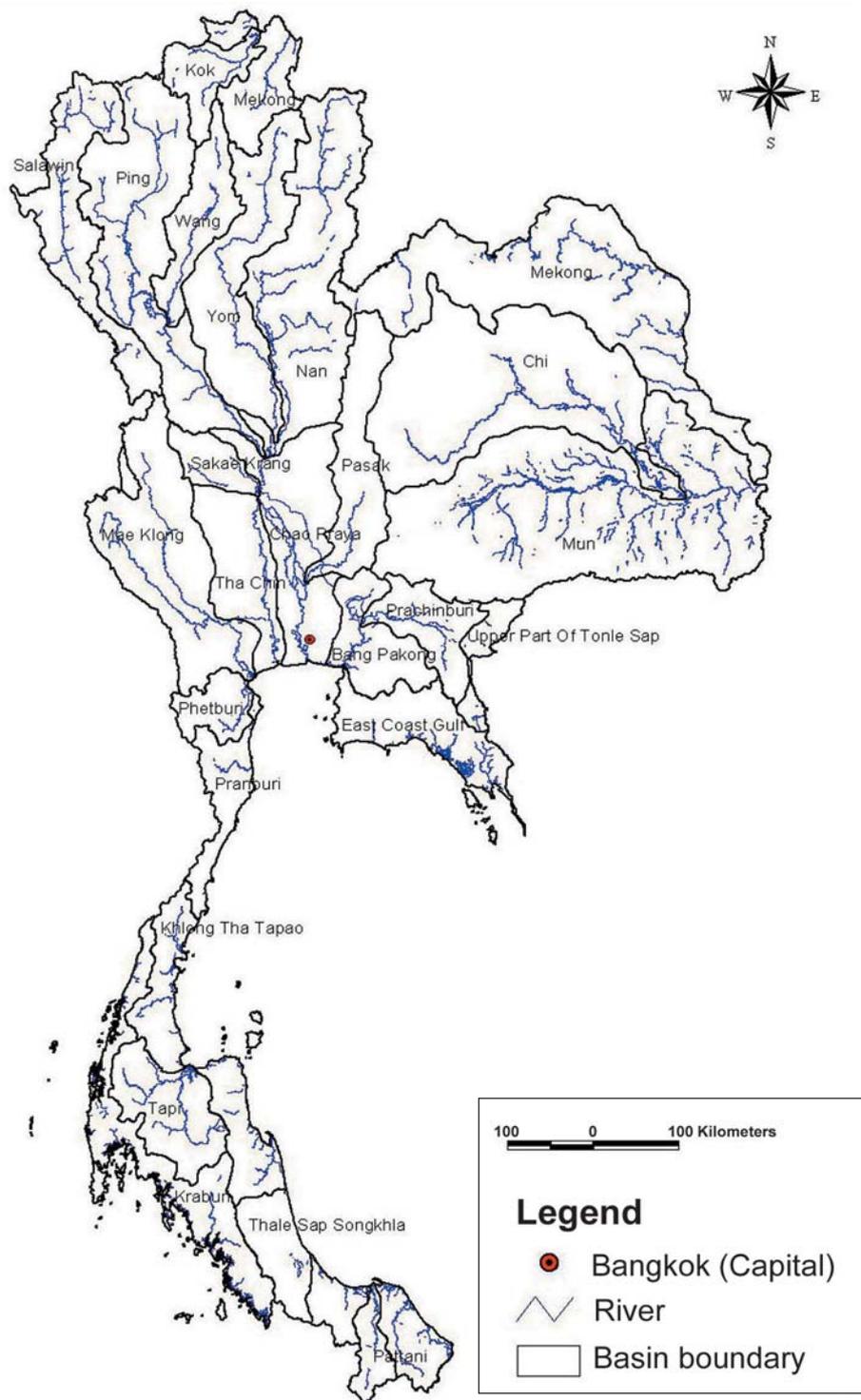


Figure 1 Map of 25 major river basins in Thailand

## NATIONAL FISHERIES STATISTICS

There are two major categories of inland fisheries statistics: capture fisheries statistics and aquaculture production statistics. For each of these categories, yield and value are collected on a yearly basis and are used to indicate the status and trend in the fisheries sector at the national level.

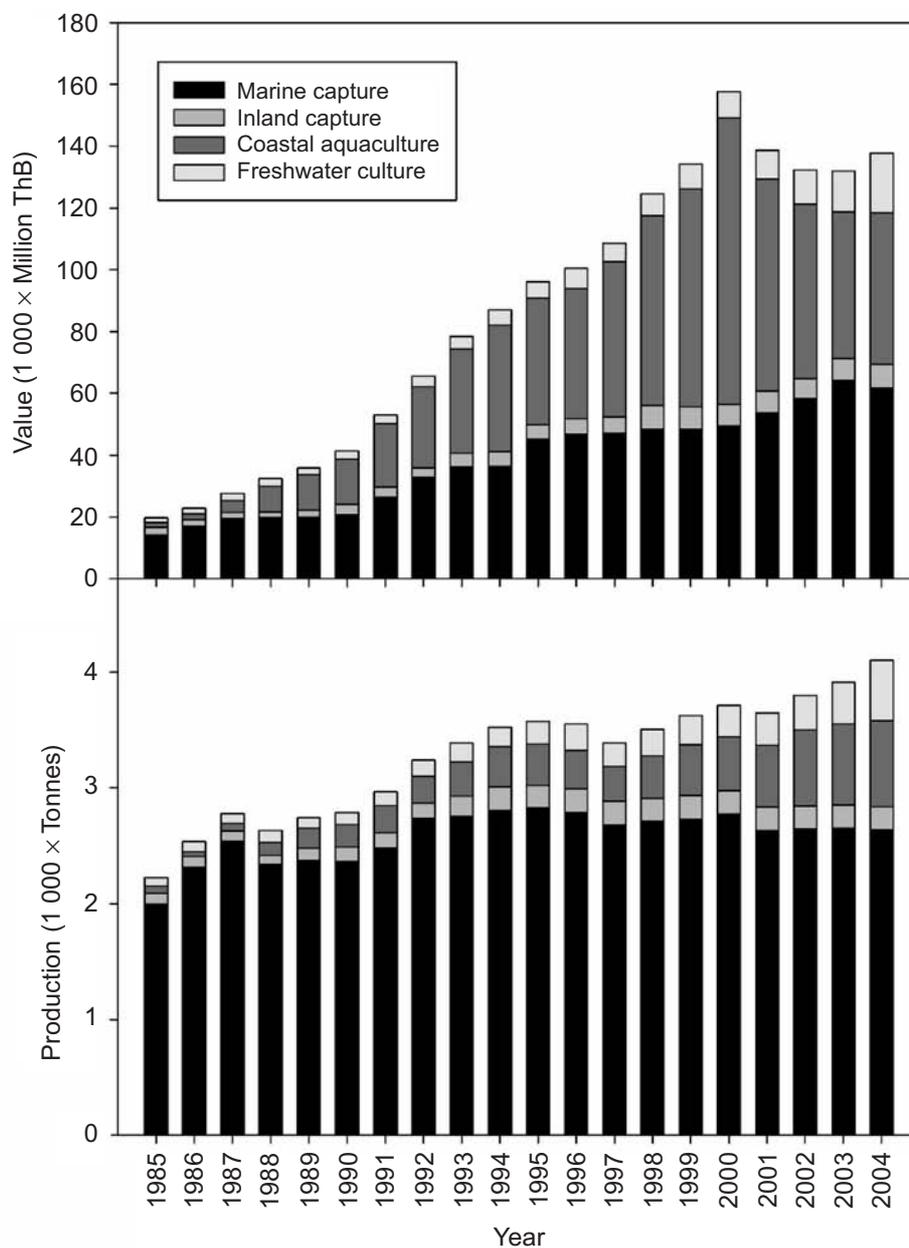


Figure 2 Fisheries production by sector, 1985 to 2004<sup>3</sup>

The reported total inland fisheries production (capture and aquaculture) is between 700 000 and 800 000 tonnes, of which 200 000 tonnes<sup>4</sup> are capture fisheries production. However, over the years it has been stated many times that the official figures for the inland freshwater sector probably underestimate the true figure. One reason for this could be the way in which the data are produced, i.e. data are collected

<sup>3</sup> DoF (2006a).

<sup>4</sup> DoF (2007).

mainly from major landing sites in large reservoirs. Furthermore, these data do not cover all the reservoirs in Thailand. The inland fisheries production data in Thailand has always been of doubtful reliability, but progress in resolving this issue has been slow.

The process of collecting fisheries statistics has been improved gradually over the years and there has been considerable support allocated to all the provincial fisheries offices to help in the collection of data for national statistics purposes, but it is still not clear if this process has improved reporting.

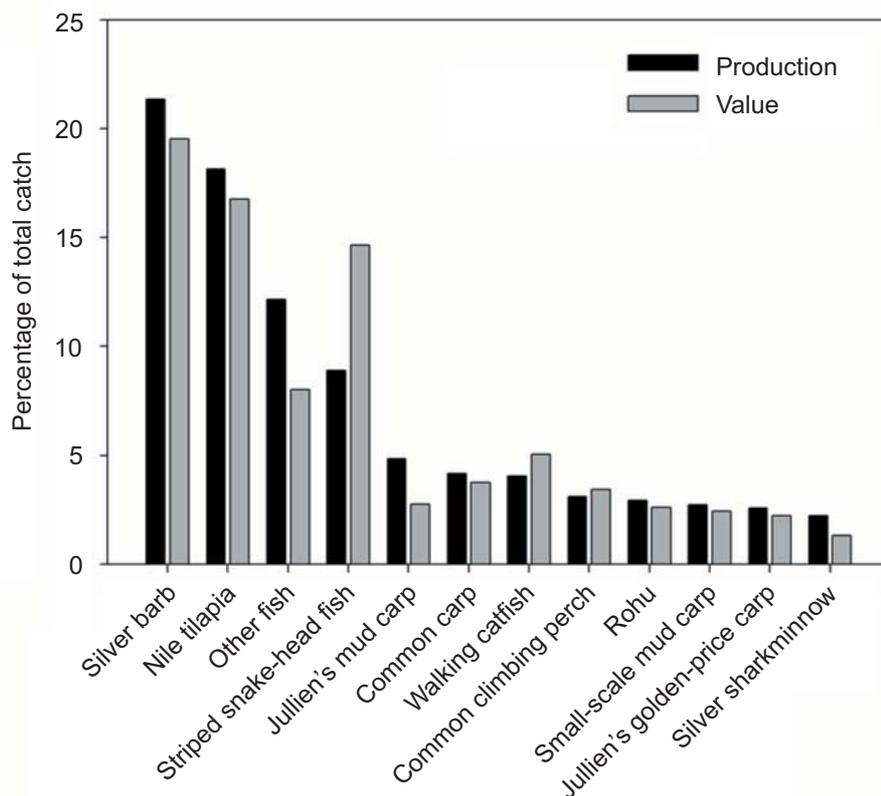
In Thailand, the rate of utilization of freshwater fish is high, as almost all kinds of fish are eaten. The freshwater fish base ensures food security for the steadily expanding population, especially the low-income rural communities and urban poor (Menasveta, 2000). Inland capture fisheries in Thailand are considered mostly to be SSF and, as stated above, contribute approximately 200 000 tonnes per year (Figure 2), which was valued at about 7 436 million baht in 2004 (Table 4, Figure 2). Although the share from inland fisheries is not high (comparing official inland capture fisheries production to official marine capture fisheries production), it is considered the most accessible and inexpensive source of protein for the majority of Thais (Pawaputanon, 2003).

**Table 4** Total inland capture fisheries (1 000 tonnes) in Thailand from 1981 to 2005<sup>5</sup>

Year	Total production	Capture (1 000 tonnes)		% Inland production	Value (million baht)		Average value/kg of inland fishes
		Marine	Inland		Marine	Inland	
1981	1 989.0	1 756.9	116.5	8.3	no data	no data	no data
1982	2 120.1	1 949.7	87.7	6.3	no data	no data	no data
1983	2 255.4	2 055.2	108.4	6.9	no data	no data	no data
1984	2 134.8	1 911.5	114.4	7.7	no data	no data	no data
1985	2 225.2	1 997.2	92.2	7.5	no data	no data	no data
1986	2 536.3	2 309.5	98.4	7.4	16 976.3	2 069.9	21.0
1987	2 779.1	2 540.0	87.4	6.4	19 357.1	2 113.1	24.2
1988	2 629.7	2 337.2	81.5	7.0	19 823.0	1 784.7	21.9
1989	2 740.0	2 370.5	109.1	7.3	19 935.3	2 228.2	20.4
1990	2 786.4	2 362.2	127.2	8.3	20 738.4	3 301.7	26.0
1991	2 967.7	2 478.6	136	8.7	26 403.7	3 290.8	24.2
1992	3 239.8	2 736.4	132	8.5	32 833.0	2 998.8	22.7
1993	3 385.1	2 752.5	175.4	10.0	36 224.1	4 489.5	25.6
1994	3 523.2	2 804.4	202.6	10.6	36 337.2	4 805.6	23.7
1995	3 572.6	2 827.4	191.7	10.9	45 183.2	4 601.1	24.0
1996	3 549.2	2 786.1	208.4	12.3	46 815.3	4 995.4	24.0
1997	3 384.4	2 679.5	205	12.0	47 134.2	5 154.2	25.1
1998	3 505.9	2 709.0	202.3	12.2	48 380.8	7 687.5	38.0
1999	3 625.9	2 725.2	206.9	12.7	48 444.8	7 221.3	34.9
2000	3 713.2	2 773.7	201.5	12.7	49 401.8	7 024.8	34.9
2001	3 648.4	2 631.7	202.5	13.2	53 718.5	7 049.4	34.8
2002	3 797.0	2 643.7	198.7	13.0	58 374.5	6 290.3	31.7
2003	3 914.0	2 651.2	198.4	14.3	64 169.5	7 069.9	35.6
2004	4 099.6	2 635.9	203.7	17.7	61 800.5	7 436.2	36.5
2005	4 118.5	2 615.6	198.8	17.9	63 222.7	7 852.8	39.5

<sup>5</sup> Fishery Information Technology Centre, DoF, Thailand 2007.

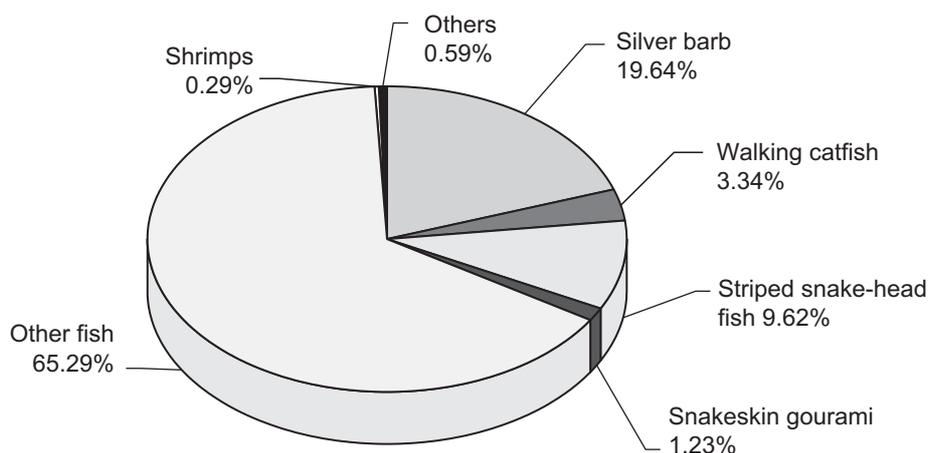
Inland capture fishing activities in Thailand are carried out in natural and human-made freshwater bodies of various types, from rivers and their tributaries to reservoirs and fishponds. Fish caught from inland habitats are multispecies and vary in abundance depending on the productive status of the water bodies (Pawaputanon, 2003). The main fishing gears are fish trap, gill net, long line, hand line, cast net, harpoon and landing net. Silver barb, Nile tilapia, striped snake-head fish, Jullien's mud carp, walking catfish and common climbing perch generally are the dominant species in various freshwater bodies (Appendix 1 and Figure 3). The production and value of inland capture fisheries, particularly obtained from natural reservoirs, which are the main freshwater bodies, have been increasing (Appendix 2). Freshwater fish contributed more than 99 percent of total production, whereas most of the remainder, only 0.29 percent, consisted of shrimps (Figure 4).



**Figure 3** Production and value of 12 important species of inland capture fisheries obtained from natural reservoirs, freshwater landing places and pond traps, 2003<sup>6</sup>

In 2003 approximately 3.13 million fishers participated in fishing in inland capture fisheries. Most of them (60.49 percent) are located in the northeast of Thailand. The rest are in the northern (25.34 percent), central (9.15 percent) and southern (5.02 percent) parts of Thailand (Fishery Information Technology Center (FITC), 2007, personal communication). The fishers generally go fishing for periods of four to seven days per week. Approximately 2.72 million fisher households participated in fishing in inland capture fisheries. Of these households, 96.22 percent fished for food consumption, whereas the remainder (3.78 percent) fished for trade. There are no systematic records of the total number of fishing boats employed in inland capture fisheries. This is mainly because most of the fishing boats are small-scale and are not obliged to register. There are only occasional surveys of the number of fishing boats operating in some natural reservoirs. For instance, it was found that 300 fishing boats operated in Beung Boraped area (Nakhon Sawan Inland Fisheries Research and Development Center, 2007). There are also constraints in producing information on other key aspects of inland fisheries. The main constraints are lack of up-to-date basic data, lack of accuracy of the data collection, lack of knowledge of scientific data collection methodologies, as well as the data being scattered over a wide area (Pawaputanon, 2003).

<sup>6</sup> DoF (2005a), (2005b), (2005c).



**Figure 4** Composition of inland capture fisheries by species 2004

## REVIEWED GROSS PROVINCIAL PRODUCT (GPP) SURVEY IN THE FISHERIES SECTOR

Gross domestic product (GDP) and gross provincial product (GPP) are used as national indicators of socio-economic status. According to the Office of the National Economic and Social Development Board (ONESDB), the objectives of using GDP and GPP are to determine the overall socio-economic status of Thailand and to indicate the trend and direction of economic growth.<sup>7</sup> Relevant government agencies are requested to provide detailed information on value added of various products at province level to help determine the province's socio-economic status.

Fish production contributed about 1.4 percent of the total GDP in 2003 (note that this figure is based on production estimates that are possibly underestimated). As fish production is one of many sectors to be combined for determining the status and trend of the national economy, the Fisheries Information Technology Center (FITC) of the DoF, Thailand has produced survey guidelines for carrying out the GPP survey since 2003. These guidelines have been distributed to all provinces that are to conduct surveys to gather data for GPP estimation. These guidelines provided details of survey techniques including forms for data collection, which have been categorized into marine and inland production. Furthermore, types of fisheries activities in each category are also divided into capture fisheries and aquaculture.

Fish production data are collected from sampled households by using statistical sampling techniques and interview forms to gather information on household production, fishing activities, fishing frequency, income and expenditure. There are five habitat types categorized under the agricultural census survey. These five habitat types are considered to be the most important habitats for freshwater fisheries production and fishing grounds for the rural people. Local communities normally have free access to these habitats for fisheries purposes. Hence, these habitats generate significant amounts of production.

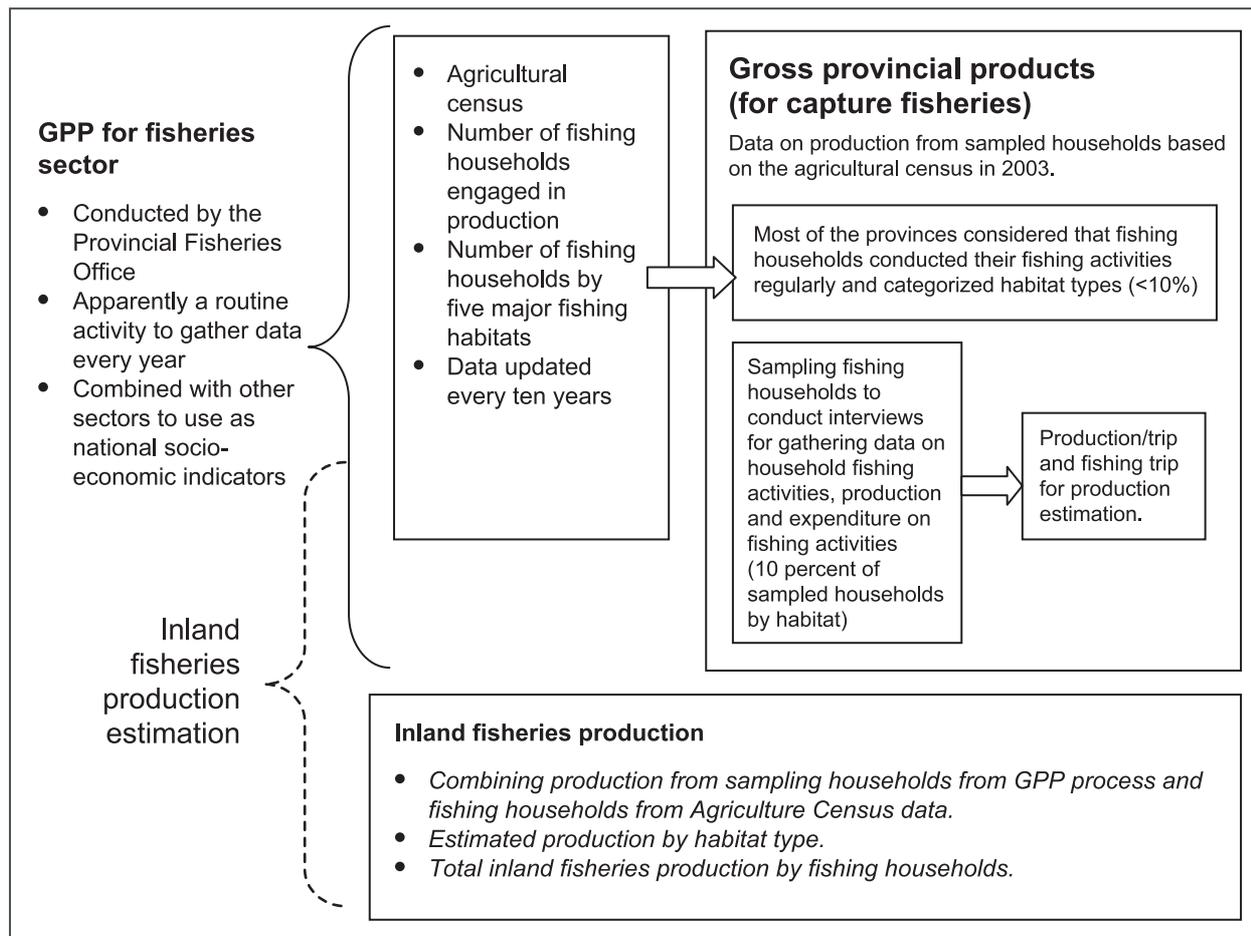
For the GPP survey, data on the value of inland capture fisheries are estimated for five different habitat types: river, pond trap, reservoir, natural swamp and community pond. Thereafter, the total production from all types of habitat is combined to present the total quantity of production with the value derived from the capture fisheries sector.

<sup>7</sup> ONESDB (2005).

## FRAMEWORK FOR PREPARATION OF A NATIONAL SYNTHESIS ON INLAND CAPTURE FISHING IN THAILAND

The overall framework used for the estimation of inland capture fisheries production considered the production yield of fishing households rather than the production of professional fishers (Box 1). Fishing household could be commercial-scale, large-scale or medium-scale fishing households as well as a vast number of small-scale fishing households. The large and medium-scale fishing households are a group that uses large gear and conducts fishing to extract the resources for trade whereas the small-scale fishing households utilize the inland fisheries resources mainly for their own consumption.

**Box 1** The overall framework for estimating inland capture fisheries production



In order to get detailed data on fishing households and participation in fisheries for the assessment of production, agricultural census data that provided information on fishing households at the village level were linked with the household production data from the GPP survey. Then the data from the different sources were combined and analyzed to quantify the total freshwater production yield of the fishing households.

A database was developed which effectively merged the data sets required for assessing inland capture fisheries. The data sets included in the database are: the agricultural census, the sample of fishing households under the GPP survey, census and GIS data on water bodies. These data sets were stored together and shared the same spatial references and were further linked to provincial political boundaries. In addition, data on household production and the household participation in the fisheries sector were matched with the GIS database for further spatial analysis. Using GIS gives considerable power in analyzing large data sets and the database also enabled overlay and mapping analysis. Hence, detailed

information on production status and trends of inland capture fisheries in Thailand could be more accurately presented and estimated and should therefore be more useful for fisheries resources management and policy.

## DATA SETS USED IN THE ESTIMATION

In order to estimate the inland fisheries production, two major parts of official statistics and data sets were used to extrapolate inland capture fisheries production.

1. **Agricultural census** is a national official set of statistics that is collected every ten years by the National Statistical Office (NSO). The last updated survey was conducted in 2003. This survey included a few questions on inland fisheries as one economic agricultural activity. The agricultural census aimed at establishing the current status of the agricultural structure in Thailand. Statistics were collected from both capture and culture systems. The survey was conducted throughout the country at community level using the “Closed Segment Concept”<sup>8</sup>, which considers data collection in those provinces where agricultural activities are carried out. In addition, this census data is now used as the database for surveying socio-economic conditions at provincial level.
2. **Gross provincial product (GPP)** is compiled from economic and social indicators at provincial level. This information requires routine surveys in each province. Data collection to determine valuation is carried out by various government agencies in order to cover the value of all types of product for both agricultural and non-agricultural sectors. The ONESDB provides budget and technical support to all agencies. The collection of data on the fisheries sector is under the responsibility of the Provincial Fisheries Office. Data collected cover various categories of marine and inland fisheries for both capture and aquaculture systems. It is worth noting that the process to collect data on capture fisheries sector is similar to the routine survey for annual inland capture fisheries production of DoF. The detailed process of the GPP data collection is shown in Box 1.
3. **GIS Database** is a geo-database used to support a mapping system. The database provided by the DoF is shared among various organizations. For this study, data on water bodies, watershed boundary and political boundary were extracted from the GIS database.
4. **Water bodies** are stored in a database from the DoF providing detailed names of the water bodies, their location, area and their status in terms of fisheries production. However, this data did not cover large dams and reservoirs.

## INLAND CAPTURE FISHERIES PRODUCTION ESTIMATION

Before carrying out the “trial” estimate of inland capture fisheries production two main aspects were considered. First, data and information should be routinely collected to determine the status and trend of the fisheries sector. Second, the data should cover small-scale fishing households, which are always overlooked. Small-scale fishing households represent a large group of people in the rural area that utilize fisheries production for their own consumption and there is no useful statistical report of production from this sector. Therefore, the study aimed to cover all major groups of people who participate in the fisheries sector and to present more reliable information on inland fisheries production.

Besides strengthening inland capture fisheries information, the study also aimed to provide comments that could help to improve the process of fisheries data collection. In addition, the information obtained

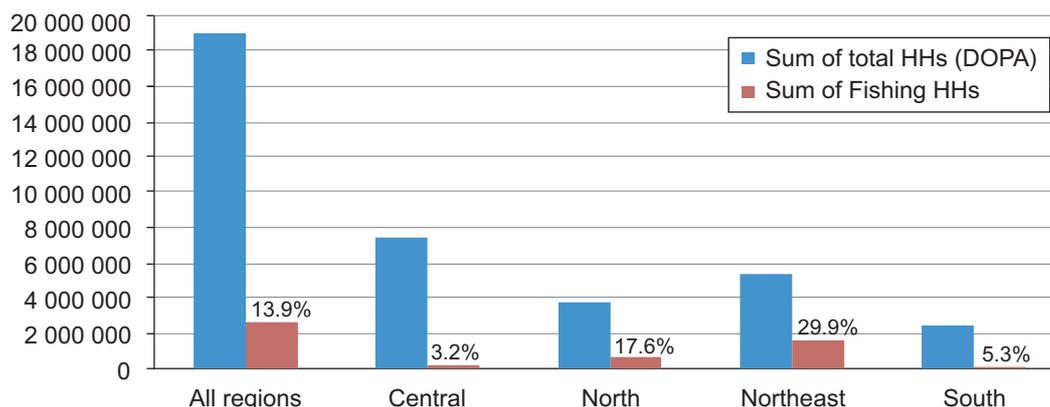
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<sup>8</sup> “The idea of the closed segment is to account in a rigorous manner for all of the land, livestock, etc., within the boundaries of the segment at the time of the interview regardless of what farm, or part of a farm, may be involved. Thus, the basic unit for enumeration becomes a “tract” which is a farm or part of a farm within a sample segment.” (Houseman and Becker, 1967, p. 19).

can help clarify the status and trend in the inland capture fisheries sector and ultimately help to determine two main indicators, namely, a) the participation in the fisheries sector (number of people); and b) the socio-economic value of this sector.

## PARTICIPATION IN INLAND FISHERIES SECTOR

Data derived from the agricultural census in 2003 showed that about 13.9 percent of the total households, or 2.5 million households throughout Thailand, conducted fishing activities in various inland fisheries habitats (Figure 5). The highest participation in inland fishing activities is in the North and Northeast regions where people depend more on freshwater fisheries resources to meet their dietary needs. Figure 6 presents the number of fishing households at district level in Thailand.



**Figure 5** Total households and fishing households in Thailand and by region

## SAMPLING OF FISHING HOUSEHOLDS

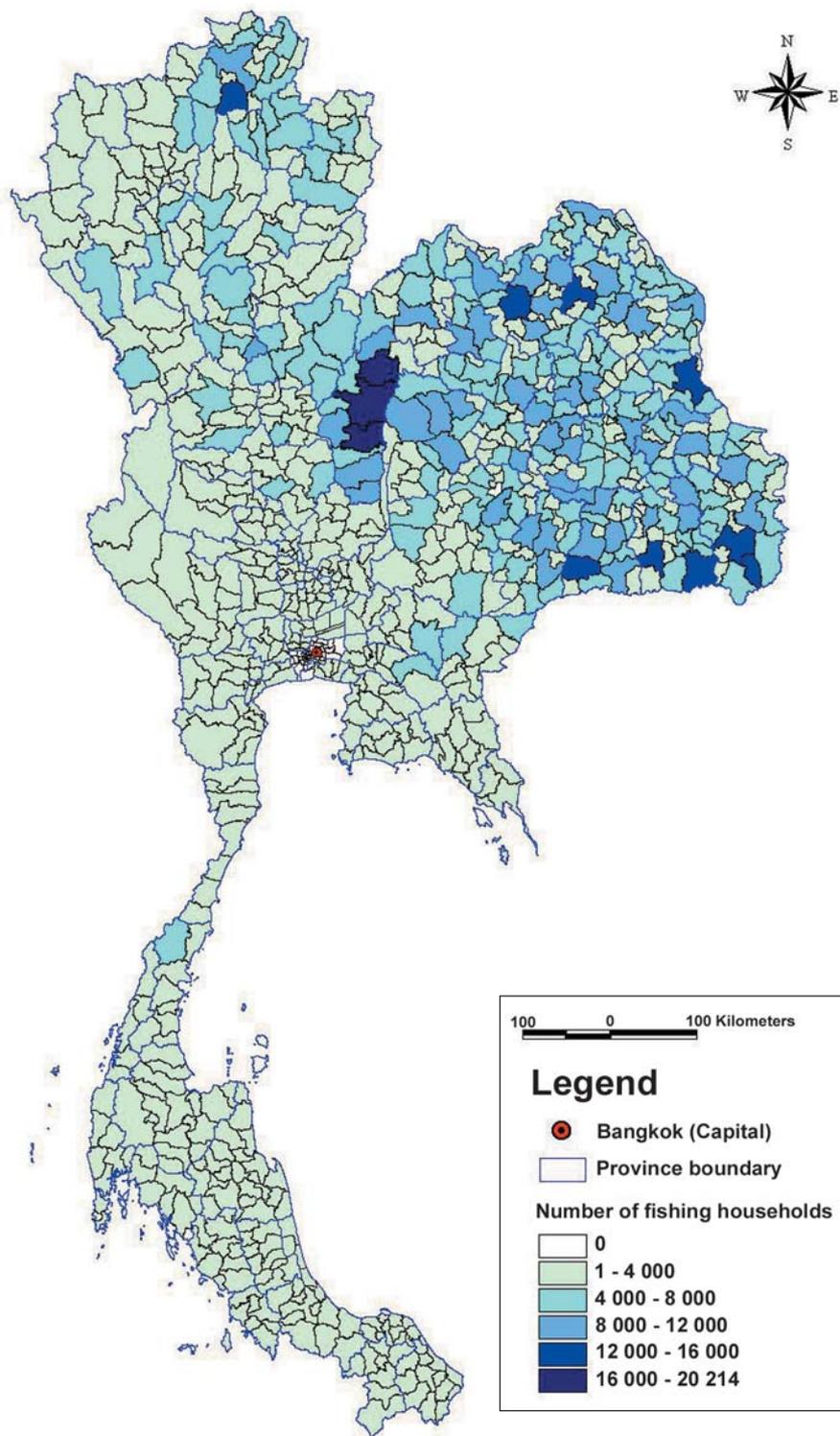
The trial study sampled fishing households that had been interviewed under the GPP survey of the inland capture fisheries sector. The sampled households had been asked to report the amount of household production, expenditure and income from fishing activities by habitat type. This survey was carried out throughout the country to estimate inland fisheries production and the value of this sector. Data from the GPP household survey of 2005 was used. After being checked, cleaned and stored in the database, a total of 2 215 households were available for analysis and used for production estimation and mapping.

## DISTRIBUTION OF HOUSEHOLD PRODUCTION

The distribution of household production is shown in Figures 6 and 7. Household production by region varied widely among the small-scale and middle-scale to commercial-scale fishing households. Of the total 2 215 households, 77.1 percent reported production less than 300 kilograms (Figure 7). It could be assumed that one-third of the sampled fishing households' production is less than 25 kg/month.

Inland capture fisheries are very important to the livelihoods of the Thai people. Most of the households in the low-production group utilized their production mainly for household consumption, whereas the production from middle-scale to commercial-scale fishing was mainly for sale (Figure 8).

As in other studies/surveys in the fisheries sector, household production distribution from the GPP survey is skewed to the right. Mean production of the total 2 215 households is  $401.6 \pm 1\,090.5$  kg/year where half of the total sampled households (median of production distribution) reported their production less than 120 kg/year and 75 percent of the total sampled households reported their production less than 281 kg/year (Figure 9).



**Figure 6** Distribution of fishing household in Thailand