DATA COLLECTION AND STATISTICS IN THE ANDAMAN SEA, THAILAND

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Abstract

Data collection and statistics prepared by Department of Fisheries (DOF), Thailand represents the first step in the process leading to data compilation and dissemination. Catch and effort data are collected on log sheets, which are completed onboard the fishing vessel or transcribed by the fishing company from the captain's log. Landing data are collected from the vessel's agent, stevedoring company or canneries in the port of transhipment or unloading. Species composition and length data are collected through port sampling surveys. Factors that can affect fisheries data collection include data collection forms, coverage rate and sampling design.

The DOF scheme collects catch, effort, size composition, biological and other relevant data to evaluate tuna stocks. The improvement of fishing techniques by applying purse seine and longliner as well as finding new offshore fishing ground are considered as alternatives in order to meet the demand of raw materials required by the local canneries that have experienced fast developed since 1979.

Introduction

Fishery management plans in Thailand are base on different principles, e.g. maintaining maximum biological yield or producing maximum economic yield, etc. However, unless we know the biological status of a certain population of fish, none of the above objectives can be achieved. Therefore, population studies are essential for establishing fishery management plans, no matter what are the objectives of management. These are to estimate the present size and age structure of a stock and to predict how the stock would react to a given amount a fishing effort and estimate the optimum size of the stock which can support the maximum yield in the long term. The prerequisite information on which such a study can be realized is as follow:

1. Total amount of fish removed from a stock.
2. Estimation of abundance indices.
3. Estimation of growth of fish and age composition of stock.

Since 1979, tuna resources have become very important for the marine capture fisheries due to the ncreasing demand of canneries in the country. It was an imperative to undertake comprehensive studies on tuna at that time as there were few studies on the topic. Particular attention was assigned to the study of basic tuna biology and other data collection to assess the state of exploitation of tuna stocks in Thai waters. The Department of Fisheries (DOF) focused on designing a proper sampling scheme to collect the catch, effort, size composition, biological and other relevant data for the evaluation of tuna stocks.

The responsibility to collect data for DOF, Thailand databases lies with Fisheries Economics Division (FED) and Marine Division. To extend data collection and information exchange on a regional basis, concepts and definitions have to be standardized so that statistics can be compiled in a format fitting the requirements of policy planners, scientists and industry applications. Tuna statistics collected by DOF can be classified into three categories:

1. Annual catch by species and gear type and the number of fishing craft operated by gear type.
2. Catch and fishing effort by time-area strata.
3. Size-frequency data by time-area strata.

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System of tuna statistics collection

Small tunas

The general data collection system in Thailand is based mainly on the new marine fisheries production surveys initiated in 1969.The surveys are conducted in the field by six DOF supervisors and 70 enumerators. Samples are selected at random, based on the type of fishing. The survey is applied on major types of fishing methods and gears (since 1973, 11 fishing methods have been covered) and if information is required on fishing gear applied in certain areas, the random sampling technique is applied (DOF, 1991).

Logbook Survey: Logbook data is collected on a weekly/monthly basis. Field enumerators visit selected landing ports regularly to record all related data. This data is recorded in a logbook provided by FED. Interview is necessary by the field enumerator if a key information is not available or missed out. All information is subsequently forwarded to the statistics office in Bangkok to evaluate, analyse and disseminate.

Four types of questionnaire are administered for the logbook survey to fit with operational conditions of each fishery.

1. Otter board trawl and pair trawl
2. Thai purse seine(TPS), Chinese purse seine(CPS), Anchovy purse seine(APS) , Mackerel encircling gill net, King mackerel gill net (KMG) and luring purse seines(LPS).
3. Bamboo stake traps.
4. Beam trawl and push nets

The coverage of the logbook survey includes all the fishing ports in six coastal provinces along the West Coast of Thailand (Fig 1). Information is collected on fishing effort and production per fishing unit (by fishing area and month). Data on fishing effort includes the number of trips, number of fishing days, number of hauls and number of fishing hours (DOF, 1999).

The estimation method adopted in the logbook survey is as follows:

A simple estimation is applied with the following:

$$\hat{T}_h = \frac{N}{n}\sum_{j=1}^{n} X_{hi}$$

where $\hat{T}_h$ = Total catch of marine fish by gear by month

N = Total number of fishing units.

n = Number of sample fishing units

X = Catch of sample fishing unit.

h = Month 1,…., 12, i = Sampling Unit i,…..,n.

The total catch by year is applied with the following:

$$\hat{T} = \sum_{h=1}^{12} T_h$$

where $\hat{T}$ = Total catch of marine fish by gear by year.

The estimation work is done at the FED office on a monthly basis after all questionnaires were received from the enumerators. Supervisors examine the data. Data are collected on the number of fishing units registered in the year and the number of fishing units actually operated in each month. The latter figure may vary from month to month. However, due to the shortage of field staff such figures may not be available. In that case, the estimation of monthly figures which is a number of fishing units of registered in the year (N) are used.

There are two shortcomings in the catch and effort data for tuna and tuna-like species in the general catch statistic: (I) breakdown into species is not available except for the catch data for longtail tuna (*Thunnus tonggol*) which has been available since 1979, and (II) the fishing gear classification used in the national statistics collection system is far from accurate due to the fact that the national fishing gear classification which was established long time ago and was incompatible with the change in current fishing. The incorrect classification occurs in particular for purse seines that have developed rapidly in recent years.

Port-sampling and landing survey: Port-sampling and landing surveys have been conducted by the staff of the Andaman Sea Fisheries Development Center (AFDEC) on a monthly basis at 11 major landing ports along the coast. The landing survey on pelagic fish caught by purse seiners has been carried out since 1984.

Purse seiners along the Andaman Sea Coast of Thailand can be classified into regular purse seines (RPS) and CPS. RPS consist of TPS, green purse seine (GPS), fish aggregating device (FAD), LPS, APS and tuna purse seine (TUN) (Boonragsa and Boonsuk, 1998).

The main commercial fishing port of pelagic fisheries along the Andaman Sea Coast of Thailand consisted of 11 fishing ports, of which 4 ports are located in the upper part of the coast and 7 ports are located in the lower part of the coast (Fig.1)

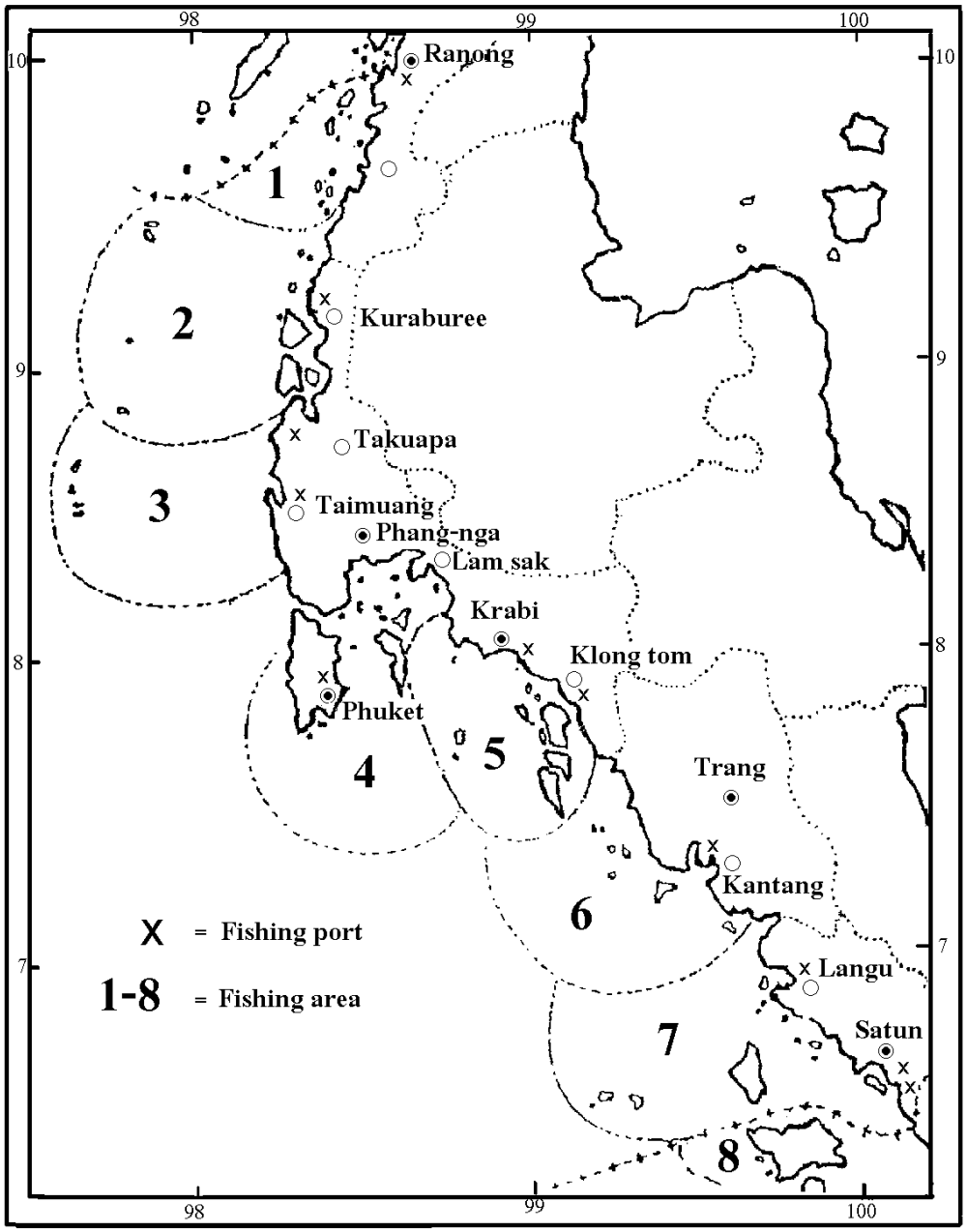


Fig. 1 The main fishing ports and fishing areas for purse seines along the Andaman Sea coast of Thailand (Boonragsa and Boonsuk, 1998).

1. Ranong fishing port, Ranong province. The port supports the fishing boats operated in Ranong and Myanmar waters.

2. Nang-yon fishing port, Phang Nga province. The facility supports only purse seiners which basically fished in Kuraburee waters.
3. Namkem fishing port, Phang Nga province. The port supports mostly purse seiners which operated in Takuapa and Taimuang waters.
4. Tab-lamu fishing port, Phang Nga province. The pier supports mostly purse seiners whose fishing grounds are in Taimuang to Takuapa waters.
5. Phuket fishing port, Phuket. The facility includes both private sector and Fisheries Marketing Organization (FMO). It is located at Muang district, Phuket province. It supports trawlers, purse seiners etc which mostly operate in Phuket, Phang Nga and Krabi waters and fishing fleets which jointly operate in neighboring countries such as Indonesia and India etc.
6. Krabi fishing port, Krabi province. The port accommodates primarily purse seiners which operate in the south of Phang Nga Bay in Krabi waters.
7. Klongtom fishing port, Krabi province. The port supports the landing of purse seiners which operate in the waters north of Trang.
8. Kantang fishing port, Trang province. Kantang port supports the landing of fishing boats operated in Trang and Satun waters and the Thai fishing fleet which operate on a joint venture basis in the waters of neighbouring countries.
9. La-ngu fishing port, Satun province. The pier supports purse seiners and small size trawlers which operated in Satun water and Thai-Malaysia boundary sea.
10. Tammalang fishing port, Satun province. The post supports the landing of fishing boats which mostly operated in Malaysian waters.
11. Jae-bilang fishing port, Satun province. The pier accommodates purse seiners, pair trawler, push net etc, which operated in Satun and Thai-Malaysia boundary waters.

The number of samples taken are different from season to season. The information obtained at each landing port include the types of purse seines and catch details, consisting of species composition, fishing effort, fishing ground, length-frequency distribution of each species, number of boat landing etc. Sampling is normally carried out on a monthly basis during a new moon and full moon. The record books provided data for the previous months. The data collected from fishermen and owners of landing ports consists of catch by species, trips and other information from different type of gears.

The composition of the tuna catch during the sampling surveys was determined by species, size and types of fishing gear. The fork length of the fish was measured separately by species in 0.5 cm intervals (lower limit) at the sampling site.

The estimation method adopted in the port-sampling survey is as follows (Boonragsa and Chanasith, 1995):

$$\hat{T} = \frac{Nd}{\hat{t}} \sum_{i=1}^{n} X_i$$

where $\hat{T}$ = Estimate of total catch of pelagic fish,

N = Total number of fishing boat,

d = number of fishing effort (day) per boat,

$\hat{t}$ = Average number of fishing effort per trip,

X_i = Total catch of pelagic fish per trip per boat of sample unit, and

n = Number of trip of sample unit.

The data on length of the samples of each pelagic species of each gear in each month were raised to the total catch of each gear by using the raising factor (RF):

$$\text{RF} = \frac{W_t}{W_s}$$

W_t = Total weight estimated and

W_s = Sample weight.

Tuna and Billfish

Since 1993, the tuna fished by foreign fleets in the eastern Indian Ocean (tuna purse seines and tuna longliners) have been landed at Phuket Port (Fig. 1). Changes in the fishing areas from the western to the eastern of Indian Ocean were driven by economic reasons as Thailand has become the main frozen tuna market in the world. This was also due to an advantage in infrastructure for transportation of the deep-sea port and the international airport. The Thai tuna purse seine, Mukmany, have been operated in the eastern Indian Ocean since 1998.Under these circumstances, an updated evaluation on the status of the tuna fisheries in the eastern Indian Ocean is important and needs an urgent investigation.

Port-sampling and landing surveys: These surveys have been conducted by the staff of AFDEC on a monthly basis at two landing ports in Phuket province since 1993 to collect fishing and biological data for tunas e.g. catch, effort, individual fork length and weight. Landing data covers the catch unloaded from the vessel. They usually include data on the vessel (name, flag, and registration number), the port of unloading, the vessel's agent in the port of unloading, the dates of unloading (in number of fish and tonnes for longline and in tonnes for purse seine) by species. Port sampling data includes species composition and length samples taken as the catch is unloaded. The species composition samples can be used to verify log sheet and landing data. The length samples can be used for stock assessment, together with other types of data.

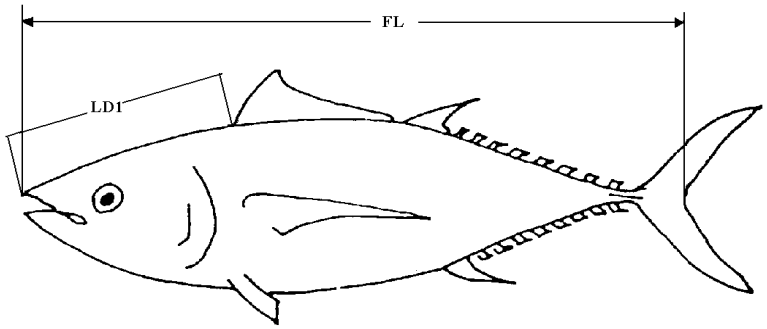
Log sheet data: Log sheet data for purse seines were established and developed since 1999 after AFDEC staff received a suggestion from the Spanish Fisheries Office and the Fisheries Statistician of the Secretariat of the Pacific Community (personal communication). Log sheet data include information related to fishing trips and fishing operations. The trip data can include details about the vessel (such as the vessel name, country of registration, fishing permit of license number, etc.), the dates and ports of departure and return and effort (such as the number of set per trip for purse seine, etc.). The operational data includes the data and time of the operation, the location, the retained catch of target and non-target species, discards by species, and other information relating to the operation (such as the school association for purse seine set, etc.). Log sheet data are used for estimating annual catches by fleet, monitoring catch rate by fleet, standardisation of catch rates and assessing stock based on catch and effort (Appendix 1).

The data from landing surveys, port-sampling surveys and log sheets can be used together to estimate annual catches by the fleet.

The catches of tunas by purse seine are composed mainly of skipjack (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*) and bigeye tuna (*T. obesus*). The catch of tuna longlines consists largely of yellowfin tuna (*T. albacares*), bigeye tuna (*T. obesus*), swordfish (*Xiphias gladius*), billfish (*Makaira* spp., *Tetrapturus* spp., *Istiophorus* spp.) and requiem sharks (*Carcharhinus spp)* (Chantawong, 1998). Length measurements (FL and LD1 of tunas, PDL of billfish) and weights (whole weight by purse seine, gilled & gutted weight of tunas by longline, dressed weights of billfish by longline) are collected. Details of measurements of tuna and billfish can be taken as:

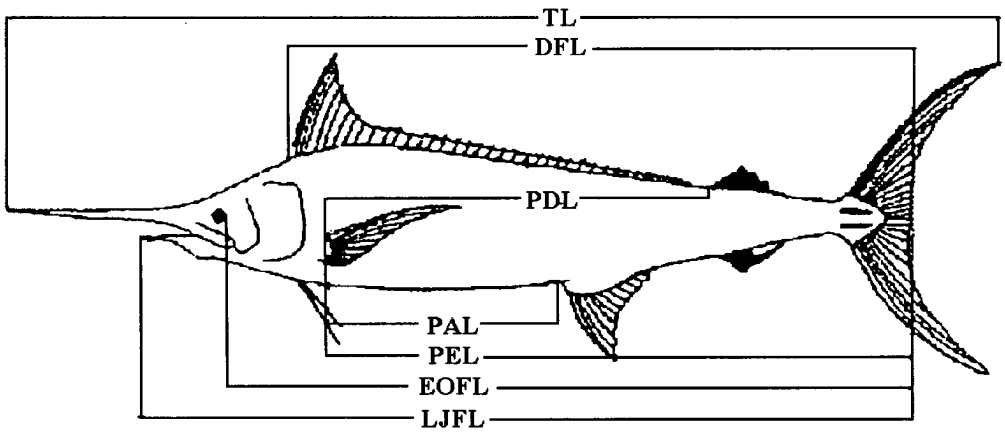
Tunas : Small specimens have been measured in FL, for yellowfin and bigeye (large size > 10 kg) measured from the trip of the snout to the base of the first dorsal fin (LD_1) (Fig 2).

Fig. 2 Measurements of tuna shaped fishes FL and LD1 (Sakurai and Miyake, 1987).



Billfish: Billfish are measured in pectoral- 2 nd dorsal length, that is, a projected straight distance between the most anterior insertion of the pectoral fin to the most anterior rim of the 2 nd dorsal fin (PDL) in Fig 3.

Fig 3. Alternative measurements of billfish-PDL (Poisson et al., 1998).



For the conversion from gilled and gutted weight to live weight of yellowfin and bigeye tuna, the factor of 1.09 (Anon., 1998) was used.

Conclusion

The DOF focuses on research, development, extension, training, statistics, resource management, quality control, export development and provision of credit for fishermen groups. At present, tuna resources have become very important for marine fisheries. Demand for the fish has risen from local canneries which have become key supplier to the world and have experienced fast developed since 1979. In order to meet the demand of raw materials, the improvement of fishing techniques by the use of purse seiners and longliners, as well as finding new offshore fishing grounds, are considered as alternatives.

It is urgent to study basic tuna biology and collect necessary information to appraise the state of exploitation of tuna stock in Andaman Sea and eastern Indian Ocean. Currently, the available information on the fish is insufficient to support sustainable management.

Data collection and statistics prepared by AFDEC and FED represents the first step in the process leading to data compilation and dissemination. Catch and effort data are collected on log sheets which are completed on board the fishing vessel or are transcribed by the fishing company from the captain's log. Landing data are collected from the vessel's agent, stevedoring company, as well as canneries in the port of transhipment or unloading. Species composition and length data are collected through port sampling surveys. Factors that can affect fisheries data collection include data collection forms, coverage rate and sampling design.

Problems and recommendation

Problems include:

1. Difficulties in obtaining the length-frequency data for some months due to time limitation at the fishing ports (such as small tunas for national purse seine, tuna and billfish for foreigner fleet, etc.).
2. Most of small tunas caught were immature, and hence the data on spawning season are not made available to domestic fleet.
3. Confusion and lack of sound basis for the species identification for small tunas (such as frigate tuna and bullet tuna for local purse seiners) and billfish (such as *Makaira* spp., *Tetrapturus* spp. and *Istiophorus* spp. for foreigner longliners).
4. Lack of log sheets of foreigner longliner unloaded at Phuket fishing port, only the interview data have been taken from the export company and masterfishermen. The data collection system for longliner has to be better established, so that all data users (such as the IOTC) researchers and fishermen may be satisfied.
5. The data collection and statistics for tuna and billfish should be an area of inter-regional cooperation between countries which used these resources (such as small tuna fisheries in the Andaman Sea). The cooperation in data collection should be established between the flag country and the port of unloading

or transhipment (such as the supply of log sheets by foreigner tuna purse seine and longline fisheries in the eastern Indian Ocean).

References

Anon. 1998. Indian Ocean Tuna Fisheries Data Summary, 1986-1996, IOTC Data Summary No. 18. 180 p.

Boonragsa, V. and S. Boonsuk. 1998. Pelagic fisheries and resources along the Andaman Sea Coast of Thailand. Andaman Sea Fisheries Development Center, Marine Division, Department of Fisheries. 52 p.

Boonragsa, V. and J. Chanasith. 1995. Status of the Indo-Pacific mackerel resource and fishery along the Andaman Sea Coast of Thailand, 1979-1993. Technical paper no. 38. Stock Assessment Unit, Andaman Sea Fisheries Development Center, Marine Division, Department of Fisheries. 53 p. (in Thai)

Chantawong, P. 1998. Tuna Fisheries in the East Indian Ocean. Paper presented at the 7 th Expert Consultation on the Indian Ocean Tunas, 9-14 November 1998, Victoria, Seychelles. 10 p.

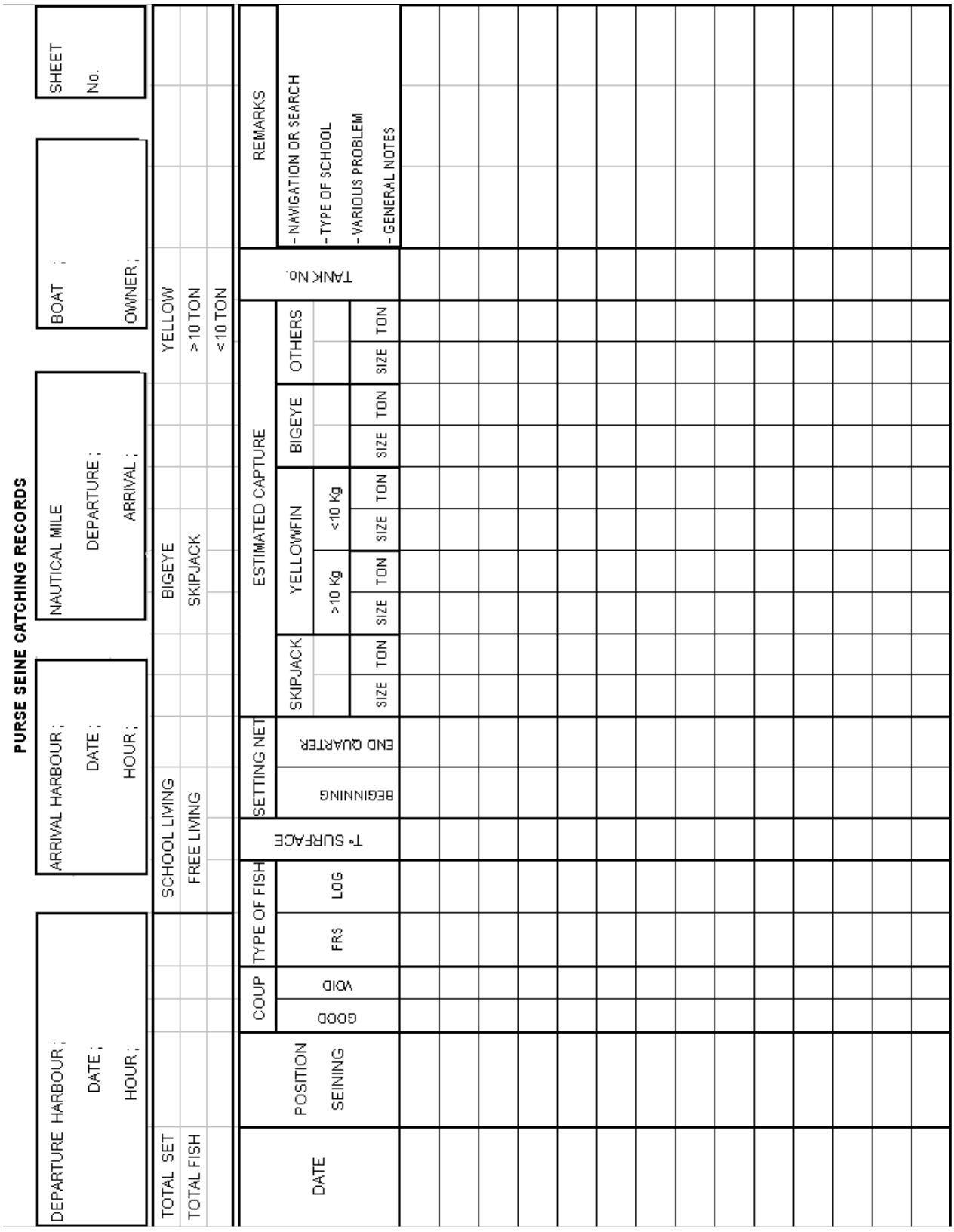
Department of Fisheries. 1991. The marine fisheries statistics 1989 base on the sample survey. Fisheries Economics and Information Technology Sub-Division, Fisheries Economics Division, Department of Fisheries. 99 p.(in Thai).

Department of Fisheries. 1999. Guide of the explain on the marine fisheries statistics in1999. Fisheries Economics and Information Technology Sub-Division, Fisheries Economics Division, Department of Fisheries.146 p. (in Thai).

Poisson, F., D. Guyomard and F. René. 1998. Collection of statistical and biological information on Reunion Island swordfish fishery. Paper presented at the 7 th Expert Consultation on the Indian Ocean Tunas, 9-14 November 1998, Victoria, Seychelles. 19 p.

Sakurai, T. and M. Miyake. 1987. Manual for collecting statistics and sampling on tuna and tuna-like species in the Indian Ocean and Southeast Asian Region. IPTP Manual no. 2 for Collection of Tuna Statistics. 157 p.

Appendix 1


PURSE SEINE CATCHING RECORDS
DEPARTURE HARBOUR ;
DATE ;
HOUR ;
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HOUR ;
NAUTICAL MILE
DEPARTURE ;
ARRIVAL ;
BOAT ;
OWNER ;
SHEET No.
TOTAL SET
TOTAL FISH
SCHOOL LIVING
FREE LIVING
BIGEYE
SKIPJACK
YELLOW
>10 TON
<10 TON
DATE
POSITION SEINING
COUP
GOOD
VOID
TYPE OF FISH
FRS
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T° SURFACE
SETTING NET
BEGINNING
END QUARTER
ESTIMATED CAPTURE
SKIPJACK
SIZE
TON
YELLOWFIN
>10 Kg
<10 Kg
BIGEYE
OTHERS
TANK No.
REMARKS
- NAVIGATION OR SEARCH
- TYPE OF SCHOOL
- VARIOUS PROBLEM
- GENERAL NOTES