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KUALA TERENGGANU, MALAYSIA

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REPORT OF THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:

RESEARCH AND MANAGEMENT IN THE SOUTH CHINA SEA

ORGANISED BY:

MARINE FISHERY RESOURCES
DEVELOPMENT AND MANAGEMENT DEPARTMENT
SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER

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24TH - 26TH JANUARY 2000
KUALA TERENGGANU, MALAYSIA

I. INTRODUCTION

1. The SEAFDEC MFRDMD Fourth Regional Workshop on Shared Stocks: Research and Management in the South China Sea was held in Kuala Terengganu, Malaysia, from 24th to 26th January 2000. The main objectives of this workshop are (a) to identify the problems in the management of shared fish stocks in the South China Sea, (b) to identify appropriate management systems for the shared fish stocks in the South China Sea, and (c) to develop appropriate regional fish resources survey mechanisms.

2. The Workshop was attended by delegates from Brunei Darussalam, Indonesia, Malaysia, Philippines, Thailand, Vietnam and Training Department of SEAFDEC; resource persons from FAO, SEAFDEC Secretariat, and MFRDMD, and observers from Department of Fisheries Malaysia, Universiti Putra Malaysia, University College Terengganu, and the DANIDA project on the Assessment of the Living Marine Resources in Vietnam (ALMRV). The list of delegates appears as **Annex 1**.

II. OPENING CEREMONY

3. Mr Ismail Taufid Md Yusoff, Chief of SEAFDEC MFRDMD, welcomed all the participants to the Workshop. He was happy to have Mr. Hashim bin Ahmad, the Deputy-Director General of Fisheries Malaysia, officiate in the Opening Ceremony, on behalf of the Director-General, because Mr. Hashim has been very much involved and familiar with the affairs of SEAFDEC. The Workshop was also fortunate to have resource persons from the FAO and the SEAFDEC Secretariat, whose presence and contribution were deemed as very important, to help guide the participants on the proper track in carrying out their mission. To ensure the sustainable development of the shared fish stocks, he hoped the fisheries managers of the region would support the work identified for implementation by the fisheries researchers at the national level. The full text of Mr. Ismail's opening address is given as **Annex 2**.

4. In his keynote address, Mr Hashim bin Ahmad, the Deputy-Director General of Fisheries Malaysia, welcomed all participants to the Workshop on behalf of the Director-General and the Government of Malaysia. He was pleased to note that MFRDMD had started its activities rather early in the new millenium, amidst the still on-going festive mood of the New Year and Eid celebration everyone was presently enjoying. He reiterated that SEAFDEC viewed the convening of regional workshops as one of its more important activities because it fulfilled the needs of the SEAFDEC Strategic Plan in providing a forum for fisheries scientists and managers to meet, plan and formulate suitable programs and activities for the research and management of fisheries resources in the region. The United Nations Convention on the Law of the Sea had stipulated that coastal states were obliged to conserve their marine resources, protect and preserve their marine environment, and cooperate directly or through

existing international organizations. He hoped that SEAFDEC through MFRDMD would be able to address such obligations in a more effective manner. He expected the Workshop to provide a strong initiative for what could eventually be a successful program of collaborative activities and mutual benefits for the countries in the region, and wished all participants every success in their deliberations. The full text of Mr. Hashim's keynote address appears as **Annex 2a**.

5. On behalf of the Director General of Fisheries Malaysia as well as SEAFDEC Council Director for Malaysia, Mr. Hashim Ahmad declared open the Workshop.

III. BUSINESS ARRANGEMENTS

(a) Adoption of the Agenda and Time Table of the Workshop

6. The Workshop adopted the Agenda and Time Table, which appear as **Annex 3**.

(b) Appointment of Chairpersons and Rapporteurs

7. Mr. Hitoshi Fujita, Deputy Chief of SEAFDEC MFRDMD, Dr. Yasuhisa Kato of the SEAFDEC SECRETARIAT, Dr. Purwito of the FAO, Mr. Ibrahim Salleh of SEAFDEC MFRDMD and Mr. Ismail Taufid Md. Yusoff, Chief of SEAFDEC MFRDMD, were appointed as chairpersons of the workshop sessions; while Dr. Mohd Taupek Mohd Nasir, Dr. Mansor Mat Isa, Mr. Raja Bidin Raja Hassan and Mr. Ku Kassim Ku Yaacob of SEAFDEC MFRDMD were appointed as rapporteurs for the plenary sessions. Dr. Mohd Taupek Mohd Nasir served as the Technical Rapporteur for the whole Workshop.

IV. COUNTRY STATUS REPORTS IN RELATION TO SHARED FISH STOCKS AND MANAGEMENT EXPERIENCES

Chairperson : Mr. Hitoshi Fujita, SEAFDEC MFRDMD

(i) Malaysia (Peninsular Malaysia)

"The Pelagic Fishery on the east coast of Peninsular Malaysia"– by Ms. Chee Phaik Ean (**Annex 4**)

8. The paper gave an overview of the status of the pelagic fishery resources on the east coast of Peninsular Malaysia. These resources most probably consist of transboundary stocks since pelagic fish are characteristically migratory in nature. It has also been accepted that many of these stocks are shared by a few countries in the adjacent area. However, after years of meetings and deliberations, problems in the actual assessment and management of these shared stocks still prevail. This report also outlined some of the outstanding problems relating to these aspects.

(ii) Malaysia (Sabah)

"Marine fisheries resources status: Sabah report" - by Mr. Irman Isnain (**Annex 5**)

9. The 1998 total marine fisheries landings in Sabah was about 196,000 metric tonnes valued at RM 660 million, which was an increase of about 12.5 % compared to the value of 1997. The fishing grounds here are divided into two major zones: the West Coast Zone and the East Coast Zone. The estimated potential yields were around 265,000 tonnes and 85,000 tonnes in the coastal fisheries and deep sea fisheries, respectively. Pelagic species had the biggest component in the marine fisheries sector at about 50% of the yearly marine fish landing, had migratory behavior and were exploited together as shared stocks with neighboring countries. The demersal resources ranged from mid to overexploited level. In terms of value, prawn resources were the most important component in the marine fish production sector.

Discussion

The Workshop was informed that some differences in the water salinity of Sabah compared to other areas probably influence the distribution of a fish species like the *Rastrelliger*.

(iii) Malaysia (Sarawak)

"Pelagic fisheries resources of Sarawak, Malaysia" - by Mr. Albert Chuan Gambang (**Annex 6**)

10. The speaker informed the meeting because of the central position of the waters off Sarawak within the South China Sea, the area is believed to be the main routes for straddling and migratory fish stocks. Fishing in Sarawak was more concentrated in the coastal areas which occupy about 1/3 of the EEZ waters of the state. Fishing vessels here could be grouped into 4 main categories: purse seiners, gillnetters, bottom trawlers and traditional fishing vessels, with gillnetters having the largest number of vessels. The coastal pelagic fish were dominated by 6 main groups: mackerels, scads, sardines, spanish mackerels, hairtails and hardtail scads. Previous acoustic surveys had assessed the biomass of pelagics at between 900,000 – 1,700,000 tonnes. Management of these resources had been through two main measures; controlling the effort through the issuance of fishing licences and restriction on fishing areas for different size boats. Encroachment of bigger fishing vessels into the coastal areas was one of the management problems.

Discussion

The Workshop noted that more accurate information on the biological parameters and species of the pelagic fisheries in this region were still needed, but felt that information on the actions and implementations that have been taken by the respective countries concerning previous recommendations should be highlighted.

(iv) Thailand

"Status of small pelagic fish resources and fisheries in Thai waters" - by Ms. Praulai Chantawong (**Annex 7**)

11. The status of the pelagic fisheries and resources in Thai waters was estimated based on the fisheries statistics of Thailand between 1980 and 1995. An attempt had also

been made to assess the present status for the major small pelagic stocks, namely the Indo-Pacific mackerels, Indian mackerels, round scads, small tunas, anchovies and sardines. Other technical reports pertaining to pelagic fisheries and resources had also been reviewed. In the Gulf of Thailand, most of the small pelagics had been overfished, with the exception for the hardtail scad and the king mackerel. In the Andaman Sea, stocks of the Indo-Pacific mackerel that were located in the lower parts of the coast and stocks of the banded trevally had shown indications of overfishing. To date, recovery of these stocks appeared to have improved. For the Indian mackerels, round scads, sardines, small tunas, hardtail scads and bigeye scads, the seemingly no drastic changes in their catch probably implied that these resources were being sustained.

Discussion

The Workshop requested further information on the activities of commercial vessels from areas that had been closed for a certain duration (close season), and was informed that the vessels would normally operate outside the area of concern. Some comments have also been made regarding the success in the conservation measures of the Indo-Pacific mackerels.

(v) Vietnam

"Problems of shared fish stock in Vietnam" - by Dr. Chu Tien Vinh **(Annex 8)**

12. The Vietnamese fisheries sector was the fourth most important economic sector in the country after oil, agriculture and textile. These fisheries were considered as multi-species, multigears, small scale and free assess fisheries, with most of the fishing efforts effected by relatively small vessels. The coastal pelagic and demersal resources had now been reported as being overexploited. Surveys and research on marine resources had been conducted for many years, since the establishment of the Indo-China Institute of Oceanography in 1923. Results of these research activities had been described in different reports and publications. Shared stocks of oceanic pelagics were still believed to be underexploited, due to lack of appropriate fishing vessels and technology. Illegal fishing by foreign vessels still occurred in the waters of Vietnam. Major problems faced in fisheries management include those such as overfishing in the coastal waters, habitat degradation, destructive fishing methods, industrial and agricultural pollution, lack of data on offshore fisheries resources and statistics, and lack of fisheries law and legislation framework.

Discussion

The Workshop commented on the fact that most of the countries in this region have common stocks of fish in their waters, but the extent of stock sharing between the countries however is still unknown. In offshore waters of Vietnam, tuna was suggested as the most important species.

(vi) Philippine

"Status and management of Philippine pelagic resources potentially shared with neighboring countries" – by Mr. Noel C. Barut (**Annex 9**)

13. The speaker mentioned that the fishery sector contributed significantly to the country's economy and continued to play an important role in providing livelihood and in attaining food security. A significant amount of the sector's contribution came from pelagic resources that were potentially shared with other countries, such as the highly migratory species of tunas, billfishes, oceanic sharks and small pelagics. An average of 1.09 million tonnes had been caught from 1993 to 1997, a great majority of which was taken by commercial fishing boats numbering to about 3,416 in 1998. The paper also outlined the status and management of potentially shared pelagic fishery resources, including problems encountered in research and management, as well as the past, present and future national resource surveys.

Discussion

The Workshop noted that in coastal resource management, the Philippines has adopted several strategies, one is to reduce fishing pressure through giving supplemental or to complement the income of the fishermen by providing them with other sources of livelihood. This would be done gradually, until such time that they are prepared to leave the fishing activity, thus reducing the fishing pressure in the coastal waters.

(vii) Brunei Darussalam

"Status report of pelagic fisheries in Brunei Darussalam" - by Mr. Sabri Hj Mohd Taha (**Annex 10**)

14. The total fish production of the country in 1998 was estimated at 12,641 metric tonnes, around 51% of which were the pelagics. The estimated potential yield of small pelagics from the Brunei Darussalam's EEZ was around 7660 metric tonnes, but at present only about 38% of this amount were exploited annually. Most of the small-scale and commercial fishing activities were within the 3-40 nautical mile offshore waters, and very little fishing activities were undertaken beyond. Up to 1999, the small scale fisheries contributed around 85% of the total fish production, while the balance of 15% were contributed by the commercial sector. With the addition of more commercial vessels beginning for the year 2000, an increase in contribution from the commercial sector was expected in the years to come.

(viii) Indonesia

"Management of shared stock in Indonesia" - by Mr. Ketut Widana (**Annex 11**)

15. The speaker mentioned that Indonesia, as a coastal state, has some stocks of fish considered as shared, and is deeply concerned about their management, especially for the transboundary and migratory shared stocks. The country had made serious efforts to manage those species considered as shared in line with the responsible fishing principle, but felt that their effective management should also be carried out through a sub-regional, regional or international cooperation. At present, fisheries management

agreement between sharing countries, both at the bilateral and/or multilateral level, was still insufficient. The paper proposed that SEAFDEC be the facilitator for the region in planning and implementing the research/studies on the management of shared stocks, taking priority in certain species that were shared.

V. REVIEW OF SHARED FISH STOCKS IN THE SOUTH CHINA SEA

Chairperson : Dr. Yasuhisa Kato, SEAFDEC SECRETARIAT

(i) **"Implementation of past recommendations from the shared stocks workshops; the SEAFDEC experience"**– by Dr. Mansor Mat Isa, SEAFDEC MFRDMD (**Annex 12**)

16. The Workshop was informed that following the FAO/SEAFDEC Workshop on Shared Stocks, held in Bangkok in 1985, a number of recommendations had been formulated which were believed to have then been implemented by the respective countries of the South China Sea region. Also following this 1985 meeting, a number of meetings/workshops had also been organized by the relevant authorities, such as the "Working group meetings on mackerels and roundscads in the Straits of Malacca" by FAO/BOBP in 1985-1987, and meetings on shared stocks by APFIC in 1996. SEAFDEC MFRDMD had conducted three Shared Stock Workshops covering various themes since 1994. The paper listed the various recommendations that had been formulated and touched briefly upon the success of their implementation in the region.

(ii) **"Review on the status and biomass of pelagic fishery resources in the South China Sea"**– by Mr. Raja Bidin Raja Hassan, SEAFDEC MFRDMD (**Annex 13**)

17. The paper informed the meeting about a series of acoustic surveys that had been conducted by MFRDMD using the research vessel *MV SEAFDEC* in collaboration with TD and other SEAFDEC member countries during the previous four years. In this period, four main areas were covered by the vessel: the Gulf of Thailand and east coast of Peninsular Malaysia, Sarawak-Brunei Darussalam and Sabah, western Philippines, and the waters of Vietnam. A similar study using the training vessel KL CERMIN had also been conducted in the Malaysian EEZ in 1998. Both vessels were equipped with the scientific echosounder, FQ70, to collect back scattering values (sv) data that are needed for stock determination. The paper presented to the Workshop some information on the estimation of pelagic fish biomass for the collaborative studies and national surveys conducted by the member countries based on the representative species.

(iii) **"Stock sharing among neighboring coastal states"** – by Mr. K. Katsuyama, Japan Fishery Agency (**Annex 14**)

18. The speaker informed the Workshop that in 1994 the United Nations Convention on the Law of the Sea (UNCLOS) took effect. Following this, the international reinforcement of management on highly migratory fish and straddling fish was pursued with the establishment of the U.N. Implementation Agreement. In the Northeast Asian waters, including areas adjacent to Japan, a regional fishery

organization concerned with the management of small pelagics had still not been established. However, bilateral discussions were made on a gradual basis between the countries involved within the framework that they belonged. Management measures were introduced starting with fish species for which management was possible, based on the perspective of building up long term multilateral agreements. Some of the pertinent issues highlighted in the paper include those relating to multilateral agreements regarding straddling fish species and highly migratory species, those relating to the situation in the areas surrounding Japan, and also those facing the Southeast Asian region. He also pointed out the possibility that target management level of shared stocks will be affected by the stock abundance in this region.

(iv) "Management of shared stocks in the South China Sea: Are we ready ?"– by Dr. Purwito Martosubroto, FAO (**Annex 15**)

19. The paper informed, among others, that the development of fisheries management in the region should now be enhanced with the availability of CCRF and its various technical guidelines. Fisheries management deals with allocation of resources, hence the participation of stakeholders in the process of management plan development is a forefront requirement. With the increase in globalisation, some developed countries had used trade as a tool to promote sustainable and responsible fisheries. Eco-labelling was one of the emerging practices in the global trade. USA had used the TED/BED issue as a means to reject import from any country which did not use TED/BED in their shrimp fisheries. Dolphin safe was another label that was required for tuna imported to the USA. It thus became clear that strengthening the national management institutions by coastal states bordering the South China Sea should form an important agenda for the Fisheries Department in the individual countries. Regional and international organizations could then play a role towards enhancing the management of shared stocks, hand in hand with the management of national stocks by individual coastal states, to make the region ready for the management of shared stocks.

VI. REGIONAL MECHANISM AND FUTURE DIRECTION OF SEAFDEC ON RESEARCH OF THE SHARED FISH STOCKS

Chairperson : Dr. M. Purwito, FAO

(i) "Regional fisheries statistics of the Southeast Asian region"– by Mr. Suriyan Vichitlekarn, SEAFDEC Secretariat (**Annex 16**)

20. The paper introduced briefly SEAFDEC's planned strategies and actions for improving fishery statistics and its systems in the Southeast Asian countries in light of development and management of sustainable fisheries with emphasis on management of shared stocks. It was also emphasized that strengthening of national fishery statistical systems as well as sustainable data collection systems should be promoted as the long-term approach for management of sustainable use of shared fish stocks in the region. The need of a sustainable data collection should not be limited to individual countries only, but likewise the prospect of having an integrated fishery statistical system among the countries of this region. The paper also outlined the strategies and actions required for improvement of fishery statistics, including notes on strengthening of national fishery statistical systems, promotion of data exchange

and regionally comparable data systems, development of human resources at various levels, and coordination and collaboration among the member countries and concerned agencies.

Discussion

The Workshop congratulated SEAFDEC for its success in publishing the statistical bulletin since the last two decades. However, it was observed that the contribution of participating countries in providing the required statistical data was getting less. The Workshop suggested that better cooperation and continuity are needed from the countries concerned to be able to publish these data.

(ii) **"Optimising the application of a marine Geographical Information System (GIS) in fishery research and resource management in Southeast Asian region"**– by Mr. Rosidi Ali, SEAFDEC MFRDMD (**Annex 17**)

21. The paper described a project that had just been initiated by MFRDMD to promote the application of marine Geographical Information System (GIS) in fisheries research and resources management in the Southeast Asian region. Features and functions of Marine Explorer were briefly described. Two case studies were reviewed. Steps to materialize the application of this GIS in fisheries research and resources management for this region were also listed and discussed. The speaker showed to the Workshop some samples of the results that had been obtained using this impressive tool.

(iii) **"Application of remote sensing in fisheries "**– by Mr. Ku Kassim Ku Yaacob, SEAFDEC MFRDMD (**Annex 18**)

22. Remote sensing techniques were used to study the distribution of fish in relation with oceanic phenomena such as sea surface temperature (SST) and ocean color (phytoplankton). Pelagic fishing data were analysed between May 1997 and August 1998. Satellite data from the NOAA AVHRR (SST) and SeaWiFS (phytoplankton) were also analysed. The results indicated that a large number of pelagic fish were caught in the warm water fronts, as well as in the areas of high density of phytoplankton. The paper however concluded that further analyses were still needed to reaffirm this observation.

Discussion

The Workshop was informed that MFRDMD would conduct a workshop on the application of remote sensing in fisheries in the middle of the year 2000.

Additional works need to be conducted by MFRDMD to relate the remote sensing data with the actual catch data, leading to the production of maps of potential fish zones in the South China Sea.

(v) **"Regionalization of the Code of Conduct for Responsible Fisheries - Phase III, Fisheries Management"**– by Dr. Mohd Taupek Mohd Nasir, SEAFDEC MFRDMD (**Annex 19**)

23. The Workshop was informed that the Code of Conduct for Responsible Fisheries (CCRF), unanimously adopted on 31 October 1995 by the FAO Conference, provides the necessary framework for national and international efforts to ensure the objectives of ensuring the effective conservation, management and development of all living aquatic resources can hopefully be achieved. Four years of exhaustive efforts by interested countries of the world have resulted in a consensus on the current comprehensive text of the CCRF. During the negotiation process, however, specific regional issues were diluted, or perhaps even avoided, with a view towards finding acceptable global compromises and consensus on controversial issues. The different fishing scenarios and issues that exist within the Southeast Asian region, especially those relating to the multi-species coastal and small-scale fisheries, which are rather dominant here but unfortunately were only superficially covered by the global Code, need to be firmly addressed before the Code can be implemented for the region. The paper outlined the various steps that were currently being taken by SEAFDEC MFRDMD to regionalize the Code (Fisheries Management) for Southeast Asia.

Discussion

The Workshop noted that Fisheries Management in this region might be grouped into 2 groups: (1) Fisheries Management for small scale fisheries to be conducted by TD in collaboration with MFRDMD and (2) Fisheries Management for commercial fisheries by MFRDMD. In the management of small scale fisheries, some good examples were the Fishery Sector Program in the Philippines and the community based management project in the Pha-Nga Bay.

VII. FUTURE REGIONAL FISH RESOURCE SURVEY

Chairperson : Mr. Ibrahim Salleh, SEAFDEC MFRDMD

(i) "Review of SEAFDEC collaborative resource surveys in the South China Sea"– by Dr. Y. Kato, SEAFDEC Secretariat (**Annex 20**)

24. The paper informed the Workshop that SEAFDEC's Interdepartmental Collaborative Research Program on Fishery Resource Survey in the South China Sea was initiated in 1995 after the acquisition of MV SEAFDEC from Japan. The areas covered in the survey were the Gulf of Thailand and east coast of Peninsular Malaysia (Area I), waters of Sabah, Sarawak and Brunei Darussalam (Area II), west coast of Luzon island in the Philippines (Area III), and waters of Vietnam (Area IV). Besides resource assessment using the acoustic survey, the researchers had also undertaken studies in oceanography and marine biology. The paper highlighted the achievements and problems encountered from these surveys and invited the participants of the Workshop to provide their views regarding the outcome from this series of surveys.

(ii) "Future regional fisheries resource survey program of SEAFDEC"– by Dr. Y. Kato, SEAFDEC SECRETARIAT (**Annex 21**)

25. The paper informed the Workshop that a previous meeting on the subject had decided that, among others, the collaborative survey in Vietnam would be the last of its kind in the South China Sea. Future collaborative surveys should be reviewed and properly planned and organized to meet the specific needs of fisheries and their development, with more committed participation by researchers from the Departments of SEAFDEC. The acoustic component for future surveys should also be reviewed to include species identification and its outcome beneficial for the management and development of fisheries. Also, future project proposals should take into consideration the transboundary fish stocks, including oceanic squids, and may need to prepare for the scrutiny of the Program Committee. The speaker invited the participants of the Workshop to provide comments on the regional fisheries resource survey program, especially on their immediate needs and priorities.

DISCUSSION ON REGIONAL FISH RESOURCE SURVEY IN RELATION TO SHARED FISH STOCKS

(i) The Workshop was informed that due to limited funds, SEAFDEC needs to discontinue the resource survey program. The future program will be more on a cost sharing basis from the Member Countries. MFRDMD and TD will need to prepare the proposal on this future resource survey when extra budgetary fund is identified.

(ii) Vietnam had requested for another research study to be carried out in her waters during the pre-Northeast monsoon. However, it was explained that requested survey might be conducted if additional fund is available. Thailand had proposed an additional survey in the Andaman sea which would also include training aspects on the tuna longline and purse-seine, as well as studies on other species like the oceanic squid. It was explained that MV SEAFDEC would be used for exploratory fishing and training purposes mainly in the Andaman Sea.

(iii) A survey for oceanic squids was also proposed for the Sarawak, Brunei Darussalam and Sabah waters. This study had been left out during the collaborative studies undertaken previously. However, in the ensuing discussion, participants of the Workshop were reminded that MV SEAFDEC should mostly concentrate on the transboundary or shared stocks.

(iv) It was further suggested that researchers from member countries send their proposal of research to be conducted on board MV SEAFDEC, and it would be up to SEAFDEC to scrutinize these proposals for approval. SEAFDEC needs to identify the suitable fishing gear for assessment survey and exploitation of the shared stocks.

(v) Philippines had requested technical assistance from SEAFDEC to undertake resource survey using their vessel and equipment. It was explained that some technical assistance would be provided based on agreement reached at a Program Committee of SEAFDEC.

(vi) Vietnam had proposed that future study on oceanic pelagic fish and squid in the offshore and overlapping waters of the countries in the region should be attempted. For this purpose, another research vessel is probably needed.

(vii) The workshop emphasized the importance of collection of catch and efforts data from the fishing industry and member countries are encouraged to enhance such activities

for better assessment of shared stocks in the region. However, data from research vessel is still needed to compliment the data from the industry.

(viii) The SEAFDEC Secretariat had suggested for closer communication among researchers and members of the working committee to exchange views and information on shared stocks. A dedicated e-mail may facilitate for this purpose

VIII. GENERAL RECOMMENDATIONS

Chairperson : Mr. Ismail Taufid Md. Yusof

The Workshop identified and adopted the following recommendations:

(i) SEAFDEC, in particular MFRDMD, should further facilitate and enhance: (a) activities on the compilation of catch-effort statistics, (b) research on biological aspects and stock assessment of shared stocks, and (c) studies on environmental conditions and use of Geographical Information System (GIS) and remote sensing, in the research and management of shared stocks. It is now timely and relevant to the needs of member countries to jointly develop research and management of shared stocks in the South China Sea.

(ii) Since the success in the management of shared stocks substantially relies upon the continuous efforts in collecting quality data on catch and efforts and population biology parameters (length frequency, species composition, spawning area and season, fecundity, etc.), sustainable data collection systems, particularly for the shared stocks, should be promoted, and the capability of enumerators be strengthened. In addition, comparable data exchange among member countries should also be promoted for the purpose of obtaining greater insights and knowledge on the shared stocks of the region.

(iii) Available information on the management and research of the shared stocks, especially those produced by the FAO, should be used as reference in order to provide greater awareness of the issue.

(iv) The conclusions and recommendations of this Workshop should form the basis in the discussion on the Regionalization of the Code of Conduct for Responsible Fisheries: Fisheries Management conducted by MFRDMD. Definition and methodology for the assessment of shared stocks should be clarified taking into consideration of the multi-species and multi-gear nature of fisheries in the region.

(v) The Workshop noted that more efforts should also be focused on stock identification and delineation studies using morphometric, meristics, and DNA based protocols under the mechanism of the working committee. Since the Philippines has already started studies on shared stocks employing the latter, it was indicated that the Philippines could take the lead on this field and future studies be undertaken collaboratively on a cost sharing arrangement between SEAFDEC and among the member countries. Initially, the Philippines was proposed to prepare a simple set of guidelines on the tissue collection procedures. It was further requested that the member countries should facilitate the collection of tissue samples from their respective areas.

(vi) Apart from collaboration among the member countries, collaboration among the regional organizations, i.e. SEAFDEC, ASEAN and APFIC, should be promoted for the management of shared stocks in the South China Sea.

(vii) The Workshop agreed that a working committee on shared stocks for important species be established comprising of a coordinator for each important species group and named "The Working Group on Shared Stocks in Southeast Asian Region" (**see Annex 22**). In this connection, MFRDMD would first prepare the detail structure of the working committee including its terms of reference and research areas, and would serve as the regional coordinator of this working committee. The working mechanism of the working committee is mainly exchange of relevant information and meetings might be organized depending on the needs. The Workshop has proposed that the following countries will be responsible as coordinators for the indicated species groups: Brunei Darussalam for *sardines*, Malaysia for *mackerels*, Philippines for *round scads*, Thailand for *coastal tunas*, and Vietnam for *oceanic tunas*.

IX. CLOSING CEREMONY

40. In his closing remarks, the Chief of SEAFDEC MFRDMD, Mr. Ismail Taufid Md. Yusoff, thanked the delegates for their active participation during the Workshop. He expressed confidence that better collaborative efforts can now be forged for the management and research of shared stocks in the Southeast Asian region.

ANNEXES

LIST OF PARTICIPANTS AND OBSERVERS

FOURTH REGIONAL WORKSHOP ON SHARED STOCKS: RESEARCH AND MANAGEMENT IN THE SOUTH CHINA SEA
24-26 January 2000

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ANNEX 2

Oppening Remark

by Mr. Ismail Taufid Md. Yusoff
Chief, SEAFDEC MFRDMD
The Fourth Regional Workshop on Shared Stocks: Research and Management in the South China Sea
24th - 26th January 2000, Kuala Terengganu, Malaysia

Mr. Hashim bin Ahmad
Deputy Director General of Fisheries Malaysia
And SEAFDEC Alternate Council Director for Malaysia

Dr. Yasuhisa Kato
SEAFDEC Special Advisor

Dr. Purwito Martosubroto
From Food and Agriculture Organization, Rome

Mr. Hitoshi Fujita
Deputy Chief MFRDMD

Honorable Participants

Distinguished Guests, Ladies and Gentlemen

Firstly, I would like to say welcome or "Selamat Datang" and a very good morning to everyone present here today. We are pleased that all of you could come to Kuala Terengganu despite the festive mood of early year 2000.

We are fortunate to have with us today Mr. Hashim bin Ahmad, the Deputy Director General of Fisheries Malaysia, who is representing Dato' Mohd Mazlan bin Jusoh, Director General of Fisheries Malaysia and SEAFDEC Council Director for Malaysia, who is unable to be with us due to a sudden unavoidable commitment. Anyway, we are happy to have Mr. Hashim with us as he is very much involved and familiar in the affairs of SEAFDEC.

We do hope that you have rested well since there is not much distraction here, and feeling very refresh to start our three-day session, beginning today.

Incidentally, our workshop is being held just after the festive season of the New Year and also the Eid. We hope that this will provide an easier and more conducive atmosphere for productive deliberations during all the sessions.

We are also fortunate to have with us today, resource persons from the FAO and also the SEAFDEC Secretariat, whose presence and contribution is deemed very important to help guide us on the proper track in carrying out our mission.

We have a very busy schedule and hope to be able to formulate new directions and also resolve a number of issues relating to fisheries management, future collaborative studies, and also their regional mechanisms.

The participants for this workshop are from Brunei Darussalam, Indonesia, Japan, Malaysia, the Philippines, Thailand and Vietnam. We also received positive response and support from the SEAFDEC Secretariat and also our sister Department, TD, who have shown a keen interest to participate as observers, together with the researchers from other institutions in the host country.

I feel that most of us are familiar with one another through the various forums and opportunities provided by SEAFDEC.

We also would like to welcome the two gentlemen from DANIDA, now attached in Vietnam, and also our former Japanese expert, who are present today as observers. Thank you very much for your valuable support.

We at SEAFDEC MFRDMD hope to foster closer regional cooperation in relevant areas to be discussed during this workshop. Subsequently, in order to ensure the sustainable development of the shared fish stocks, we hope that fisheries managers of the region will support the work identified for implementation by the fisheries researchers at the national level.

This workshop is very timely for us to chart out a more meaningful and productive regional collaboration for the new millenium.

With that I would like to end this short address and wish that we will have a very lively and fruitful discussion during the next three days.

Opening Address
by the SEAFDEC Council Director for Malaysia at The Fourth Regional Workshop on Shared Stocks: Research and Management in the South China Sea 24-26 January 2000, Kuala Terengganu.

Distinguished Guests and Participants
Ladies and Gentlemen

Assalamualaikum w.b.t. & Good Morning

Thank you for giving me this opportunity of addressing to you in the opening ceremony of the Fourth Regional Workshop on Shared Stocks in the South China Sea, organised beginning today for three days by the Southeast Asian Fisheries Development Center (SEAFDEC) in this tranquil city of Kuala Terengganu. It is a great pleasure to note that the Marine Fishery Resources Development and Management Department (MFRDMD) of SEAFDEC is starting its activities rather early in this new Millenium, amidst the still on-going festive mood of the New Year and Eid celebration that we are presently enjoying. Anyway, on behalf of the Government of Malaysia and SEAFDEC, I bid you all a very warm welcome and sincerely hope that you will have a very nice and pleasant stay here in Terengganu.

Ladies and Gentlemen

SEAFDEC views the convening of this regional workshop as one of its more important activities because it fulfils the needs of the SEAFDEC Strategic Plan in providing a forum for Fisheries Scientists and Managers to meet, plan and formulate suitable programs and activities for the research and management of fisheries resources in the region.

Also, in line with the SEAFDEC Strategic Plan, MFRDMD is liaising very closely with the SEAFDEC Secretariat to make this meeting a truly inter-departmental affair. As such, other relevant activities of SEAFDEC that bear some mutual interest to both the Secretariat and MFRDMD have also been included in the Program Agenda for further deliberation in the workshop.

I am indeed happy to note that you have responded positively and accepted the invitation to participate in this fourth workshop, to further share your valuable experiences for the betterment of fishery resources research and management in this region. This gesture will further consolidate the establishment of a long-lasting working group or networking of researchers and managers that will be able to forge continuity and commitment for the implementation of activities to be identified under the regional and national research inputs for the shared stocks.

Ladies and Gentlemen

The waters of our region harbor marine resources of great biodiversity and have fish species whose populations are migratory and distributed across the boundaries of different countries. Issues are bound to arise concerning the proper utilization of these resources, especially when these also relate to problems like over-fishing, destructive fishing, marine habitat devastation, and the deplorable effects of marine pollution. All these provide adverse impacts towards achieving long-term viability and sustainability of our fishery resources.

The United Nations Convention on the Law of the Sea stipulates that coastal states are obliged to conserve their marine resources, protect and preserve their marine environment, and cooperate directly or through existing international organizations. It is hoped that SEAFDEC through MFRDMD would be able to address such obligations in a more effective manner, especially through regional collaboration and cooperation among the member countries. Thus, the presently on-going effort by SEAFDEC to regionalise the Code of Conduct for Responsible Fisheries for the sustainable management of fishery resources in this region is thus deemed as extremely important, and should be amply supported by all concerned parties in the region.

I am happy to note that SEAFDEC has also successfully implemented other research and training programs for the benefit of its member countries. The Interdepartmental Collaborative Research Survey was one of the recommendations that were agreed upon at the First Regional Workshop on Shared Stocks in 1994, and this has successfully been implemented by SEAFDEC in 1995-1999. Other studies pertaining to shared stocks have likewise been initiated by MFRDMD and most of these are still on-going.

I understand that the deliberation over the next few days will concentrate on the various aspects of research and management relating to fish stocks shared in this region. I am certain that despite the geographical differences in the culture and history of resource exploitation that are known to exist between the countries of the region, we should still be able to find some common footing and approaches in the assessment methodologies that can be formulated for the rational management of these stocks. In the long run, the success obtained from such ventures will surely lead towards greater profitability and benefits, both economically and socially, for our fishermen.

Ladies and Gentlemen

From the workshop agenda, I noted that SEAFDEC intends to review its Collaborative Resource Surveys in the South China Sea and establishes a regional mechanism under which the future direction of SEAFDEC in matters relating to shared stock studies and regional fisheries statistics can be better defined. There is also an intriguing paper on shared stock management in the South China Sea. These are some of the recommendations that have been made during the last meeting of the Program Committee.

May I suggest that this workshop could also perhaps review existing complementary national research activities and create an opportunity of enhancing the regional capacity in conducting research on these stocks for their rational exploitation and management. This would enable SEAFDEC and countries of the region to optimize their financial resources more cost effectively. The workshop should focus on the major shared resources of the region, besides encouraging for an increase in the national and regional research efforts and collaboration whose objectives should be directed towards better understanding of these shared species. Management problems on stocks shared between two or more countries should also be discussed.

In this respect, an integrated regional research program could perhaps also be formulated in this workshop and implemented collaboratively by the countries of the region. SEAFDEC could then become the effective agency involved in the coordination of the various research activities.

I sincerely hope that this workshop we are about to convene would provide a strong initiative for what could eventually be a successful program of collaborative activities and mutual benefits for the countries in the region. Let us also hope that the valuable experiences shared and gained in this workshop are the actual products of some productive discussions initiated among the participants. I trust this workshop would also serve as an appropriate forum to establish collaboration and formulate more pragmatic programs and activities for the region.

Ladies and Gentlemen

I wish you every success in your deliberations in this workshop.

Finally, it is my great pleasure to declare that this workshop be open.

ANNEX 3

ADOPTED AGENDA
FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
Research and Management in the South China Sea
24-26 Januaray 2000, Kuala Terengganu

1st Day, 24h January 2000

Opening Session

0830 Arrival of guests
Registration of participants
0930 Welcome address by Chief of MFRDMD
0945 Opening address by SEAFDEC Council Director for Malaysia
1015 Tea Break

Morning Session:

Presentation of Country Status Report in relation to shared fish stock and management experience

Chairperson: Deputy Chief of MFRDMD
Rappoteur: Dr. Mohd. Taupek Mohd Nasir
Mr. Ku Kassim Ku Yaacob

1100 Presentation of country report for Malaysia (Peninsular Malaysia)
1120 Presentation of country report for Malaysia (Sabah)
1140 Presentation of country report for Malaysia (Sarawak)
1200 Presentation of country report for Thailand
1220 Presentation of country report for Vietnam
1240 Lunch

Afternoon Session Chairperson: Deputy Chief of MFRDMD
Rappoteur: Dr. Mohd Taupek Mohd. Nasir
Mr. Raja Bidin Raja Hassan

1400 Presentation of country report for Philippines
1420 Presentation of country report for Brunei
1440 Presentation of country report for Indonesia
1500 Tea break
1520 Discussion on fisheries management problems faced by Member Countries and non-member countries
1600 Adjournment

2nd Day, 25th January 2000

Morning Session:

Review of shared fish stock in the South China Sea

Chairperson: Dr. Y. Kato
Rappoteur: Dr. Taupek Mhd Nasir
Participant from Philippines

0900 Implementation of past recommendations from the shared stocks workshops; the Southeast Asian regional experience - Dr. Mansor b. Mat Isa, **SEAFDEC/MFRDMD**.
0930 Review on status and biomass of shared fish stocks in the South China Sea – Mr. Raja Bidin b. Raja Hassan, **SEAFDEC/MFRDMD**.
1000 Stock Sharing among Neighboring Coastal States – K. Katsuyama, **Japan Fisheries Agency.**
1030 Tea break.
1100 Management of Shared Stocks in the South China Sea, are we ready ? - Dr. Purwito Martosubroto, **FAO**.
1130 Discussion on the above paper.
1230 Lunch

Afternoon Session:

Regional mechanism and future direction of SEAFDEC on research of the shared fish stocks

Chairperson: Dr. M. Purwito
Rapporteur: Dr. Mansor Mat Isa
Participant from Brunei

1400 Regional Fisheries Statistics of the Southeast Asian Region – Surian, **SEAFDEC/Secretariat**.
1430 Application of GIS in fishery resources management - Mr. Rosidi b. Ali, **SEAFDEC/MFRDMD**.
1500 Application of remote sensing in fishery resources management – Ku Kassim b. K. Yakob, **SEAFDEC/MFRDMD**.
1530 Tea break
1600 Code of conduct for responsible fisheries- Phase III, Fisheries Management – Dr. Taupek b. Mohd Nasir, **SEAFDEC/MFRDMD**.
1630 Discussion on regional mechanism and future direction of research on Shared Fish Stocks in the South China Sea
1700 Adjournment

3rd Day, 26th January 2000

Morning Session:

Future Regional Fish Resource Survey

Chairperson: Mr. Ibrahim Salleh
Rapporteur: Dr. Mohd. Taupek Mohd Nasir
Participant from Malaysia

0830 Review of SEAFDEC collaborative resource surveys in the South China Sea – Dr. Y. Kato, **SEAFDEC/Secretariat**.
0900 Paper presentation on future regional fish resource survey – Dr. Y. Kato, **SEAFDEC/Secretariat**.
0930 Discussion on regional fish resource survey in relation to shared fish stocks.
1030 Tea break

Afternoon Session:

Chairperson: Mr. Ismail Taufid Mohd Yusoff
Rappoteur: Dr. Taupek Mohd Nasir
Participant from SEAFDEC Secretariat

1430 Adoption of report
1600 Closing address
1630 Tea break

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ANNEX 4

Annex 4

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
PENINSULAR MALAYSIA

THE PELAGIC FISHERY ON THE EAST COAST OF PENINSULAR MALAYSIA

By:

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The Pelagic Fishery on the East Coast of Peninsular Malaysia[1]

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Abstract

This report gives an overview of the status of the pelagic fishery resources on the east coast of Peninsular Malaysia. These resources most probably consist of transboundary stocks since pelagic fish are characteristically migratory in nature. It has also been accepted that many of these stocks are shared by a few countries in the adjacent area. However after years of meetings and deliberations, problems in the actual assessment and management of these shared stocks still prevail. This report outlines some of the outstanding problems.

Introduction

The pelagic fishery on the east coast of Peninsular Malaysia recorded total landings of 104,554 tonnes in 1996 (Anon., 1996a). This represented 36% of the total marine landings on the east coast or 13% of the total marine production in Peninsular Malaysia. In terms of importance the east coast ranked after the west coast where pelagic fish contributed 16% of the total marine landings.

Status of the Pelagic Fishery on the East Coast of Peninsular Malaysia

On the east coast of Peninsular Malaysia, the pelagic fishery is supported by three major groups of fish, namely, the Indian mackerel (*Rastrelliger kanagurta*), scads (*Atule mate, Alepes, Selar* and *Selaroides leptolepis*) and roundscads (*Decapterus*). Small tuna (*Thunnus tonggol, Euthynnus affinis* and *Auxis thazard*) are also important and contribute to a substantial proportion of the pelagic fish landings (Fig 1). The fishery is supported by a mix of species but not dominated by *Rastrelliger* as seen on the west coast of Peninsular Malaysia. Most of the *Rastrelliger* caught off the east coast of Peninsular Malaysia are *R. kanagurta* mixed with small quantities of *R. faughni*. On the west coast of Peninsular Malaysia the dominant species caught is *Rastrelliger brachysoma*.

The fish purseseine is the major commercial gear for pelagic fish, and landed 72% of the total pelagic fish landings in 1996. The commercial trawl landed 9%. Other important traditional fishing gear like the hook and line, including trolls, landed 7%, followed by 6% for driftnets and 6% for liftnets and other gear (Anon., 1996a). Small tuna and some pelagics are mainly caught by troll lines. Driftnets are important for small pelagics and seasonally for small tunas.

[1] Paper to be presented at the Fourth Regional Workshop on Shared Stocks in the South China Sea, Kuala Terengganu, Malaysia, 24-26 January 2000.

Problems Concerning Shared Stocks

Identification of the Shared Stock

Many hypotheses of the shared stocks in the region have been made. Since the early 1980's the Southeast Asian Fisheries Development Center, SEAFDEC (Anon., 1981; Anon., 1985; Anon., 1995, Anon., 1996b, Anon., 1998) as well as other agencies like the South China Sea Fisheries Development and Coordination Programme, SCSP (Anon., 1976), Bay of Bengal Programme, BOBP (Anon., 1987a) and Indo-Pacific Tuna Development and Management Programme, IPTP (Anon., 1987b) initiated regional projects for the assessment and management of shared stocks. These projects hypothesised the fish stocks that were possibly shared by adjacent countries in the Southeast Asian region. Limited tagging on selected pelagic fish like *Rastrelliger brachysoma* (Anon., 1987a) and small tuna (Raja Bidin, 1991) was conducted by Thailand and Malaysia but the results obtained could not define the shared stocks owing to the limited number of fish tagged and the poor and non-reporting of recovered fish. Thus tagging only provided preliminary results on the nature of the shared stocks.

To aid in the definition of shared stocks, currently available molecular techniques could be attempted on selected species on a regional basis. This should be conducted in parallel with morphometric studies, in which data analyses can now be performed using available computer software. Information gathered through these studies can then be pooled with existing information on the biology of the fish to define the stocks shared.

Stock Assessment

Fish stock assessment is being conducted nationally in Malaysia and in other countries in the region irrespective of whether the stocks are shared or not. This is inevitable because of the urgent need for management as these stocks contribute significantly to the economy of the nation.

In Malaysia fish stock assessment techniques currently used are still based on single species although limited attempts in the assessment of multi-species fish stocks have been made (Yong *et al.*, 1994). Because of insufficient data, simplistic models like the surplus production models based on catch and "standard fishing effort" are still being used. The use of other more sophisticated models still hinges on the difficulty in collecting series of data on the multi-species and multi-gear in the fisheries complicated further by the location of landing sites all along the coastline. There are only a few major fish landing complexes for the centralised landing of catches. A major difficulty is in the estimation of relative fishing effort contributed by a variety of fishing gear used to capture the same species e.g the catch of *Rastrelliger brachysoma* by the trawl, fish purseseine and the driftnet on the west coast of Peninsular Malaysia (Chee, 1999). The same goes for the penaeid shrimp fishery where different stages in the life cycle of *Penaeus merguiensis* are caught by different fishing gear (Ahmad-Adnan and Lim, 1994).

The use of acoustic techniques is the most direct method for assessing pelagic fish stocks. In the waters of Malaysia few acoustic surveys had been conducted (Aglen *et al.*, 1981; Edi-Muljadi *et al.*, 1984). In this respect, SEAFDEC had been successful in implementing regional pelagic fish resource surveys off the east coast of Peninsular

Malaysia, Thailand, Philippines and Vietnam. However estimates provided by these surveys should be further refined through the use of better fishing techniques to sample fish.

To enable assessments of shared stocks, a regional database should be established. This database should be maintained up-to-date, particularly the landing statistics for the national production since these data are needed to support assessment. These data should be made available to an active regional technical working group which should be formed to conduct assessments regularly so that results obtained could be used as a basis for the proper management of shared stocks. This working group with sufficient expertise, should be committed, sufficiently funded and should meet regularly.

Sufficient funds and personnel should be made available to support a continuous monitoring programme nationally and regionally to collect and document data both from experimental fishing e.g. fish resource surveys, as well as from the commercial fisheries.

Other Problems

The above problems are technical problems concerning the nature and assessment of shared stocks. As outlined by Purwito (1998), the management of shared stocks also require coordinated regulation, surveillance and enforcement. Fisheries management is also constrained not only by biological aspects of fish stocks but by social and economic aspects of fishers and fishing communities. This is particularly true in the Southeast Asian region where fisheries management has to be viewed in the context of rural development (Marr, 1982).

Management of Pelagic Fish Resources

Fisheries management measures in Malaysia are incorporated in the legal framework of the Fisheries Act 1985.

In 1981, a licensing policy which demarcated specific fishing areas to fisheries using different fishing gear and operated different sizes of fishing vessels as well as codification and colour identification schemes for fishing vessels were introduced. Current fishery management measures which mainly control entry into the fishery include licensing of fishing gear and vessel as well as registration of fishermen. In the area of Monitoring, Control and Surveillance (MCS), the Department of Fisheries Malaysia has established a good network and works in close cooperation with the Royal Navy and Marine Police.

The construction of artificial reefs in the waters off the Malaysian coast, is an important fisheries management tool adopted. The main objective is to rehabilitate declining fisheries and marine aquatic resources in coastal areas. Marine Parks and Marine Protected Areas have also been gazetted for conservation.

Recently Malaysia placed great emphasis on stakeholder participation in fisheries management through the initiation of consultations and discussions with fishers, the fishing industry and non-governmental organisations. Community based fisheries management approaches have been recommended for the management of inshore fisheries in areas up to 12 nautical miles from shore (Raja Mohammad Noordin, 1999). The formulation of fisheries management plans involving the participation of the Department of Fisheries Malaysia,

representatives of fishermen and the fishing industry as well as non-governmental organisations and local universities was initiated through a workshop held with the support of FAO (Anon., 1999).

National Fish Resource Surveys and Other Scientific Studies

Most of the experimental fish resource surveys conducted in Malaysia are demersal surveys because of the availability of suitable research vessels (Abu Talib and Alias, 1997). Pelagic fish surveys using the acoustic technique have been conducted but not on a regular basis. In Malaysian waters acoustic surveys had been conducted by the DR. FRIDTJOF NANSEN (Aglen, 1981), K.K. AYA (Edi-Muljadi *et al.*, 1984) and lately by M.V. SEAFDEC. Malaysia conducted a comprehensive demersal and pelagic fish resource survey in her Malaysian Exclusive Economic Zone (EEZ) waters in 1985 – 1987 using the chartered vessel R.V. RASTRELLIGER (Anon., 1987c). Another survey for demersal and pelagic fish in the Malaysian EEZ was conducted in 1997 – 1999.

Besides these surveys, monitoring of landings at specific landing sites had been conducted. Catch and composition data by fishing gear as well as biological data on selected fish were gathered. However these activities had been constrained by funding especially over the last few years.

Conclusion

Regional programmes have been recommended for the proper assessment and management of shared stocks. This is accepted as necessary but effort towards achieving this could not be sustained. Under the umbrella of regional programmes like BOBP and IPTP, many projects were initiated but these activities folded up upon the termination of these projects. It is hoped that SEAFDEC can now initiate, facilitate and sustain regional projects to achieve the goal of regional collaborative fisheries management.

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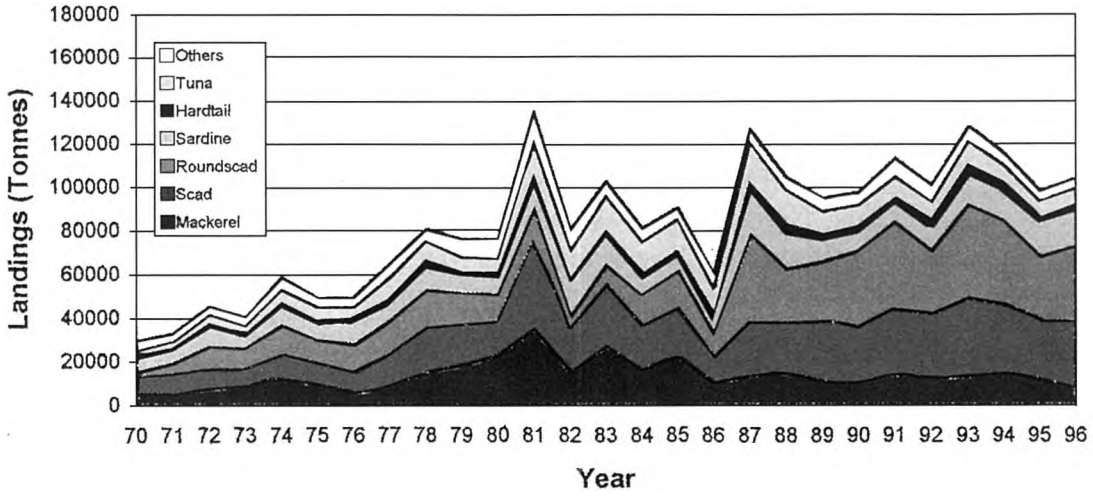
Fig. 1: Landings of Pelagic Fish on the East Coast of Peninsular Malaysia



ANNEX 5

Annex 5

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
MALAYSIA

(2) SABAH

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MARINE FISHERIES RESOURCES STATUS: SABAH REPORT

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I. INTRODUCTION

A developing country's economic status is wholly dependent on the optimization and production of its agricultural sector, which includes fisheries. Biusing (1997) reported that the fisheries sector has importance in providing cheap protein (national per capita of 37 kg/year or 60-70% of animal protein consumed) besides offering social economic opportunities to fishermen, downstream processors and traders. In 1998, the total marine fisheries landing (94% of the total fisheries landing) was 196.2 metric tons with a value of RM 660,079 million. This figure shows an increase of 12.5% with a value of RM90,916 million compared to the marine fisheries landing reported in 1997. From 1993 to 1998, the marine fisheries shows a steady and consistent trend of high contribution (93-94%) to the state's total fisheries production and followed by the aquaculture sector (5-6%) which includes contribution from the freshwater sub-sector. The lowest contribution came from the open water fisheries with yearly production of less than 1%. This report covers the latest status of the marine fisheries sector in Sabah including various issues and recommendations pertaining to the industry.

II. PROFILE OF THE MARINE FISHERIES ZONES IN SABAH

2. 1 Fishing Zones

The marine fishing grounds are divided into two major zones which are the West Coast Zone (South China Sea and Sulu Sea) and East Coast Zone (Sulu Sea and Sulawesi Sea). Sabah's coastal line of some 1,600 km has vast biodiversity ranging from various types of coral reefs, sea grass, mangrove swamps and river mouths. The main characteristics of both zones respectively are as follows:

West Coast Zone

All areas in this zone are in the *continental shelf* (water areas between the coastal line and isobath of 200 meters in depth) which elongates between 30 to 200 nautical miles (nm) towards the open sea. The zone's off-shore EEZ (Economic Exclusive Zone) is estimated at 90,000 km^2 with estimated trawlable grounds of 14,000 km^2. The Palawan Trench (more than 2,500 meters in depth) is located along the Sarawak's waters up north towards the Philippines' waters. The main marine fisheries species available along this trench are the oceanic tuna and small pelagic species. At present, various types of fishing activities are being carried out in the coastal waters by using both modern gears (trawlers, purse seines and drift nets) and traditional gears ("selambau", hooks & lines and traps). Crustacean fisheries (prawn fishery) is also another important activity carried out in the Brunei Bay, areas between Tuaran and Kota Belud and in Kota Marudu.

East Coast Zone

This zone represents a smaller area due to the EEZ borders of Philippines and Indonesia. There are unique diversed aquatic profiles ranging from 50 meter to more than 1,000 meter in depth along a few kilometers from the coastal line of Semporna. The main fisheries resource in this area are the coral reef fishes, oceanic tuna and small pelagic species. Mangrove forests are mostly found in Sandakan and Tawau coastline. Both areas are well-known as the most important fishing site for crustacean fishing activities in Sabah in which more than 60% of the marine prawns landing are contributed from these two sites.

Both modern and traditional gears are used in most fishing activities carried out in the coastal line water (less than 30 nm from the coastline). At present, the deep sea fishing zone is not fully exploited (more than 30 nm from the coastal-line) due to technological constrains and unsuitability of the local fishing gears in venturing into deep sea fishing.

III. STATUS OF THE MARINE FISHERIES INDUSTRY IN SABAH

3.1 Potential yield

To date, the actual potential yield of the Sabah's marine fisheries is still unknown. Until a more comprehensive research is carried out in future, all potential yields are estimated based on a previous preliminary research as a rough guideline. **Table 1** shows that there is an estimate of 265,000 metric tons and 85,000 metric tons (total: 350,000 metric tons) potential yield of coastal fisheries and deep-sea fisheries respectively.

Table 1 - Marine Resource Fish Production Potential (Sabah)

Fishing region	Resource category	Potential yield (mt)
COASTAL WATERS	small pelagics	80000
(within 12nm zone)	tuna	20000
	demersal fish	130000
	coral fish [1]	n/a
	crustaceans	20000
	other invertebrates	15000
	Sub-Total	**265000**
DEEP SEA	Pelagic [2]	54000
(beyond 12nm zone)	Tuna [3]	20000
	Demersal [3]	11000
	Sub-Total	**85000**
	Grand Total	**350000**

Source: Biusing, 1996
[1] roughly estimation more than 50,000 mt
[2] acoustic survey result (SEAFDEC 1995)
[3] Survey result RV Rastrelliger 1985
other estimation based on Biusing 1995

3.2 Fishing vessels

The commercial fishing sector involves large-scale operations by using various types of modern devices (trawlers, purse seines and drift nets) operated by large vessels whereas vice-versa for the traditional fishing operations.

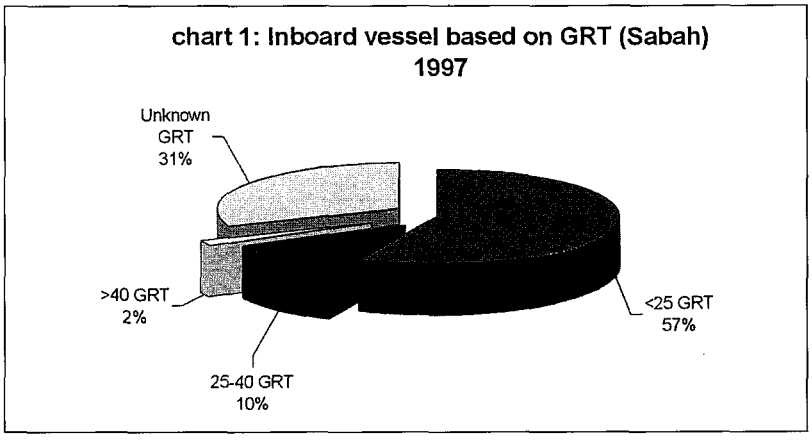
Sabah has the largest traditional fleet in Malaysia in which 85% are for vessels with non-motors and 31% for vessels with motors (**Table 2**). Most of these vessels are traditionally operated at the shoreline areas.

Table 2: Total Fishing Boat (Malaysia) 1997

Area	Inboard engine	Out Board engine	Non-powered	sub total
Sabah	3214	4065	2557	9836
FT Labuan	11	87	3	101
Sarawak	1675	727	3	2405
Pen. Malaysia	12701	8112	437	21250
Total	**17601**	**12991**	**3000**	**33592**

Source: Annual Fisheries Statistic Malaysia

Chart 1 shows that 57% of the inboard powered vessels are small in size (less than 25 GRT), 10% moderate (25-40 GRT) and 2% large (more than 40 GRT). However, the sizes of 31% of the vessels are still unknown but it is believed that it consists of small vessels.



Characteristics of Inboard & Outboard, powered vessels by zone, non-powered vessels by zone and categories of fishing vessels by district are described in detail in **Table 3-5**.

Table 3: Inboard powered fishing vessel (Sabah) 1997

Fishing area	Inboard powered by GRT (Gross Tonnage)									
GRT	>5	5-10	10-15	15-20	20-25	25-40	40-70	>70	Unknown GRT	Total
East Zone	326	428	277	159	135	222	9	5	293	1840
West Zone	20	246	139	60	43	115	43	1	693	1360
Total	**346**	**674**	**416**	**219**	**178**	**337**	**52**	**6**	**986**	**3214**

Source: Annual Fisheries Statistic Sabah

Table 4: Out-board and non-powered fishing vessel (Sabah)

Vessel category	Non-powered vessel	Out-board engine
East Zone	1,499	1,667
West Zone	1058	2,398
Total	**2,557**	**4065**

Source: Annual Fisheries Statistic Sabah

Table 5: Fishing vessel by district (Sabah) 1998

District	Non-powered	Out Board engine	Inboard engine	sub total
Tawau	295	670	150	1115
Semporna	283	165	452	900
Kunak	90	94	12	196
Lahad datu	112	108	146	366
Sandakan	485	360	854	1699
Beluran	178	634	164	976
Kudat	75	255	936	1266
Kota marudu	129	390	37	556
Pitas	131	220	67	418
Kota Belud	343	340	93	776
Tuaran	61	162	35	258
Kota Kinabalu	15	254	246	515
Papar	20	145	1	166
Beaufort	65	383	38	486
Kuala Penyu	239	323	7	569
Sipitang	3	150	41	194
Total	**2524**	**4653**	**3279**	**10456**

Source: Annual Fisheries Statistic Sabah

3.3 Fishermen population

Although it was estimated that Sabah has about 40,000 number of fishermen involved in the fishing industry, it has been reported that there are only 20,845 people who are full-time fishermen. The fishermen consist of 74% locals, 25% others and 0.90% Chinese with a total population of 15,176 person, 5,056 person and 183 person respectively. Almost 19% of these fishermen are from Sandakan followed by Kudat (13%) and Tawau (9.8%). **Table 6-8** shows the characteristic of the fishermen population.

Table 6: Breakdown Fishermen based on Race (Sabah) 1995

Races	Sub-total	percents %

Chinese	183	0.90
Bumiputera	15176	74.34
Miscellaneous	5056	24.77
Total	**20,415**	**100%**

Table 7: Full-time Fishermen (Sabah) 1998

District	Sub-total	percents %
Tawau	2036	9.77
Semporna	1781	8.54
Kunak	669	3.21
Lahad datu	801	3.84
Sandakan	3987	19.13
Beluran	1568	7.52
Kudat	2915	13.98
Kota marudu	713	3.42
Pitas	650	3.12
Kota Belud	1203	5.77
Tuaran	490	2.35
Kota Kinabalu	1719	8.25
Papar	356	1.71
Beaufort	718	3.44
Kuala Penyu	851	4.08
Sipitang	388	1.86
Total	**20,845**	**100%**

Table 8: Fisherman Based on Gears (Sabah) 1998

Gears type	Sub-total	percents %
Trawl net	5129	24.61
Seine net	1497	7.18
Drift net	6134	29.43
Lift net	1394	6.69
Hooks & Lines	4806	23.06
Traps	589	2.83
Miscellaneous	1296	6.22
Grand total	**20,845**	**100%**

3.4 Fish landing monitoring system

Previously, fish landings are estimated by observations in fish markets only. From 1991 onwards, the system was upgraded in which SMPP (Sistem Maklumat Pengurusan Perikanan/Fisheries Management Information System) is applied as a fish landing monitoring tool in 16 districts all over the state.

3.5 Marine fish landings by zones

In 1998, there is a high increase of 81% in marine fisheries production (196.2 metric tons) compared to 1991 (108.4 metric tons) as shown is **Table 9**. During the period, Tawau and Kudat show significant high contributions (> 150%) and followed by Kota Kinabalu (113%) compared to a drastic decline of production in Beaufort and Kota Belud's (> -60%). There are 6 districts (Lahad Datu, Tawau, Kota Kinabalu, Semporna, Kudat and Pitas) with relatively high increase in production (>150%), 3 districts (Kunak, Sandakan and Sipitang) with moderate increase (38-71%) and 1 district (Kota Marudu) which has not shown any

significant change in terms of production. Other districts (Tuaran, Papar, Beluran, Kuala Penyu, Kota Belud and Beaufort) show a decline between –10% until –85%. However, factors pertaining to the declining of fisheries production have not been identified although there are possibilities of unrecorded landings or over-fishing occurrence in other districts.

Table 9: Marine Fish Production based on Zone (Sabah) 1991-1998

ZONE/DISTRICT	91	92	93	94	95	96	97	98	Average	%91
Tawau	22.63	30.05	39.84	45.87	60.12	74.27	59.01	59.93	48.97	+164.8
• *Tawau*	*4.71*	*4.25*	*3.96*	*6.91*	*10.01*	*16.70*	*15.91*	*16.54*	*9.87*	*+251.2*
• *Semporna*	*4.16*	*4.70*	*6.85*	*9.00*	*18.01*	*17.41*	*14.78*	*12.34*	*10.91*	*+196.6*
• *Kunak*	*10.90*	*18.29*	*25.08*	*24.57*	*26.77*	*35.20*	*20.33*	*18.63*	*22.47*	*+70.9*
• *Lahad Datu*	*2.86*	*2.81*	*3.95*	*5.39*	*5.33*	*4.96*	*7.99*	*12.42*	*5.71*	*+334.3*
SANDAKAN	26.56	31.64	34.31	36.38	32.1	35.17	30.01	36.12	32.79	+36.0
• *Sandakan*	*20.29*	*25.14*	*28.93*	*27.16*	*27.57*	*28.05*	*24.98*	*31.87*	*26.75*	*+57.1*
• *Beluran*	*6.27*	*6.50*	*5.37*	*9.23*	*4.54*	*7.12*	*5.03*	*4.25*	*6.04*	*-32.2*
KUDAT	11.76	23.26	32.86	31.42	27.78	25.58	25.13	31.14	26.12	+164.8
• *Kudat*	*11.11*	*18.79*	*20.34*	*27.66*	*25.33*	*24.32*	*23.37*	*30.14*	*22.63*	*+171.3*
• *Kota Marudu*	*0.44*	*3.68*	*10.22*	*2.85*	*1.34*	*0.68*	*1.11*	*0.46*	*2.6*	*+4.5*
• *Pitas*	*0.21*	*0.79*	*2.29*	*0.91*	*1.11*	*0.59*	*0.65*	*0.54*	*0.89*	*+157.1*
KOTA BELUD	13.50	18.44	14.12	8.54	7.69	8.57	6.69	5.27	10.35	-61.0
• *Kota Belud*	*4.68*	*8.53*	*8.06*	*3.99*	*2.44*	*3.92*	*5.12*	*3.95*	*5.09*	*-15.6*
• *Tuaran*	*8.82*	*9.91*	*6.06*	*4.55*	*5.25*	*4.65*	*1.58*	*1.32*	*5.27*	*-85.0*
KOTA KINABALU	26.81	25.77	26.50	25.87	27.88	29.39	48.15	57.22	33.45	+113.4
• *Kota Kinabalu*	*20.24*	*16.21*	*16.63*	*20.79*	*24.96*	*27.51*	*46.47*	*56.12*	*28.62*	*+177.3*
• *Papar*	*6.57*	*9.56*	*9.87*	*5.08*	*2.92*	*1.88*	*1.68*	*1.10*	*4.83*	*-83.3*
BEAUFORT	7.17	7.16	7.49	12.25	10.90	7.15	5.27	6.54	7.99	-8.8
• *Beaufort*	*2.60*	*3.28*	*3.09*	*5.02*	*6.18*	*3.93*	*1.96*	*2.35*	*3.55*	*-9.6*
• *Kuala Penyu*	*3.42*	*2.52*	*2.82*	*5.88*	*4.03*	*2.51*	*2.62*	*2.60*	*3.3*	*-24.0*
• *Sipitang*	*1.15*	*1.35*	*1.58*	*1.35*	*0.70*	*0.71*	*0.69*	*1.59*	*1.14*	*+38.3*
JUMLAH	**108.44**	**136.31**	**155.12**	**160.33**	**166.46**	**180.14**	**174.27**	**196.23**	**159.66**	**+81.0**

Source: Annual Fisheries Statistic Sabah

3.7 Pelagic Resources

Pelagic species has the biggest component in the marine fisheries sector of Sabah. In 1991 to 1998, it contributed 47-52% (average 50%) marine fish landing yearly (**chart 2 & Table 10**). The main dominant species are various neretic tuna (10-21%; average 16%), mackerel (*Rastrelliger* spp) (8-18%; average 12%) and round scads (*Decapterus* spp) (11-17%; average 14%) of the total pelagic species landing yearly (**chart 3 & Table 11**)

Table 10: Marine fisheries sector production through resource type (Sabah) 1991-1998

Unit: metric tonnes

Resource	91	92	93	94	95	96	97	98	Average
Pelagics	56877	71560	80264	76405	84136	93693	86365	92388	80211
Demersal	23040	25375	29153	32341	36492	38469	38798	48940	34076
Crustacean	14834	15382	16817	16306	16093	15832	13729	14718	15463.88
Miscellaneous	13713	23988	28433	35276	29741	32149	35373	40181	29856.75
Total	**108464**	**136305**	**154667**	**160328**	**166462**	**180143**	**174265**	**196227**	**159607.6**

Source: Annual Fisheries Statistic Sabah

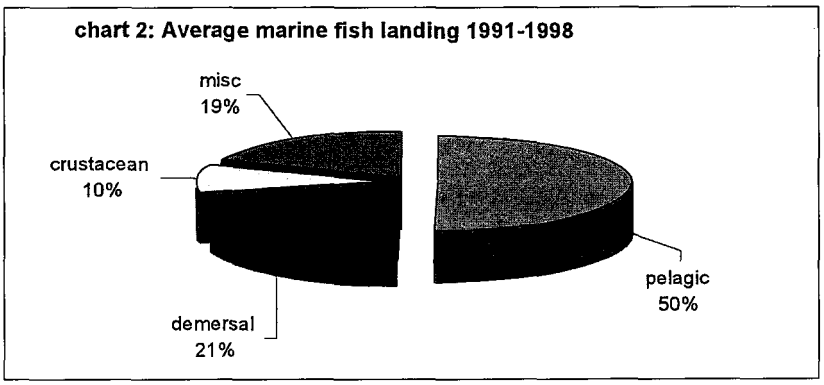


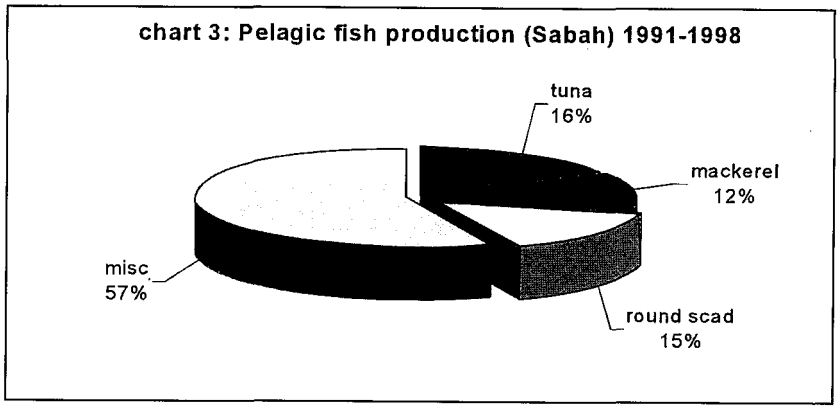
Table 11: Pelagic Fish Production (Sabah) 1991-1997

Unit: metric tonnes

	91	92	93	94	95	96	97	98	Average
Tunas	10821	15102	17136	11564	10704	15840	14007	9628	13100
Mackerel	10349	11132	12631	9300	9830	8163	7202	8834	9680
Round scad	6701	9777	11094	12954	14784	14922	11866	12913	11876
Miscellaneous	29006	35549	39403	42587	48818	54769	53290	61013	45554
Total	**56877**	**71560**	**80264**	**76405**	**84136**	**93694**	**86365**	**92388**	**80211.13**

Source: Annual Fisheries Statistic Sabah

The pelagic species has "migratory" behavior and are exploited together as shared stocks



with other neighboring countries in South East Asia. In this context, stock management of these species is hard to implement because it requires exploitation management with other countries. At present, the migration pattern and actual stocks are still unknown and this requires a collaborative research among countries to study the population dynamic and biological characteristics of the pelagic species.

In the past, there is an indication that the tuna resources are exploited at middle and moderate level both in coastal waters and deep sea. Based on this, it is advisable to use FAD (fish aggregating device) where fishing methods such as hooks and lines, purse seines and trawler are used.

3.8 Demersal resources

In general, the demersal fisheries in the coastal of Sabah status exploitation level ranges from mid to overexploited level. Trawlers are the common fishing device used in the fishing activities. Most of the coastal fishing ground in the west coast are not suitable for exploitation due to the existence of petroleum platforms and oil pipelines. To date, the demersal resources in the off-shore has not been exploited to the maximum unless a better fishing device and methods are introduced.

3.9 Prawn resources

Prawns resources are the most important component in the marine fisheries production sector. Between 1995-1998, the prawn fisheries has contributed a quantity of 6% (average) and value of 18% to the yearly marine fisheries production (**Table 12-13 & chart 4**).

Table 12: Marine fish landing quantity based on resource (Sabah) 1995-1998

Volume: metric tons						
Resource type	1995	1996	1997	1998	average	percents
Fish	141608	155212	150079	170766	154416.3	86
Prawn	12398	11521	10290	8739	10737	6
Miscellaneous	12456	13410	13896	16722	14121	8
Total	**166462**	**180143**	**174265**	**196227**	**179274.3**	**100%**

Source: Annual Fisheries Statistic Sabah

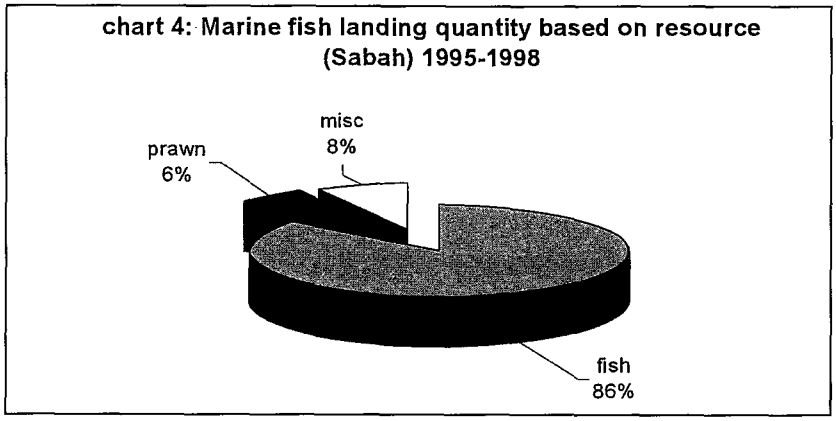


Table 13: Marine fish landing value based on resource (Sabah) 1995-1998

Value: RM ('000)						
Resource type	1995	1996	1997	1998	average	percents
Fish	318.152	357.989	416.296	490.687	395.781	72
Prawn	100.355	95.652	97.98	93.252	96.810	18
Miscellaneous	42.484	50.24	54.888	76.14	55.938	10
Total	**460.991**	**503.881**	**569.164**	**660.079**	**548.529**	**100%**

Source: Annual Fisheries Statistic Sabah

3.10 Fisheries Resources Research Program

Most of the previous research carried out in the past are concentrated at the Western Coast of Sabah. Little work has been done in the east coast (prawn resource research in Labuk Bay) due to safety reasons. Below are the information of all previous research works carried out through collaborative efforts: -

Year	Research vessel	Area	Notes
1997-98	KK Manchong	West Coast	2nd Malaysia ZEE survey
1995-96	KK Manchong	West Coast	SEAFDEC collaborative survey (demersal survey)
1995-96	MV SEAFDEC	West Coast	SEAFDEC collaborative survey (pelagic survey using 'hydro-acoustic' and oceanography
1993-95	KK Manchong	West Coast	DOF Sabah & IPP Sarawak collaborative survey

Stock assessment and basic biology research was also carried out for 39 fish stocks (pelagic and demersal) at the west coast of Sabah.

SCOMBRIDAE (14 species)	CARANGIDAE (10 species)	Other families (15 species)
Euthynnus affinis	*Decapterus macrosoma*	*Abalistes stellaris*
Katsuwonus pelamis	*Decapterus maruadsi*	*Dussumeira acuta*
Rastrelliger kanagurta	*Decapterus russelli*	*Herklosichthys quadrimaculatus*
Rastrelliger brachysoma	*Megalaspis cordyla*	*Gerres filamentosus*
Rastrelliger faughni	*Selar boops*	*Lactarius lactarius*
Sarda orientalis	*Selar crumenopthalmus*	*Nibea semifasciata*
Scomber australasicus	*Selar mate (Atule mate)*	*Nempiterus japonicus*
Scomberomorus commerson	*Selaroides leptolepis*	*Nemipterus nemurus*
Scomberomorus guttatus	*Seriolina nigrofasciata*	*Nemipterus peronii*
Scomberomorus lineolatus	*Alepes djeddaba*	*Priacanthus macracanthus*
Scomberomorus queenslandicus		*Priacanthus tayenus*
Auxis thazard		*Sphyraena forsteri*
Auxis rochei		*Sphyraena jello*
Thunnus alalunga		*Sphyraena obtusata*
		Siganus javus

The potential of the fisheries resources in Sabah is still unknown due to non-availability and unreliable basic information, which requires a comprehensive research. The latest report available comes from the fisheries resource research, which was carried out by IPP (Institut Penyelidikan Perikanan) along the west coastline of Sabah. The findings are used as basic guidelines by the Department of Fisheries Sabah in managing the resources.

At present, the potential yield and biomass estimations are as **Table 14**:

Table 14 - Demersal Resource Potential (West Coast Of Sabah)

Fishing Zone	Coastal	Offshore	Combine
Estimated trawlable area	11,400km²	16,300 km²	27,700 km²
Mean trawl catch rate	169kg/hour	265kg/hour	208kg/hour
Commercial fish	79%	90%	85%
trash fish	21%	10%	15%
Mean density	2.55mt/km²	3.98mt/km²	3.14mt/km²
total demersal biomass	29,070 mt	64,870 mt	86,980 mt

Source: Biusing, 1996

IV. CONCLUSION AND RECOMMENDATION

Sabah has an important role in developing the fisheries industry in Malaysia in terms of providing protein supply as required in NAP3 (National Agricultural Policy). Based on this report, it is well-understood that the off-shore fisheries are still yet to be exploited to the maximum due to technological constraints. Investment from the corporate sector into this industry is encouraged to strengthen the industry financially. Besides that, it is also suggested that the Department of Fisheries Malaysia assist the Sabah Fisheries in both planning and implementing comprehensive research in near future because the establishment

of a smart-partnership between these organizations will enhance and develop a good networking in developing the fisheries industry.

In conclusion, a master plan for further development of the fisheries sector should be established and carried out in future. The master plan approach should be a holistic and comprehensive planning regime, which includes basic issues such as resource availability, competitive use of the resources, technological advances, sustainability of resources and manpower. Without proper guidelines, there may be negative impacts of the industry towards the environment, social and economics elements in future.

V. ACKNOWLEDGEMENT

The authors wish to thank both the Director General of Fisheries Malaysia and Director of Fisheries Sabah for giving the opportunity to present this paper. A big thank you is also extended to all parties for the assistance in providing all the necessary data and information which make it possible to produce this paper.

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9. Pelan Tindakan Strategik (2001-2005) Pembangunan Perikanan di Peringkat Daerah/Wilayah

ANNEX 6

Annex 6

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
MALAYSIA

(3) SARAWAK

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STATUS OF PELAGIC FISHERIES RESOURCES OF SARAWAK, MALAYSIA

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1. INTRODUCTION

The state of Sarawak ,which is part of East Malaysia, borders the southern part of the South China Sea. The state's continental shelf extends between 30 to 200 nautical miles northwards. The water depth within the continental shelf reaches 200 metres at the edge and then drops to 1,000 metres. The trench towards the northeast can reach 2,500 metres depth. All demersal fish presently landed is caught within the continental shelf. However, pelagic fish is more widespread and could be fished even beyond the continental shelf. Because of the central position (Figure 1) of waters off Sarawak within the South China Sea, the area is believed to be the main routes for straddling and migratory fish stocks.

The 1997 statistics showed that 11,008 people are involved in fishing and related activities. There are 10,438 fishermen and 570 fish dealers. The present fishing is still concentrated in the coastal area which occupies only 1/.3 of the EEZ area for Sarawak.

2. FISHERIES

2.1 Fishing Fleets

In 1997, a total of 4,370 fishing vessels of every category operated mostly in the coastal waters. The fishing vessels could be grouped into 4 main categories: purse seiners, gillnetters, bottom trawlers and traditional fishing vessels. The largest number of vessels belongs to the gill net category (36.4 percent), followed by traditional vessels (31.3 percent) and bottom trawlers (16.4 percent) (Table 1). The smallest number is purse seiners, which occupied only 0.5 percent of all fishing vessels. Fishing vessels that are used to fish small pelagics are gillnetters and purse seiners.

In terms of catch, bottom trawlers dominated (57.8 percent) followed by gillnetters (22.5 percent) and traditional vessels (14.8 percent). Purse seiners only landed 1.5 percent of the catch.

About 88 percent or 3,847 of the fishing vessels are below 20 GRT (Table 2). These are mostly coastal and traditional fishing vessels. Only 2.8 percent or 124 fishing vessels are more than 70 GRT. These are deep-sea fishing vessels. The rest of the fishing vessels (399 in numbers) are fishing between the coastal and offshore area.

For purse seiners, only 2 vessels are above 70 GRT and therefore able to fish offshore. All the gillnetters are below 70 GRT and carry out their fishing within the vicinity of coastal area.

2.2 Fish Landings

2.2.1 Overall

Since 1985 the overall landings had increased by 64 percent from 62,892 tonnes to 103,212 tonnes in 1997 (Table 3). Almost all landings are from the coastal area, that is, between 20-30 nautical miles from the coast. The main resources are demersal,

pelagic, prawn and jellyfish. Demersal fish occupied the bulk of the landing at 35-52 percent for the last three years (Table 4). Prawn occupied between 8-11 percent and jellyfish occupied between 10-38 percent of the landings.

2.2.2 Small Pelagics and Tuna

For the last five years (1994-1998) landing from small pelagics has not increased and is hovering around 20,000 tonnes (Table 3 and Figure 3). Small pelagics occupied only 15-20 percent of the overall landings. Almost 100 percent of the landings are from the coastal area

Tuna landings have not been impressive at around 2,000 tonnes annually, which is 2 percent of the overall landing. Tuna is also caught mainly in the coastal area. The offshore tuna is mostly caught by purse seiners based at Labuan.

3. PELAGIC FISH SPECIES COMPOSITION

3.1 Coastal Pelagic Fish

The catch composition of coastal pelagic fish is dominated by 6 main groups, which occupied 8 to 13 percent of the catch (Table 5). These groups are mackerel (*Rastrelliger sp.*), scads (*Selar mate, Selar sp.*), sardines (*Sardinella sp., Dussumieria sp.*), spanish mackerel (*Scomberomorus sp.*), hairtail (*Trichiurus sp.*), and hardtail scad (*Megalaspsis cordyla*). The other important groups are sharks, pomfret (*Pampus sp., Parastromateus sp.*), shad (*Tenualosa sp.*) and longfin herring (*Opisthopterus sp.*). All these groups are caught close to the shore. At least 17 main pelagic fish groups are caught in the coastal area.

3.2 Offshore Pelagic Fish

The offshore pelagics are dominated by 8 groups such as round scads (*Decapterus russeli, Decapterus macrosoma*), one-fillet scad (*Selar mate*), bigeye scad (*Selar crumenophthalmus*), Indian mackerel (*Rastrelliger kanagurta*), black pomfret (*Formia niger*), yellow banded scad (*Selaroides leptolepis*), hardtails (*Megalaspis cordyla*) and sardines (*Dussumiera sp.*) (Table 6). The most common offshore pelagic fish is round scad ,which occupied 57 percent of the catch. This is followed by the scad/selar group which occupied 26 percent of the catch. The proportion for Indian mackerel is 8 percent.

3.3 Tuna

The coastal tuna is dominated by the following species: kawakawa (*Euthynus affinis*), longtail tuna (*Thunnus tonggol*), frigate tuna (*auxis thazard*) and skipjack (*Katsuwonus pelamis*).

The main species of oceanic tuna are skipjack (*Katsuwonus pelamis*) , 72 percent, yellowfin (*Thunnus albacares*) , 28 percent and frigate tuna (*Auxis thazard*). Frigate tuna is small in size and generally escape through the large mesh size of tuna purse seine. Tuna caught has a mean size of 37-83 cm or between 0.9 – 10 kg.

4. BIOMASS AND EXPLOITATION OF PELAGIC FISH

Several acoustic surveys (KL Paus, 1994; SEAFDEC, 1996,1997; and KL Cermin, 1998) of the Exclusive Economic Zone (EEZ) off Sarawak and Sabah have assessed the biomass at between 900,000 – 1,700,000 tonnes. The estimated biomass for Sarawak waters is between 700,000 – 1,088,000 tonnes. This gives a potential annual yield of 435,200 tonnes.

All this resource is found in the offshore area. The present landing at 20,000 tonnes of pelagic fish (which is from the coastal area) shows that there is still room for further exploitation of the offshore resource. Purse seiners using FADs is a suitable fishing method to exploit the resource.

The biomass of tuna has been estimated at 90,000 tonnes for both coastal and offshore. There is also a need to expand the exploitation of tuna, considering that the present landing is only 2,000 tonnes annually.

5. FISHERIES MANAGEMENT

Management of fisheries resources in Malaysia has been through two main management measures: (1) controlling effort through the issuing of fishing licences and (2) restriction on fishing area for different size boats. In Sarawak, the restriction on fishing area is based on the zonation system according to the size of boats (see Table below).

Fishing Zones in Sarawak

Zone Category	Distance From Coast (nautical miles)	Vessel Size Allowed For Each Zone (GRT)
A	0-3	<15
B	>5	<40
C	>10	40-70
C_2	>20	>70

The coastal area as defined by fishing zone is 30 nautical miles from the coast. Beyond 30 nautical miles local vessels of more than 70 GRT and vessels from outside the state are allowed to fish subjected to conditions in the Fisheries Act.

For coastal fisheries resources, the management problems are the encroachment of bigger fishing vessels into the coastal area because of the presence of prawn resource and the more valuable species. The increase in the number of small fishing boats and efficient fishing methods in the estuarine area have almost depleted the shad (*Tenualosa sp.*) stock. The increase efforts have also reduced the stock of the more valuable species such as spanish mackerels (*Scomberomorous sp.*), long finned herring (*Opisthopterus sp.*), threadfin (*Polynemus sp.*) and long tail croaker (*Panna microdon*).

The offshore resource has less management problems due to the fact that very few local fishing vessels (if any) are fishing in the offshore zone. Our main problems are encroachment by fishing vessels from outside the state and other countries. Foreign fishing vessels caught by the Enforcement Division have used several very efficient fishing methods such as gill net targeting for sharks, large trawl nets with large size twine able to bull doze corals and some cases of bombing and poisoning. These methods are very destructive and the main challenge would be to control these fishing methods and encourage the environmentally friendly fishing methods.

6. FISHERIES RESEARCH

Some of the main research studies carried out are listed in Table 7. Most of the studies are concentrated on stock assessment, and less on biology.

Future studies should concentrate on the biology as biological knowledge of fish species are still lacking, The priority biological studies are the following: migration; spawning and reproduction; stomach contents (feeding); fish behaviour to FADs and fishing; and seasonal distribution. However, pelagic resource surveys should continue to be carried out to assess the changing status of the resource.

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Table1: Number of fishing vessels and landing,1997

Vessel	Number	Percentage	Landing(tonnes)	Percentage
Purseseiner	20	0.5	1292	1.5
Gillnet	1589	36.4	19692	22.5
Trawler	715	16.4	50729	57.8
Traditional	1369	31.3	12995	14.8
Others	677	15.5	3004	3.4
Total	4370	100.0	87712	100.0

Table2: Breakdown of fishing vessels by grosstonnage(GRT),1997

GRT	Vessel	Purseseine	Gillnet	Trawler
<20	3847	1	1529	323
20-70	399	17	60	273
>70	124	2		119
Total	4370	20	1589	715

Table 3 : Marine Fish Landings (MT) in Sarawak (1985-1998)

Year	Total	Pelagic	Tuna	Cephalopod	Demersal	Jellyfish	Prawn	Others
1985	62,892	12,050	879	273	28,279	9,994	11,246	171
1986	67,983	13,350	587	570	33,521	10,641	9,112	202
1987	69,442	10,100	711	516	33,467	12,980	11,466	202
1988	82,591	13,050	821	780	40,200	17,700	9,797	243
1989	84,257	13,500	1508	1581	41,286	11,190	14,943	249
1990	85,352	14,400	2450	2289	40,826	13,614	11,527	246
1991	86,607	16,700	1992	1895	45,645	8,962	11,137	276
1992	88,247	18,547	2103	2590	37,890	12,323	14,254	540
1993	81,924	18,679	1511	1824	38,811	10,061	10,397	641
1994	96,188	20,637	1518	1783	49,349	5,949	16,073	879
1995	99,257	23,836	1,835	1,333	57,629	3,814	10,196	614
1996	100,743	18,921	2,342	1,058	50,217	15,947	11,924	334
1997	128,194	19,152	1,353	1,919	44,982	49,186	11,048	554
1998	103,212	20,988	2,014	2,536	53,934	10,431	12,511	798

Table 4 : Percentage composition of landing by resource category

Year	Pelagic	Tuna	Cephalopod	Demersal	Jellyfish	Prawn	Others
1996	18.8	2.3	1.1	49.8	15.8	11.8	0.3
1997	14.94	1.06	1.50	35.09	38.37	8.62	0.43
1998	20.3	2.0	2.5	52.3	10.1	12.1	0.8

Table 5 : Production (tonnes) and percentage composition of pelagic species from coastal area ,1998

Fish group/species	Production	Percentage
Mackerel, *Rastrelliger sp*	3327	13.6
Scad, *Selar mate, Selar sp.*	2360	9.6
Sardines,*Sardinella sp.,Dussumieria sp.*	2342	9.5
Spanish Mackerel, Scomberomorus sp.	2284	9.3
Hairtail, *Trichiurus sp.*	2179	8.9
Hardtail Scad, *Megalaspsis* cordyla	2026	8.3
Tuna	2014	8.2
Sharks	1772	7.2
Others	1442	5.9
Pomfret,*Pampus sp.Paratromateus sp.*	1316	5.4
Shad,Tenualosa sp.	1033	4.2
Longfin Herring, *Opisthopterus sp.*	899	3.7
Wolf Herring, *Chirocentrus sp.*	433	1.8
Indian Threadfin, *Polynemus sp.*	353	1.4
Queenfish , *Chorinemus sp.*	295	1.2
Round Scad, *Decapterus sp.*	224	0.9
Travelly, *Caranx sp., Carangoides sp.*	161	0.7
Barracuda	71	0.3
Mullet, Mugillidae	22	0.1
Total	24553	100

Table 6 :Catch composition of Purse Seiners,1998
(Adapted from Richard Rumpet,1999)

Fish group/ Species	Percentage
Round Scad,*Decapterus russeli, D.macrosoma*	57.4
One-fillet Scad, *Selar mate*	15.3
Bigeye Scad, *Selar crumenophthalmus*	9.2
Indian Mackerel, *Rastrelliger kanagurta*	8.1
Black Pomfret, *Formio niger*	3.5
Yellow banded Scad, *Selaroides leptolepis*	1.2
Hardtail, Megalaspis cordyla	0.1
Sardines, Dussumiera sp.	0.1
Others	5.1

Table 7: Some of the main research activities carried out on pelagic resources

Research Area	Year	Vessel/Agency	Targeted Output
1. Acoustic surveys	1986	RV Rastrelliger Malaysia	Quantitative assessment of small pelagic
2. Acoustic surveys	1994	KL Paus Malaysia	Qualitative assessment of small pelagics
3. Acoustic surveys (SIMRAD)	1996/1997	RV SEAFDEC - Collaborative Malaysia/SEAFDEC/ Thailand	Quantitative assessment of small pelagic
4. Acoustic surveys (SIMRAD)	1998	KL Cermin, Malaysia	Quantitative assessment of small pelagic
5. FAD study	1988-1989 1997-1998	IPPCS Sarawak	Effectiveness of FADs in purse seine fishing and biology of commercial small pelagics
6. Tuna resources study	1992-1994	IPPCS Sarawak	Stock assessment, migration and biology
7. Tuna longline fishing	1993	IPPCS Sarawak	Assessment of large tuna species
8. Coastal pelagic resources	1993	IPPCS Sarawak	Assessment biology of coastal pelagics: pomfrets, and spanish mackerel
9. Shad (*Tenualosa toli*) resources	1985-1987	IPPCS Sarawak	Assessment, biology, spawning, stomach contents

FIGURE 1 - REGIONAL LOCATION OF SARAWAK, MALAYSIA

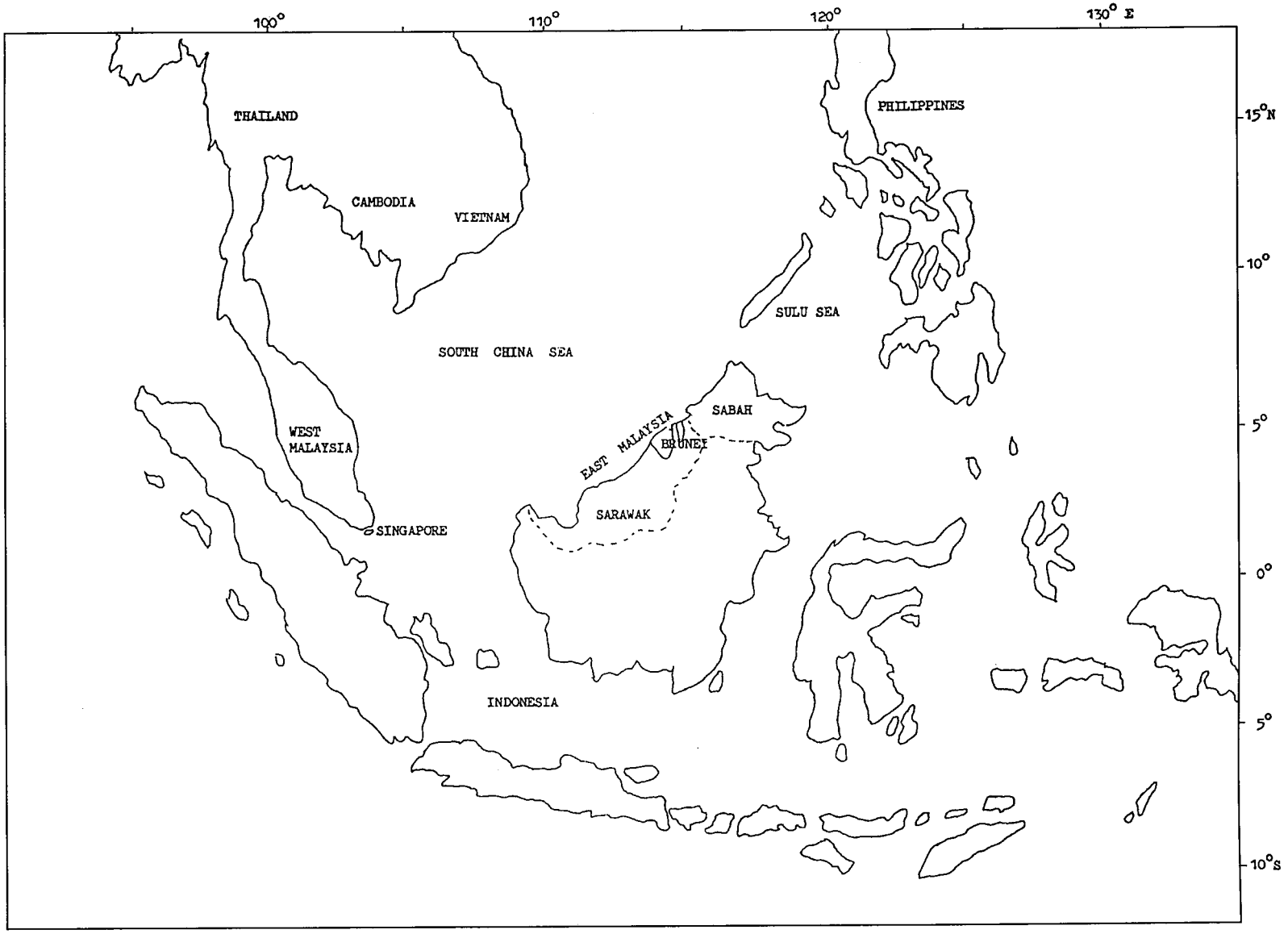


Figure 2: Fish landing by fishing gears

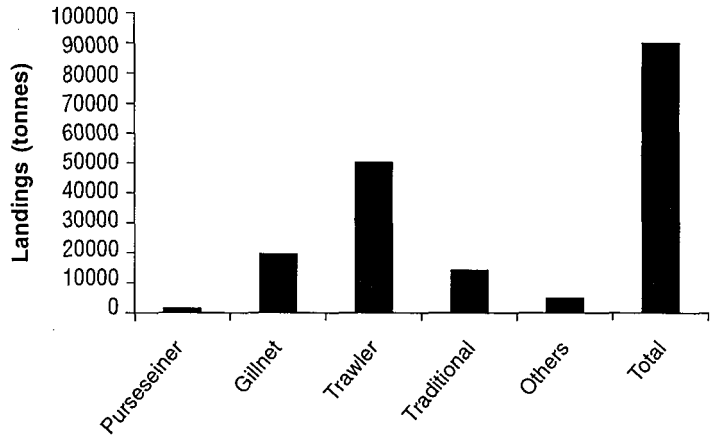
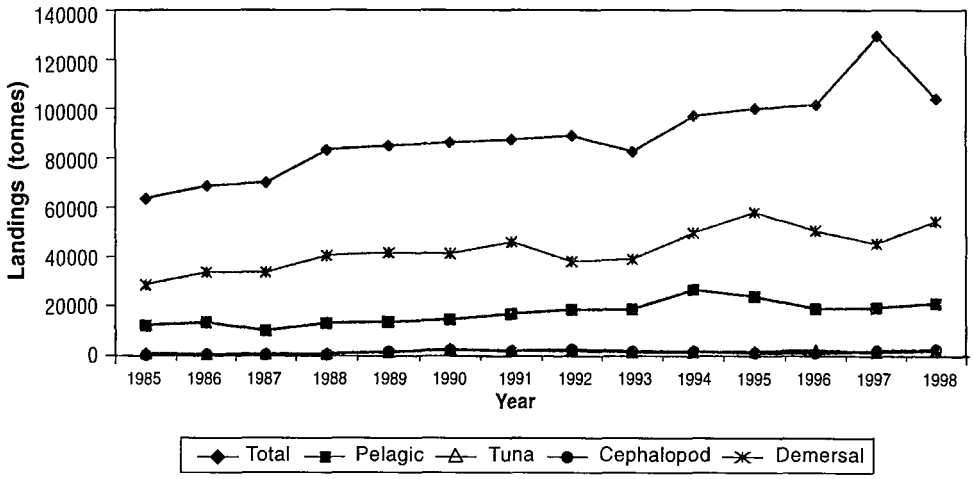


Figure 3: Trends of fish landing in Sarawak



ANNEX 7

Annex 7

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
THAILAND

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Status of Small Pelagic Fish Resources and Fisheries in Thai Waters

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Abstract

The status of the pelagic fisheries and resources in Thai Waters are provided basing on the Fisheries Statistic of Thailand for 1980 -1995 period. An attempt is also made to assess the current status found among major small pelagic stocks, namely Indo-Pacific mackerel, Indian mackerel, round scad, small tunas, anchovies and sardines. Other technical reports pertaining to pelagic fisheries and resources are also reviewed. In the Gulf of Thailand, most of small pelagic fish have been over-fished, except hardtail scad and king mackerel. In the Andaman Sea, the stock of Indo-Pacific mackerel, which located in the lower part of the coast, and banded trevally show indication of overfishing. To date the recovery of these stocks seems to have improved. For Indian mackerel, round scad, sardines, small tunas, hardtail scad, and bigeye scad, no drastic changes in their catches imply sustenance these resources.

1. Introduction

Rapid development of Thailand's fisheries in the past two decades has promoted the country into the world's frontrunner in fishery industry. In 1996, marine fishery accounted for 78% of the total fishery production, of which 70% was the contribution from the Gulf of Thailand and the Andaman Sea shared the rest. Nevertheless, the leap and bound of fishery development has led to over exploitation of fishery resources, particularly demersal fishes and invertebrates. At the same time, the catch of pelagic populations has increased significantly as well. The share of pelagic catch accounted for 33%-38% of the total marine fishery yield during 1991-1996, whereas this portion was only 24%-28% from 1979-1982. During the period of 1972-1982, the pelagic catch from the Gulf of Thailand and Andaman Sea were 313,000-379,000 metric tonnes (mt) and 30,000-44,000 mt, respectively. These catches had marked increased from both regions in recent years as shown by the catch data during 1989-1996: 559,000-707,000 mt and 100,000-288,195 mt from the Gulf and the Andaman Sea, respectively.

Small pelagic fishes such as Indo-Pacific mackerel, small tunas, scads, king mackerel, etc, are gaining more important economically. They had become the main target species for Thai fishermen since 1975 because of attractive prices offered by domestic consumer and fish canneries. According to the Fisheries Statistics, the total catches of small pelagic fish in Thailand was 917,550 mt in 1996 and increasing up to three times compared with 395,540 mt in 1982 (Department of Fisheries (DOF), 1984b and 1999). At present, Thailand is the main supplier of canned fish and other fish products to foreign markets throughout the world. Anyhow, the rapid fisheries development may lead to the deterioration of small pelagic stocks

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in Thailand. Thus, studies on small pelagic stocks are urgent in finding out the current problems, situation and status.

2. Development of Small Pelagic Fisheries

Development of pelagic fisheries in Thailand was resulted from adoption of high efficiency purse seines (84 % of total pelagic catch in 1995 (DOF, 1995b)), expansion of new fishing ground both inshore and offshore, and also the development of new fish-luring techniques. For example, Payao or fish aggregating device (FAD) are applied for day-time catching while lighting techniques especially for light luring purse seine (LPS) were developed in 1973 by installing a power generator on board. The technique has become a predominant fishing gear for mixed target pelagic species since 1982. Anchovies purse seine (APS) which commonly used to catch anchovies in coastal areas have also been developed to operate with light luring for attracting the fish school at night time as well as extending operation range offshore. Besides from catching the target species, the technique is applicable to catch mixed small pelagic fish at night. Subsequently, larger purse seine boats (Tuna purse seine, TUN) were developed as to increase their fishing capacity for catching coastal tunas in deeper water. Since 1985, the vessels have been fitted with electronic equipment such as depth recorder, sonar, and other equipment. In 1990, an installation of labor saving devices on board has been very popular among fishing vessels. The development resulted in a spectacular increase in small pelagic captures more three times in 1996 than in 1982.

3. Fishing gears

Purse seines are basically classified into regular purse seines (RPS), anchovy purse seine (APS) and Chinese purse seine (CPS). RPS consist of Thai purse seine (TPS), green purse seine (GPS), fish aggregating device (FAD), light luring purse seine (LPS) and tuna purse seine (TUN). Appendix 1 shows the fishing operation methods of purse seines (Munprasit and Muttavee, 1986).

In general, the common mesh size used in TPS, LPS, FAD are approximately 2.5 cm; the length and depth of the net range in between 300-1,200 m and 40-150 m, respectively, and number of crew is in the range of 25-40 persons. For CPS, the mesh size is about 2.5 cm, 300-500 m in length and 50-70 m in depth and number of crew is about 20-30 persons. The length, depth and mesh size of GPS net are 500-1,300 m, 60-140 m and 3.8-4.3 cm respectively, and number of crew ranges between 25-40 persons. For APS, the mesh size is about 1 cm, 200-500 m in length and 15-80 m in depth, and number of crew is about 5-30 persons. For the TUN, the boat length is longer than 24 m; the length of the net is between 1,200-1,600 m with the depth of 120-150 m and the mesh size is 9.4 cm. The number of crew is between 35-45 persons. The gear is substitutable to both LPS and TPS for catching other pelagic species in either coastal or offshore areas by using the net with mesh size of 2.5 cm.

RPS, CPS and APS are largely registered gears along the Gulf of Thailand and the Andaman Sea. The registered RPS showed a steady increase from 361 and 63, Gulf of Thailand and Andaman Sea, respectively in 1971 and reached the peak of 1,026 in 1991 (Gulf of Thailand) and 273 in 1994 (Andaman Sea). There was a slight decrease between 1992 to 1996 (909 to 707) in the Gulf and 1994 to 1996 (237 to 198) in the Andaman Sea. The number of registered CPS was between 1- 34 units from 1971-1976 in the Gulf and 12-50 units from 1971-1992 in the Andaman Sea. The number of the gear showed a steep decline and there was no record in CPS registered number since 1977 in the Gulf and 1993 in the Andaman Sea. The registered APS indicated a continuously increase from 42 in 1971 and reached 370 in 1996 in the Gulf and shown fluctuated in the range of 2-272 units from 1971-1996 in the Andaman

Sea. Trend of registered showed abruptly decreased from 272 units in 1989 to 30 units in 1996 (Fig. 1).

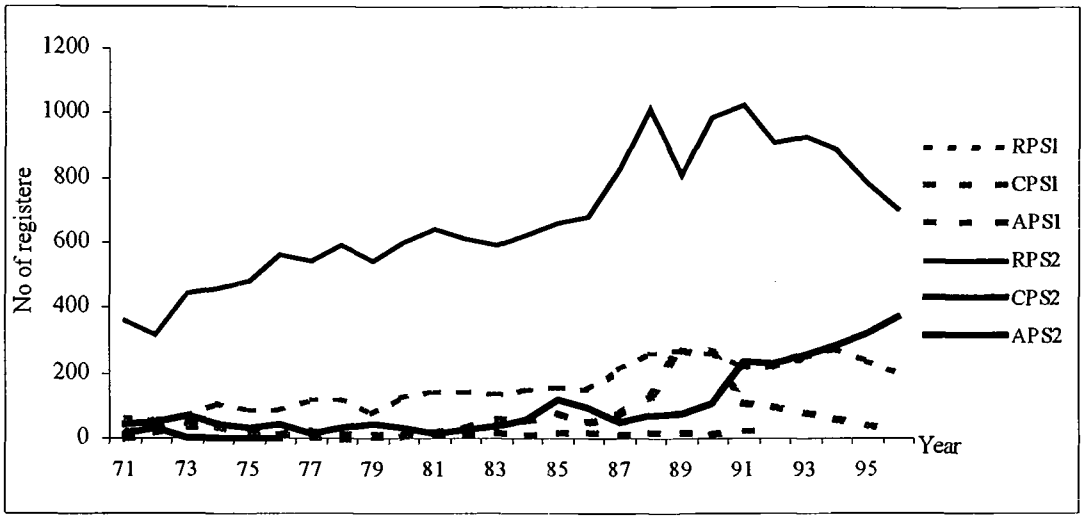

Fig.1 Number of registered of purse seiners (RPS, CPS and APS) in the Andaman Sea (dash line,1) and the Gulf of Thailand (thick line,2) during 1971-1996.
Source: Thai Fishing Vessels Statistics, DOF 1972a-1998a.

4. Species Composition

The main pelagic fishes caught by commercial fishing gear during 1980-1995 consists of Indo-Pacific mackerel (*Rastrelliger brachysoma*), Indian mackerel (*R. kanagurta*), round scad (*Decapterus maruadsi, D. macrosoma* and *D. macarellrus*), small tunas (*Thunnus tonggol, Euthynnus affinis, Auxis thazard, Katsuwonus pelamis* and *Sarda orientalis*), anchovies (*Encrasicholina* spp. and *Stolephorus indicus*) and sardines (*Sardinella gibbosa* and *Amblygaster sirm*). Nearly sole catch of certain species (*i.e., Katsuwonus pelamis, Sarda orientalis* and *D. macarellrus*) are yielded merely from the Andaman Sea. In the total pelagic catch from each region, these resources share about 78-87% in the Gulf and 65-89% in the Andaman Sea (Saikliang and Boonragsa, 1997). Other pelagic fish species are bigeye scad (*Selar crumenopthalmus*), hardtail scad (*Megalaspis cordyla*), and king mackerel (*Scomberomorus* spp.) of which their contribution to the total catch is about 13-22 % and 11-35 % in the Gulf and the Andaman Sea, respectively.

5. Fishing Ground and Seasons

Fishing ground of small pelagic fish have been expanded extensively over inshore and offshore along the coast, where the water depth is more than 20 m in the Gulf and up to 40 m in the Andaman Sea. In the Gulf of Thailand, the fishing ground of Indo-Pacific mackerel is along the western coast and the upper part of the Gulf. For Indian mackerel and sardine, the fishing ground is mainly located within the depth range of 30-70 m. Round scads distribute in offshore area (depth of water more than 50 m) while small tunas have widespread distribution in the whole Gulf, especially in the central part. Anchovies are mainly caught in coastal water along the western and eastern coast of the Gulf. The fishing season is all year round with the major peak during June to October (Southwest Monsoon) and a minor peak during November to May (Saikliang and Boonragsa, 1997). In the Andaman Sea, the main fishing ground of Indo-Pacific mackerel is located in the lower part along the coast. The fishing ground for Indian mackerel is scattering along the coast. The fishing ground for round scad is more or less widespread along the coast. Sardines and anchovies are widely distributed in the inshore and

offshore along the coast. The fishing seasons is apparent with the peak confined to Northeast Monsoon during November to May (Saikliang and Boonragsa, 1997).

6. Production and Catch Rate

Gulf of Thailand: The annual productions of small pelagic fish caught by commercial fishing gears from 1980-1994 indicated the increasing trend from 286,109 mt in 1980 to 534,599 mt in 1991. The trend rises up to the peak of 675,904 mt in 1992 then drops to 583,895 mt in 1993 and increases again during 1994-1995 (614,814-661,686 mt) (Fig. 2 and Table 2). The trend is conformable with that of the number of registered purse seines (Fig. 1).

Annual catch of Indo-Pacific mackerel fluctuated and slight decreased from the peak of 99,638 mt in 1984 to73,727 mt in 1994 and increased again in 1995 (105,323 mt). By using mackerel gill net (MEN) as standard gear, the CPUE shows the same fluctuation as that of production, except and unusual low CPUE in 1986 and 1995.

Production of Indian mackerel increased from 29,827 mt in 1984 to 38,803 mt in 1986 then decreased to the lowest catch of 16,256 mt in 1991. The catch increased again to the peak of 49,231 mt in 1994. Purse seiner is a standard gear. Trend of catch rate indicated the same pattern to that of the production.

The round scads catch slightly decreased from 27,475 mt in 1984 to 23,947 mt in 1986 then increased abruptly to 41,838 mt in 1987, after that it expresses sharply decreased to the lowest point of 10,676 mt in 1990. It increased again up to the peak of 54,633 mt in 1995. Catch rate fluctuates with decreasing trend from 1984 to 1990. The increasing trend is apparent from 1990 46 kg/day to 1995 260 kg/day.

Small tunas production increased from 69,355 mt in 1984 to 156,208 mt in 1990. The highest peak of catch was 157,163 mt in 1992 and tend to decrease in the following years. The catch rate shows similar trend as compared to the production. The minimum and maximum of catch rate are 330 kg/day in 1984 and 846 kg/day in 1991, respectively.

The catches of anchovies markedly increased during 1988 -1992 (from 66,675 mt to 120,211 mt) and then declined to 115,718 mt in 1995. Catch rate of this species fluctuated during the period of 1984 to 1995, with the lowest rate of 1,569 kg/day in 1987 and the peak of 6,282 kg/day in 1992.

Production of sardine slightly increased from 83,814 mt in 1984 to 137,965 mt in 1995 with the peak of catch of 141,422 mt in 1992. The trend of catch rate was similar to that of catch, except from 1994 to 1995.

The production and catch rate of other pelagic fish species are presented in the Table 1.

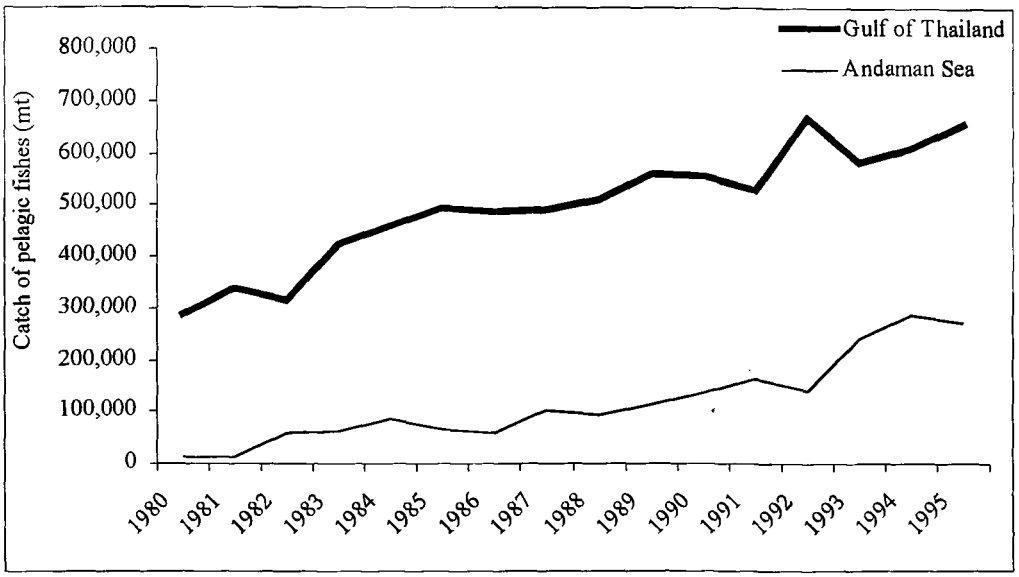

Fig. 2 Total catch of pelagic fish caught by the main fishing gears in the Gulf of Thailand and Andaman Sea, Thailand, from 1980 to 1995.

Andaman Sea: The production and catch rate of pelagic species caught by commercial fishing gears show the increasing trend during the period of 1984-1995 (Fig. 2 and Table 2). Annual catch fluctuates within a range of 59,960 - 309,834 mt. By using purse seines as standard gears, annual CPUE showed a fluctuation between 1,790 and 4,011 kg/day.

Production of Indo-Pacific mackerel increased from 18,675 mt in 1984 to the peak of 66,985 mt in 1993 and decreased down to 46,945 mt in 1995. Catch rate showed an increasing trend but fluctuated in some period from the lowest of 237 kg/day in 1988 to the peak of 994 kg/day in 1993.

Round scad catch in overall view showed increasing trend but greatly fluctuated between 2,464 mt (in 1986) and 35,994 mt (in 1994). The annual CPUE showed a same fluctuation as the production trend, which varied from 102 to 646 kg/day during 1984 to 1995.

The annual production and CPUE of small tunas showed an increasing trend with a great fluctuation in some period, and production and catch rate shot up nine times in 1995 than in1988.

Production of sardine showed slightly decreased from 41,641 mt in 1987 to 20,893 mt in 1992 and then increased abruptly to the peak of 54,849 mt in 1995. Annual CPUE indicated a same trend as production. Range of CPUE varied from 337 to 1,162 kg/day during 1984 to 1995.

Table 1: Total catches and catch rates of commercial important pelagic fish in the Gulf of Thailand from 1994 - 1995.

Species name/year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Standard gear
Indo pacific mackerel													
Total catch (mt)	99,638	97,852	88,768	92,155	88,822	92,688	68,160	55,186	88,308	68,025	73,727	105,323	
Catch rate (kg/day)	731	1,067	275	1,076	1,019	1,142	612	1,450	1,242	400	1,338	574	MEN
Indian mackerel													
Total catch (mt)	29,827	32,862	38,803	36,259	18,653	26,498	20,844	16,256	29,337	33,882	49,231	43,697	
Catch rate (kg/day)	187	240	213	185	61	122	58	86	108	140	278	165	SEINE
Round scads													
Total catch (mt)	27,475	25,667	23,947	41,838	14,015	17,267	10,676	22,747	42,525	46,286	38,394	54,633	
Catch rate (kg/day)	185	206	144	259	73	102	46	149	181	237	254	260	SEINE
Small tunas													
Total catch (mt)	69,355	81,200	90,225	96,131	141,274	124,899	156,208	137,869	157,163	106,797	99,811	86,863	
Catch rate (kg/day)	330	489	426	495	651	681	626	846	617	491	600	355	SEINE
Anchovies													
Total catch (mt)	88,804	103,101	57,959	55,466	65,675	94,315	118,727	110,020	120,211	116,648	97,343	115,718	
Catch rate (kg/day)	2,722	2,100	1,808	1,569	1,895	1,814	1,754	2,119	6,282	4,677	2,680	1,219	APS
Sardines													
Total catch (mt)	83,814	68,447	92,527	83,633	89,077	114,310	90,789	114,465	141,422	112,620	123,700	137,965	
Catch rate (kg/day)	494	520	523	430	410	624	360	730	583	575	795	634	SEINE
King mackerel													
Total catch (mt)	8,099	8,380	10,978	11,924	12,050	9,181	9,153	6,110	6,711	9,563	8,537	9,258	
Catch rate (kg/day)	89	93	99	92	82	78	83	87	83	94	98	84	KMG
Bigeye scad													
Total catch (mt)	23,061	17,174	18,728	22,978	11,931	12,063	19,972	15,451	21,851	19,581	37,080	36,449	
Catch rate (kg/day)	152	136	112	135	52	60	74	90	87	95	230	163	SEINE

Source: 1984 to 1994 (Saikliang and Boonragsa, 1997); 1995 (DOF, 1998 b)

Table 2: Total catches and catch rates of commercial important pelagic fish in the Ancaman Sea 1984 - 1995

Species name/year	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Standard gear
Indo pacific mackerel													
Total catch (mt)	18,675	13,757	13,766	15,029	12,044	17,487	25,127	38,616	32,863	66,833	65,499	46,945	
Catch rate (kg/day)	507	593	548	362	237	366	378	461	667	994	715	731	SEINE
Round scads													
Total catch (mt)	16,777	8,025	2,464	14,276	17,747	22,330	22,559	23,982	8,434	8,984	35,994	22,981	
Catch rate (kg/day)	646	373	102	336	359	494	352	335	194	143	520	443	SEINE
Small tunas													
Total catch (mt)	7,369	5,594	3,392	6,261	4,845	4,695	6,883	14,256	11,903	40,784	31,182	42,611	
Catch rate (kg/day)	269	251	124	146	89	94	99	187	247	634	440	802	SEINE
Sardines													
Total catch (mt)	30,563	27,545	26,604	41,641	32,619	29,186	27,375	24,167	20,893	38,440	29,455	54,849	
Catch rate (kg/day)	995	1,162	1,098	905	660	632	427	337	450	596	418	1,041	SEINE
Total Pelagic													
Total catch (mt)	90,846	67,852	59,960	120,563	98,912	121,646	146,281	176,794	140,969	243,176	309,834	277,957	
Catch rate (kg/day)	2,812	2,754	2,316	2,263	1,790	2,397	2,152	1,888	2,029	2,835	2,916	4,011	SEINE

Source: 1984 to 1994 (Saikliang and Boonragsa, 1997); 1995 (DOF, 1998 b)

7. The Status of Pelagic Resources and Fisheries

The pelagic fishes resources in Thai Waters have been intensely fished during the past two decades. This is particular for the situation of both Indo-Pacific mackerel and small tunas, ones among the most economically important species caught in the Gulf of Thailand and the Andaman Sea. Purse seine is the most effective gear used for catching these target species, whereas it is also the multipurpose gear used for catching pelagic fishes in general. Therefore, this causes different effect on each stock and fishing ground. From the Gulf of Thailand, Chullasorn (1998) reported on the annual production, catch rate of standard gear, and standard fishing effort for small pelagic fish during 1972-1994. By applying Schaefer and Fox model to estimate the maximum sustainable yield (MSY) and the optimum fishing effort, the results

showed that mostly small pelagic fish have been over-fished, except hardtail scad and king mackerel (Table 3). For the latter species, this may be because they are widely migratory species while there is no high effective gear for catching them. As notified in the registration of CPS, the number of gears decreased in 1973 and there was no more record since 1977. This is because the fishermen have made changes and subsequently registered their gears in another type of purse seine. Including fishing ground of this gear has also been diminished by other gears destruction. Chullasorn (1998) reported on the situation of fisheries and showed overfishing tendency as respect to the number of fishing effort (number of vessel) of TPS, LPS and FAD. Toward the solution of this crisis, Chullasorn (1998) suggested that permission of the new license for purse seiner should be limited and enforcement a decreasing of number of vessel is 20 percent from to be registered at present. In the Andaman Sea, the stock of Indo-Pacific mackerel, which located in the lower part of the coast, and banded trevally (*Atule mate*) indicated overfishing. At the same time, the recovery of this stock seems to be improved. For Indian mackerel, round scad, sardines, small tunas, hardtail scad and bigeye scad have no definite the sign of over-fished (Table 4). Besides the former results that showed be useful considered concerning the status of pelagic resources and fisheries in the Andaman Sea such as the limited of fishing knowledge and efficiency of gear for Thai fisher into offshore fishery. And, changing of target species of pelagic fisheries have controlled by the status of resources and economic demand. The decreasing of fishing effort during Southwest monsoon is a result of rough sea. In addition, small pelagic fish are widely migratory species. They have a better chance to escape from one fishing ground to another. Base on these evidences, the statuses of pelagic resources are satisfactory in the Andaman Sea (Boonragsa and Boonsuk, 1998).

Table 3 Catches and maximum sustainable yield of important pelagic species in the Gulf of Thailand.

Species	Catch from 1984-1995 (mt)	Average (mt)	MSY (mt)
Indo-Pacific mackerel[1]	55,186-105,323	84,888	84,500
Indian mackerel[2]	16,256-49,231	31,346	32,000
Round scads[2]	10,676-54,633	30,456	49,000
Small tunas[2]	69,355-157,163	112,316	111,000
Anchovies[2]	55,466-120,211	95,416	106,000
Sardines[2]	68,447-137,965	104,397	117,400
King mackerel[2]	6,110-12,050	9,162	12,400
Bigeye scads[2]	11,931-37,080	21,360	21,500
Pelagic fish[2]	286,109-661,686	500,247	594,400

Remarked: [1] = Chullarson, 1998 and MEN is standard gear by Schaefer's model.
[2]= Chullarson, 1998 and PS is standard gear by Schaefer's model.

Table 4 Catches and maximum sustainable yield of important pelagic species along the Andaman Sea.

Species	Catch from 1984-1995 (mt)	Average (mt)	MSY (mt)
Indo-Pacific mackerel[1]	12,044-66,833	30,553	23,765
Round scads[1]	2,464-35,994	17,046	15,728
Small tunas[1]	4,695-42,611	14,982	8,651
Sardines[1]	19,874-54,849	31,945	31,641
Pelagic fish[1]	56,474-286,509	154,566	136,602

Remarked: [1] = Bhatuyasevi, 1997 and PS is standard gear by Schaefer's model.

8. MANAGEMENT OF THE PELAGIC FISHERIES

Many groups of small pelagic fish have been subjected to fully exploitation and may be over-fished. This is because the rapid development and expansion of pelagic fisheries have been in the Gulf of Thailand and the Andaman Sea during the last two decades. It seems that the room for further fishery development is very scarce. Many scientists have reported their status and proposed to set up an appropriate measure to conserve, manage and control fishing operation with a view to harmonize fishing activities for the available potential resources. It is a known fact that without systematic management, monitoring, control, surveillance and rehabilitation, it will lead to greater conflict in their use. In order to conserve the marine fishery resources, the DOF of Thailand has set up various management measures through the Fisheries Act of 1901 which was consequently revised in 1947 and 1982 (Saikliang and Boonragsa, 1997). The regulations have been issued, with the objective of conserving marine fishery resources, include: determination of the size and kinds of fishing implements that are permitted in fisheries; prohibiting the use of certain types of fishing methodology in certain areas; establishing spawning and nursing seasons and areas of marine resources and prohibiting the use of certain types of fishing gear during there season and areas; mesh size regulation for purse seining, gill netting and lift netting; limiting the new entry of trawl and pelagic fisheries and ceasing to grant new trawl and purse seine licenses.

In the case of Phang-nga Bay, the conservation measures have established for the prohibit fishing of trawlers and push netters within a distance of 3,000 m in all year since 1979. For the breeding of Indo Pacific mackerel have been protected by closed seasons since 1985. In addition, the fisheries patrol have strictly on guard and fisher folk who alive surrounding in the Bay have also established the self-enforcement and implement since 1993(Chantawong *et al.*, 1996). After that the production of marine resources, especially Indo Pacific mackerel, has increasing from 300 kg/day in 1992 to 916 kg/day in 1997 caught by purse seiner (Boonragsa *et al.*, 1998).

8. CONCLUSION AND RECOMMENDATION

The annual production of small pelagic fish in the Gulf of Thailand and the Andaman Sea varies from 286,109 to 675,904 mt and 10,800 to 309,834 mt, respectively during 1980-1995. It shared about 33 percent in total catch of both Coasts. Today, the productions of small pelagic fish are up 2 times in the Gulf and 26 times in the Andaman Sea, which compared from the pelagic production in 1980. Main species of small pelagic fish caught in Thai Waters are Indo-Pacific mackerel, Indian mackerel, round scad, small tunas, anchovies and sardines. Purse seine is the main fishing gears for catching small pelagic fish in Thai Waters, that consisted of LPS, TPS, TUN, GPS, FAD, CPS and APS operated extensively over the inshore and offshore along the coast. The fishing grounds are average depth of sea is more than 20 m in the Gulf and more than 40 m in the Andaman Sea. The fishing season have caught over the whole year, which the peak considered to be high during the Southwest Monsoon in the Gulf and Northeast Monsoon in the Andaman Sea.

Resulting from the rapid development and expansion of pelagic fisheries, it has effected a great pressure on the available resources in Thailand. It is clear that almost all of pelagic fish stocks have been fully exploited and some stock are subjected to overfishing. The catch composition is changing toward smaller size of fishes and less in values as clearly observed in sardine stock that over 40% have been used for fish meal production due to small size and unacceptable for caning factories (Saikliang and Boonragsa, 1997). It is anticipated that this situation will be continued in the future if an adequate countermeasure for fishery management, resource conservation and utilization have not been undertaken.

It is recommended that urgent management measure, including limitation of fishing effort through licensing system, mesh size regulation, fishing efficiency reduction regulation (such as light intensity limitation for luring purse seine), closed area and seasons during spawning and nursing season, quota system (such as limitation on quantity and size of fish that can be allowed to land) have to be issued and implemented. In order to receive a good success, monitoring, control and surveillance of those management has to be strictly practiced.

It is recognized that appropriate research used for generating management advises to the decision maker is very necessary. There are gap in knowledge on biological information still remained in many subjects of many species. It is noted that information on spawning areas, season, size at first maturity, life span, food and feeding, growth and mortalities of many species are still lacking. Besides, information on stock identification through various mean (morphometric, meristics, DNA analysis and tagging) of important pelagic species that are also very sparse. The study should focus on it is well known that the most important basic requirement in stock assessment is the statistics especially time series of catch and effort and size composition by species. Although the statistics particularly catch by species/group of species and its associated effort are available, its reliability is still the question. In using of such information, careful examination and cross check should be taken into consideration.

It is recommended that this problem has to be solved as soon as possible in order to have proper research plan in the right way.

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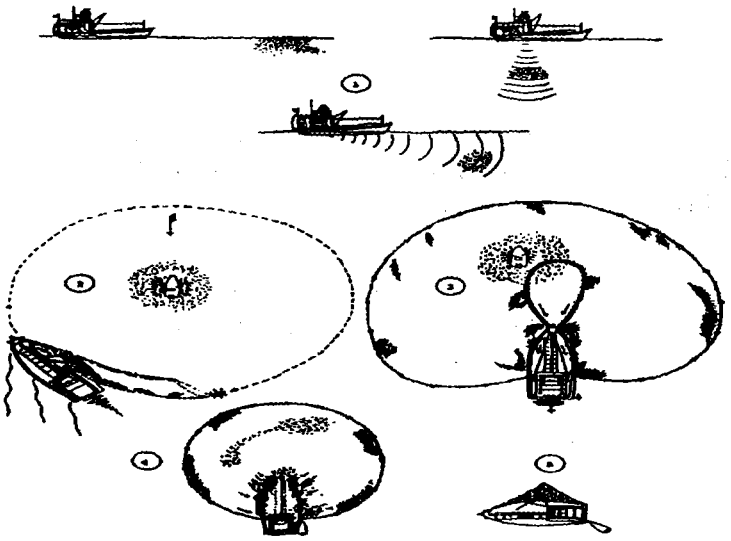
Appendix 1. Fishing operation method of TPS (A), GPS (B), FAD (C), LPS (D), TUN (E) CPS (F) and APS (G) in Thai Waters (Munprasit and Muttavee, 1986).
Symbol: 1-6 = step of fishing method of purse seine.



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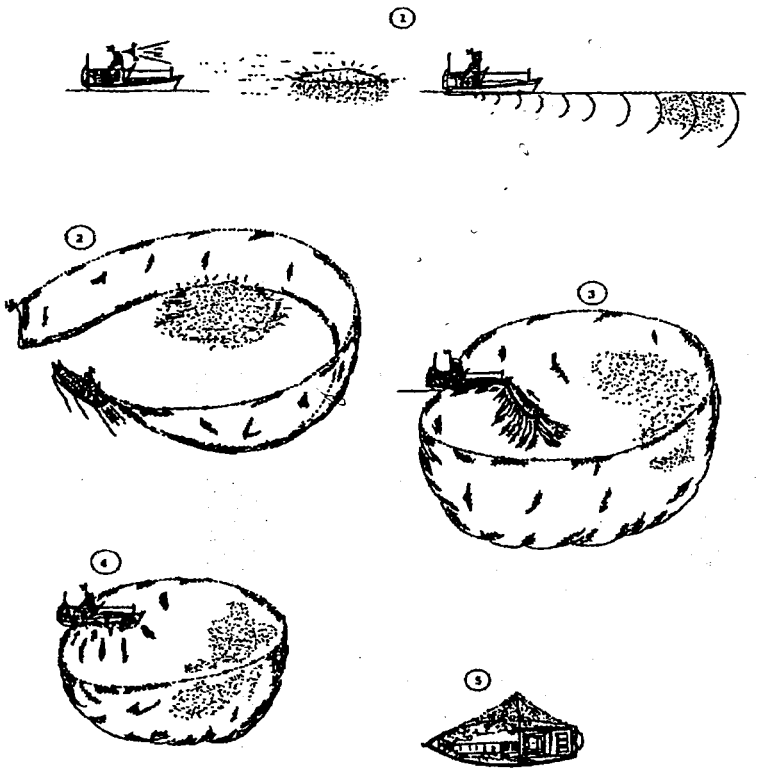

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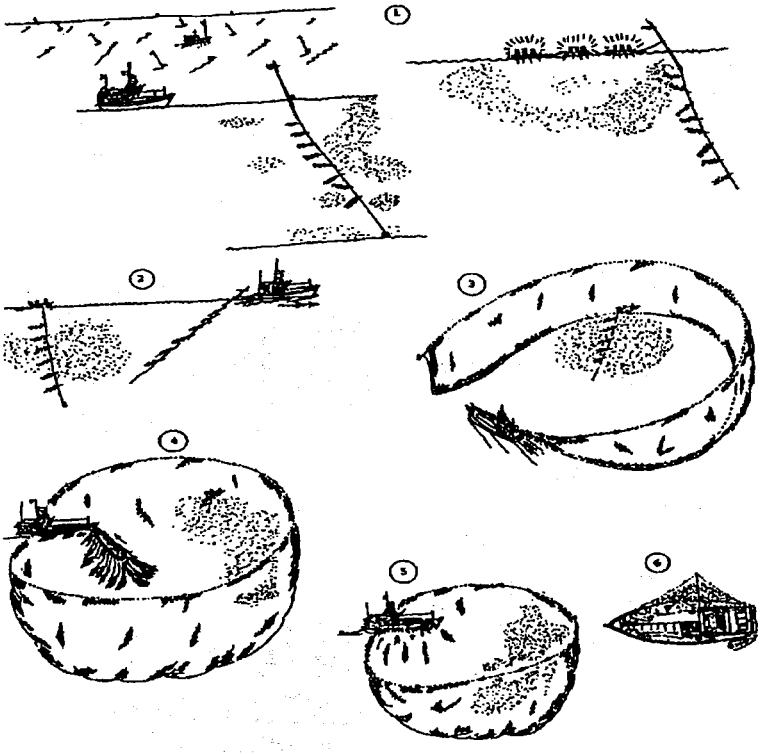

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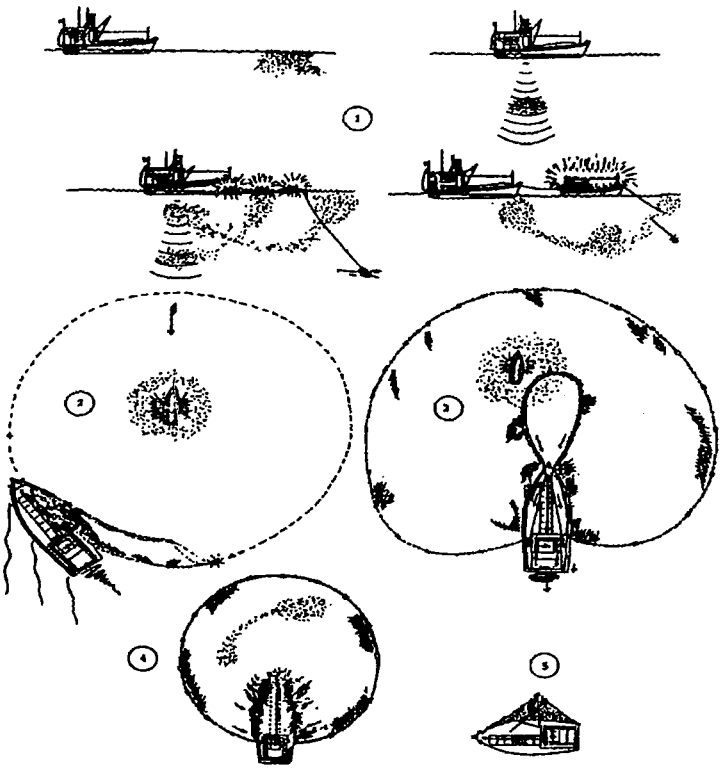

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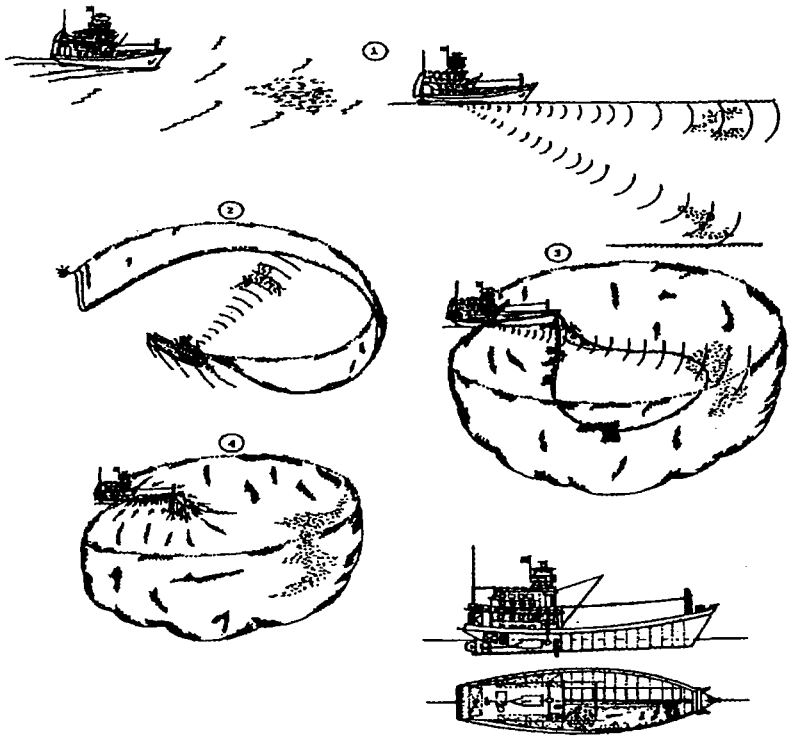

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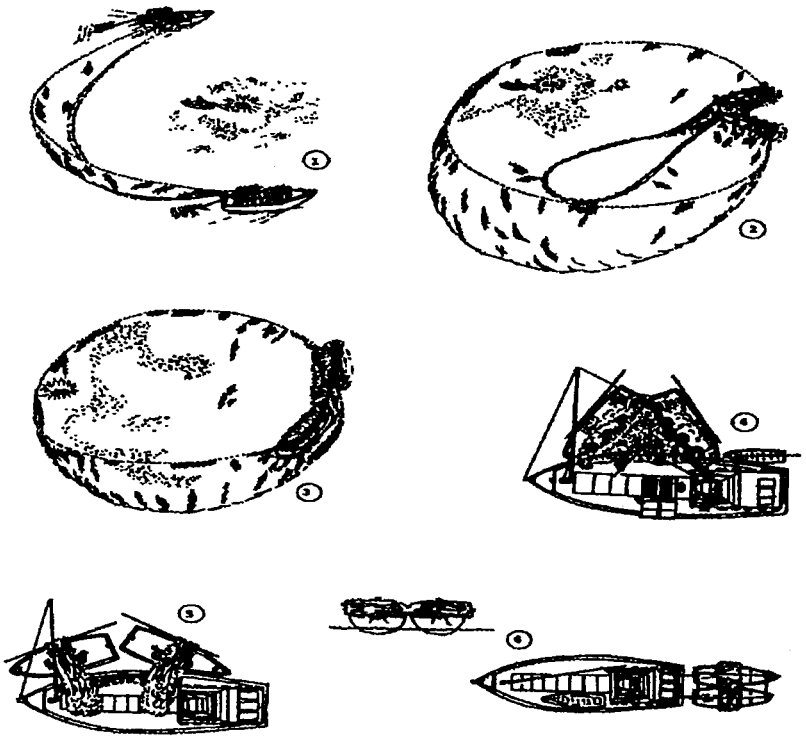

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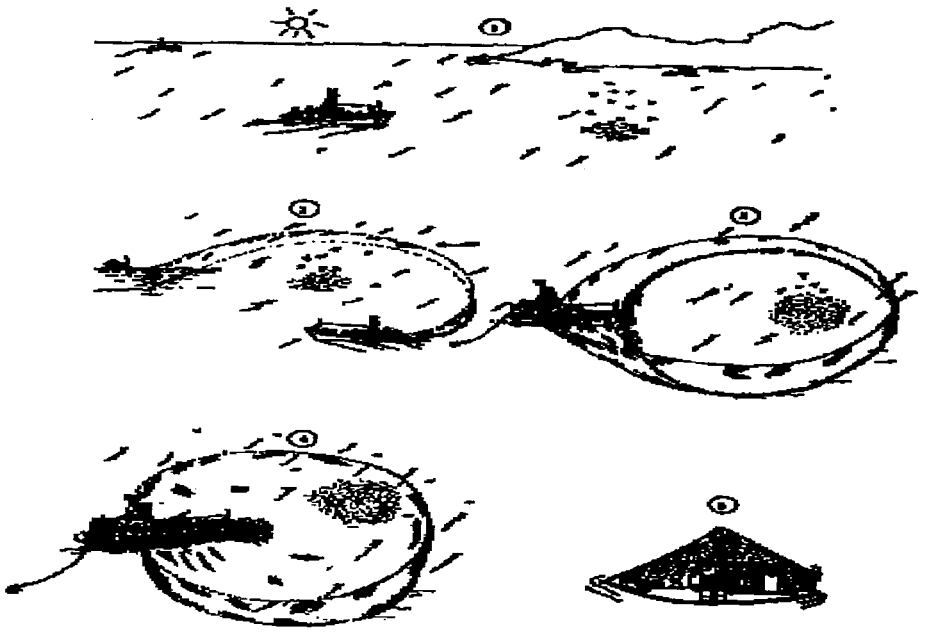

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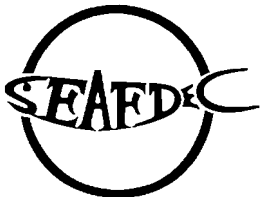
ANNEX 8

Annex 8



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
VIETNAM

By:

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Vietnam

Problems of Shared Fish Stock in Vietnam

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1. Introduction

The South China Sea (SCS) contains great biological resources, it's richness is shown in absolute number of marine living species and large number of endemic species. For the countries bordering the SCS, the marine fisheries play very important role in the national welfare of each country not only in terms of animal protein sources but also in terms of socio-economic issues.

According to FAO figure, among 52 countries of the world which had catches more than 200,000 tonnes per year in 1997, 5 countries of the Southeast Asia region had catch of marine production exceeded more than 1 million tonnes/year, namely: Indonesia (3,649,200.0 tonnes), Thailand (2,912,203.0), Philippines (1,805,806.0), Malaysia (1,172,922.0) and Vietnam (1,066,000.0 tonnes). (INFOFISH, 1999).

The Vietnamese fisheries sector plays the fourth most important role in Vietnam's international trade based economy, following oil, agriculture productions and textile manufacture. The marine fish fauna was diverse with more than 2000 species belonging to over 700 genera and 200 families, of which around 70 % are demersal species and rest are pelagic ones.

The marine fisheries of Vietnam is considered as multi-species, multi-gears, small-scale and free assess fisheries. Most of the fishing efforts is expected by relatively small vessels: nearly 98 % of fishing vessels having engine capacities less than 60 Hp. The major fishing gears included trawls, purse seine, gillnets, lift nets, long-line and hand- line. The technical specifications of various fishing gears used in Vietnam were described by Vinh C.T, and Long N. (1994).

Fisheries production of bottom trawls accounted for about 29.8 % of total production, then followed by purse seines - 26.4 %, gillnets- 18.0 %, Long-line and hand-line- 6.2 %, lift nets- 4.5 % and others- 15.1 %. (MOFi & DANIDA, 1998).

It has been reported that coastal pelagic and demersal resources have been over-exploited. This is because of concentration of fishing efforts in near-shore waters in past years. As a result, catch per unit of efforts (CPUE) has been decreased gradually. On the other hand the off-shore pelagic fisheries resources are still in the developing conditions due to sparse fishing activities. And part of them is referred to those transboundary stocks exploited by two or more countries bordering the South China Sea.

2. National fish resources surveys

The survey and research on marine fisheries resources in seawaters of Vietnam have been conducted for many years and are considered to have been started since the establishment of the Indo-China Institute of Oceanography in Nha Trang in 1923. During the time up to 1935, the Institute had conducted a lot of survey cruises by Trawler De Lanessan (1000 Hp) from the Tonkin Gulf to the Gulf of Thailand including Paracel and Spratly areas.

In 1959-1962 , the joint Vietnam-Chinese study on demersal fish resources in the Tonkin Gulf and in 1960-1961 the joint Vietnam-Soviet integrated study on fish resources in the Tonkin Gulf and adjacent waters of the South China Sea including Paracel and Spratly areas have been carried out. Trawlers of 200-800 Hp were used.

During 1959-1961 period, in the South Vietnam there had been activities of NACA expedition under Scrip California Institute of Oceanography (USA) with participation of experts of the Saigon Fisheries Research Institute and of Thailand. From 1969-1973 with the assistance of FAO/UNDP the off-shore Fisheries Research Program in waters of South Vietnam had been conducted on board of trawler Kioshin Maru No52 (1000 Hp) and purse seiner Huu Nghi (600 Hp).

From 1977-1978, study on small pelagic fish resources in the Tonkin Gulf was conducted on board of R/V Bien Dong (1500 Hp). The acoustic survey with test fishing by bottom and pelagic trawls was carried out.

During 1978-1980, small pelagic resources study in waters of South Vietnam from Thuan Hai to Minh Hai provinces on board of R/V Bien Dong was conducted.

One of very comprehensive integrated study on fisheries resources between Vietnam and Soviet Union in seawaters of Vietnam during 1979-1988 was carried out. 33 research cruises on boards of series research vessels with engine capacity ranged from 800-3800 Hp was conducted. Bottom, pelagic trawls and long-line were used for study.

Study on marine pelagic fish resources in off-shore water of Vietnam has been re-started in period 1995-1997. With JICA assistance, surveys on boards of R/V Bien Dong using 5 different mesh-size gillnets were conducted.

With support of DANIDA, the project of Assessment of living marine resources in Vietnam (ALMRV) was carried out from 1996. Research cruise on board chattered commercial fishing trawler Ha Long 408-B (600 Hp) from depth 50-to 200 m was done and at the same time, fisheries statistic data collection activities were conducted at 11 major fish landings sites along the coastline.

In order to reduce fishing pressure on resources in coastal areas, Ministry of Fisheries of Vietnam intended to develop off-shore fisheries. In period from 1998-1999, study on fisheries resources in off-shore areas was conducted on boards of chattered commercial fishing vessels, pair trawlers were used in the Tonkin Gulf and Southeast of the South and gillnets and long-lines were used in off-shore central waters of Vietnam. These studies will be continued from year of 2000.

The Collaborative Study on Assessment and Management of marine resources in the Gulf of Thailand between Vietnam and Thailand was conducted in 1997-1998 on boards of R/V BIEN DONG (1500 Hp) of Vietnam equipped with gillnets and R/V Chulabhorn (2800 Hp) of Thailand equipped with bottom trawl and vertical bottom long-line.

The SEAFDEC interdepartmental Collaborative Research Program on Fisheries Resources in the South China Sea, Area IV (Vietnamese waters) was conducted on boards of M/V SEAFDEC and R/V BIEN DONG in 1999. Hydroacoustic method, long-line, squid jigging and gillnets were used .

Results of these research activities were described in different reports and publications. Based on existing data, the fisheries resources in off-shore waters of Vietnam which closely related to shared fish stock in the South China sea could be assessed as outlined below:

In off-shore waters, by gillnests of different mesh-size, 98 species belonged to 32 families have been identified, of which 96 fish species belonged to 30 families, 2 squids species belonged to two families (Table 1). Besides, 3 species of sea turtles and 5 species of dolphin were also incidentally caught.

Catch rate of Skipjack tuna was highest (18.5 %), then followed by Devil ray (15.6 %), Common dolphin (9.1 %). Catch rate of Frigate mackerel accounted for 6.9 %), small-sized Yellowfin tuna (1.5 %), Bullet tuna (1.3 %), etc. (Fig. 1)

Among 98 species caught, catches of major 14 species comprised 86.8 % of the total catch by gillnet. Skipjack tuna was considered as the most important species of shared stock in the South China Sea.

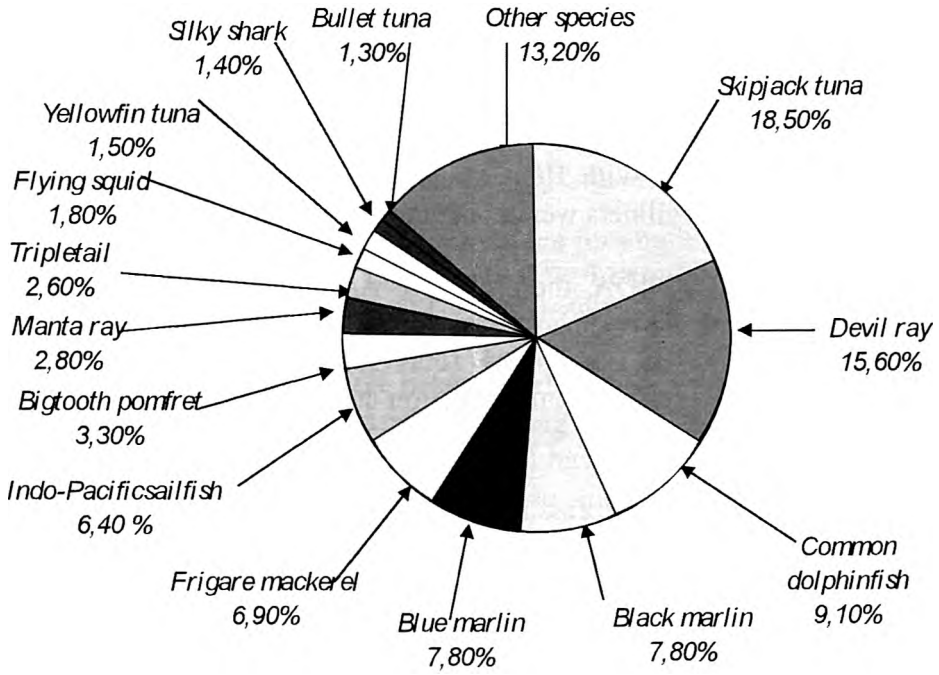

Fig. 1 Catch rate of major species in off-shore waters of Vietnam

3. Problems concerning shared fish stock with in country

In seawaters of Vietnam, multispecies resources are found. There were more than 2000 fish species have been identified, of which around 70 % are demersal and making very complicated species composition in catches of bottom trawls.

Demersal fish species are less mobile than the pelagic species and being exploited mostly in national jurisdiction only, while most of pelagic species, especially oceanic pelagic are considered as migratory resources and often be exploited by other countries bordering the South China Sea. However, studies on definition of stocks which will be used as the basic unit for fisheries management in sewaters of Vietnam are still limited and there are lack of stock assessment data on group of species or species alone. In general , the oceanic pelagic resources in off-shore waters of Vietnam haven't been studied in details.

Due to characteristics of monsoon system, number of fish schools varies largely by season around the year , concentrating in rather larger schools during the Northeast monsoon period than during Southwest monsoon period. For all different periods, small fish schools dominated, medium size schools accounted for about 15 % and large schools only 0.8 % of total number of schools observed. For small pelagic species, occurrence frequency in seawaters with depth of 20-50m accounted for 56.4 %, 50-100m (25.7 %) and 100-200m (0.6 %).(MOFi & UNDP, 1992).

Shared stocks of oceanic pelagic fish species in off-shore waters of Vietnam are believed still under-exploited due to the lack of the appropriate fishing vessels and fishing technology, especially resources of tuna and tuna-like species. Application of advanced fishing technology and development of off-shore fishing fleets can increase the production of these shared stocks in seawaters of Vietnam.

The foreign illegal fishing is being happened in seawaters of Vietnam such as Chinese fishing vessels in the Tonkin Gulf. It is difficult to control these illegal fishing in recent years.

In general, lack of the research activities on shared stocks in seawaters of Vietnam has caused difficulties in fisheries management and policy-making procedures.

4. Fisheries management measures as practiced in Vietnam

Overfishing in coastal waters, habitat degradation, destructive fishing methods, industrial and agricultural pollution, lack of data on off-shore fisheries resources and fisheries statistics systems, lack of fisheries law and legislation framework, etc. are major problems faced in fisheries management and strategies in Vietnam.

The Ministry of Fisheries of Vietnam recognized above-mentioned problems and defined main directions and measures as follows:

- To reduce fishing pressure on coastal resources by creating for fishermen another jobs and activities.

- To develop off-shore capture fisheries by building more powerful fishing boats and using advanced fishing technology. To push up research activities on off-shore fisheries resources.
- To develop aquaculture in all water bodies by sustainable technology and friendly with environments and natural ecosystems.
- To modernise fish processing subsector, pay attention on post harvest technology in order to increase value-added products and diversify fisheries products. To expand markets both domestic and oversea.
- To improve fisheries infrastructure, especially in major fish landing sites.
- To set up human's strategy, through training staffs, implementing awareness programs.
- To build up fisheries law , legislation framework, regulations and develop surveillance and enforcement measures.
- To follow the community-based management in fisheries, and
- To coolaborate closely with organizations and countries in the world and in the region.

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Table 1 Species composition of catch by gillnet in off-shore waters of Vietnam

Ord.	*Scientific name of Families and species*	*Common English name*	*Vietnamese name*
(1)	(2)	(3)	(4)
I	ACANTHURIDAE		HỌ CÁ ĐUÔI GAI
1	Naso breviostris (Valenciennes)	Spotted unicornfish	Cá Một sừng
II	BELONIDAE		HỌ CÁ NHÓI
2	Ablennes hians (Valenciennes)	Flat needlefish	Cá Nhói vằn
3	Tylosurus acus melanotus (Bleeker)	Blackfin needlefish	Cá Nhói vây lưng đen
III	BRAMIDAE		HỌ CÁ VỀN BIỂN
4	Brama orcini Cuvier	Bigtooth pomfret	Cá Vền biển
IV	CARANGIDAE		HỌ CÁ KHẾ
5	Alectis ciliaris (Bloch)	Threadfin trevally	Cá ông lão mõm ngắn
6	Atule mate (Cuvier)	Slender-scaled scad	Cá Ngân
7	Carangoides ferdau (Forsskal)	Blue trevlly	Cá Khế fecdo
8	C. orthogrammus (Jordan et Gilbert)	Yellow-spotted crevalle	Cá Khế chấm vàng
9	Decapterus maruadsi (Temminck et Schlegel)	Round scad	Cá Nục sò
10	D. kurroides Bleeker	Red-tail scad	Cá Nục đỏ đuôi
11	D. macrosoma Bleeker	Layang scad	Cá Nục thuôn
12	Elagatis bipinnulata (Quoy et Gaimard)	Rainbow runner	Cá Sọc mướp
13	Megalaspis cordyla (Linnaeus)	Hard-tail scad	Cá Sòng gió
14	Naucrates ductor (Linnaeus)	Pilot fish	Cá Thuyền
15	Scomberoides lysan (Forsskal)	Double dotted queenfish	Cá Bè xước
16	S. commersonnianus Lacepede	Talang queenfish	
17	S. tol (Cuvier)	Leatherskin	Cá Bè sâu

		queenfish	
18	Selar crumenophthamus (Bloch)	Bigeye scad	Cá Tráo
19	Seriola rivoliana Valenciennes	Almaco jack	Cá Cam
20	Seriolina nigrofasciata (Ruppell)	Black band jack	Cá Cam vân
21	Trachinotus baillonii (Lacapede)	Black-spotted dart	Cá Sòng chấm đen
22	Uraspis helvola (Forster)	Whitemouth kingfish	Cá Hiến
V	CALLIONYMIDAE		**HỌ CÁ ĐÀN LIA**
23	Pseudocalliurichthys sp.	Variegated dragonet	Cá Đàn lia
VI	CARCHARHINIDAE		**HỌ CÁ MẬP**
24	Carcharinus brevipinna (Muller et Henle)	Spiner shark	Cá Mập gai
25	C. falciformis (Bibron)	Silky shark	Cá Mập lụa
26	C. sorrah (Valenciennes)	Spot-tail shark	Cá Mập Sô ra
27	Galeocerdo cuvier (Perdo et Le Sueur)	Tiger shark	Cá Mập báo
28	Prionace glauca Linnaeus	Blue shark	Cá Mập xanh
29	Pseudocarcharias kamoharai (Matsubara)	Crocodile shark	Cá Mập sấu
VII	CHIROCENTRIDAE		**HỌ CÁ RỰA**
30	Chirocentrus dorab (Forsskal)	Wolf herring	Cá Rựa
VIII	CORYPHAENIDAE		**HỌ CÁ NỤC HEO**
31	Coryphaena equiselis Linnaeus	Pompano dolphinfish	Cá Nục heo
32	C. hippurus Linnaeus	Common dolphinfish	Cá Nục heo thường
IX	DALATIIDAE		**HỌ CÁ NHÁM**
33	Isistius brasiliensis (Quoy et Gaimard)	Black shark	Cá Nhám đen
X	DIODONTIDAE		**HỌ CÁ NÓC NHÍM**
34	Diodon eydouxii Brissout et Barneville	Porcurine fish	Cá Nóc nhím
35	D. hystrix Linnaeus	Porcurine fish	Cá Nóc nhím
36	D. holocanthus Linnaeus	Fleckled sucker	Cá Nóc nhím vằn đen
XI	ECHENEIDIDAE		**HỌ CÁ ÉP**
37	Echeneis naucrates Linnaeus	Shark sucker	Cá Ép
38	Remora remora (Linnaeus)	Remora	Cá Ép ngắn
39	Remorina albescens (Temminck et Schlegel)	White remora	Cá Ép trắng

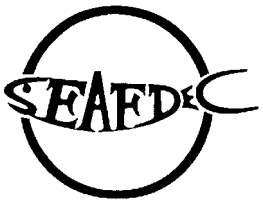
XII	EXOCOETIDAE		HỌ CÁ CHUỒN
40	Cypselurus atrisignis (Jenkins)	Greater spotted flyingfish	Cá Chuồn cổ chấm
41	C. cyanopterus (Valenciennes)	Margined flyingfish	Cá Chuồn vây xanh
42	C. longibarbus (Parin)	Coast flyingfish	Cá Chuồn
43	C. naresii (Grunther)	Uchida's flyingfish	Cá Chuồn Uchida
44	C. poecilopterus (Valenciennes)	Yellowfin flyingfish	Cá Chuồn vây vàng
45	C. sp.	Flyingfish	Cá Chuồn sp.
46	C. spilonotopterus (Bleeker)	Flyingfish	Cá Chuồn cổ vây cáo
47	C. unicolor (Valenciennes)	Bigeye flyingfish	Cá Chuồn mắt to
48	Exocoetus volitant Linnaeus	Cosmopolitan flyingfish	Cá Chuồn bay
49	Paraexocoetus sp.	Sailfin flyingfish	Cá Chuồn vây cờ
XIII	GEMPYLIDAE		HỌ CÁ THU RẮN
50	Gempylus serpens Cuvier	Snake mackerel	Cá Thu rắn
51	Lepidocybium flavobrumneum (Smith)	Escolar	Cá Thu mỡ
52	Promethichthys prometheus (Cuvier)	Snake-mackerel	Cá Thu hố
53	Ruventtus pretiosus Cocco	Oil fish	Cá Ruvet
XIV	ISTIOPHORIDAE		HỌ CÁ CỜ
54	Istiophorus platypterus(Shaw etNodder)	Indo-Pacific sailfish	Cá Cờ phương đông
55	Makaira indica (Cuvier)	Black marlin	Cá Cờ đen
56	M. mazara (Jordan et Snyder)	Blue marlin	Cá Cờ xanh
57	Tetrapterus audax (Philippi)	Striped marlin	Cá Cờ vạch
XV	KYPHOSIDAE		HỌ CÁ DẦM
58	Kyphosus vaigiensis (Quoy etGaimard)	Bass seachub	Cá Dầm
XVI	LOBOTIDAE		HỌ CÁ KẼN
59	Lobotes surinamensis (Bloch)	Tripletail	Cá Rô biển
XVII	MENIDAE		HỌ CÁ BÁNH LÁI
60	Mene maculata (Bloch et Schneider)	Moon fish	Cá Bánh lái
XVIII	MOBULIDAE		HỌ CÁ Ó DƠI
61	Manta birostric (Donndoff)	Manta ray	Cá ó dơi hai mõm
62	Mobula japonica (Muller et Henle	Devil ray	Cá ó dơi Nhật bản
XIX	MONACANTHIDAE		

63	Aluterus monoceros (Linnaeus)	Unicom leatherjacket	Cá bò một gai lưng
64	A. scriptus (Osbeck)	Leatherjacket	Cá Bò giấy gai không đều
65	Canthidermis maculata (Bloch)	Ocean triggerfish	Cá Bò chấm
XX	MYCTOPHIDAE		HỌ CÁ ĐÈN LỒNG
66	Diaphus gigas Gibert	Brightnose headlightfish	Cá Đèn lồng mõm sáng
67	D. watasei Jordan et Starks	Latern fish	Cá Đèn lồng
XXI	NOMEIDAE		HỌ CÁ CHIM HAI VÂY
68	Arioma indica (Day)	Indian driftfish	Cá Chim ấn độ
69	Cubiceps baxteri McCulloch	Drift fish	
70	C. pauciradiatus Gunther	Chunky fathead	Cá Đầu mập
71	C. squamiceps (Lloyd)	Fathead	Cá Đầu mập
72	Nomeus gronovii (Gmelin)	Man-of-War fish	Cá Nhà binh
73	Psenes arafurensis Grunther	Eyebrowfish	Cá Lông mày
74	P. cyanophrys Valenciennes	Black driftfish	Cá Chim gai
75	P. maculatus Lutken	Blue eyebrowfish	Cá Lông mày xanh
XXII	ORECTOLOBIDAE		HỌ CÁ NHÁM MÈO
76	Stegostoma fasciatum (Hermann)	Zebra shark	Cá Nhám mèo
XXIII	PRIACANTHIDAE		HỌ CÁ TRÁC
77	Priacanthus macracanthus Cuvier	Large-spined bigeye	Cá Trác ngắn
XXIV	RACHYCENTRIDAE		HỌ CÁ GIÒ
78	Rachicentron canadum (Linnaeus)	King fish	Cá Giò
XXV	SCOMBRIDAE		HỌ CÁ THU NGỪ
79	Acanthocybium solandri (Cuvier)	Wahoo	Cá Thu ngàng
80	Auxis rochei (Risso)	Bullet tuna	Cá Ngừ ồ
81	A. thazard (Lacepede)	Frigate mackerel	Cá Ngừ chù
82	Euthynnus affinis (Cantor)	Eastern little tuna	Cá Ngừ chấm
83	Katsuwonus pelamis (Linnaeus)	Skipjack tuna	Cá Ngừ vằn
84	Rasrelliger kanagurta (Cuvier)	Indian mackerel	Cá Bạc má
85	Thunnus albacares (Bonnaterre)	Yellowfin tuna	Cá Ngừ vây vàng
86	T. obesus (Lower)	Bigeye tuna	Cá Ngừ mắt to
87	T. tonggol (Bleeker)	Longtail tuna	Cá Ngừ bò
88	Sarda orientalis (Temminck et Schlegel)	Striped bonito	Cá Ngừ sọc dưa

89	Scomber australasicus Cuvier	Blue mackerel	Cá Thu úc
90	Scomberomorus commerson Lacepede	Spanish mackerel	Cá Thu vạhc
XXVI	SPHYRNIDAE		HỌ CÁ NHÁM CÀO
91	Sphyrna lewini (Griffth et Smith)	Hammerhead shark	Cá Nhám búa cố rãnh
XXVII	SYNODOTIDAE		HỌ CÁ MỐI
92	Saurida undosquamis Richardson	True lizardfish	Cá Mối vạch
XXVIII	TETRADONTIDAE		HỌ CÁ NÓC
93	Lagocephalus sp.	White-tail blowfish	Cá Nóc đuôi trắng
94	L. lagocephalus oceanicus Jordan et Flower	Spotted blowfish	Cá Nóc chấm
XXIX	THERAPONIDAE		HỌ CÁ CĂNG
95	Therapon jarbua (Forsskal)	Jarbua terapon	Cá Ong
XXX	XIPHIIDAE		HỌ CÁ MŨI KIẾM
96	Xiphias gladius Linnaeus	Broadbill swordfish	Cá Mũi kiếm
XXXI	OMMASTREPHIDAE		HỌ MỰC LỬA
97	Sthenoteuthis ovalaniensis Lesson	Flying squid	Mực lửa
XXXII	THYSANNOTEUTHIDAE		HỌ MỰC VÂY THOI
98	Thysanoteuthys rhombus Troschel	Diamonback squid	Mực vây hình thoi

ANNEX 9

Annex 9



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
PHILIPPINES

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Status and Management of Philippine Pelagic Resources Potentially Shared with Neighboring Countries

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Abstract

The fishery sector contributes significantly to the country's economy and continues to play an important role in providing livelihood and in attaining food security. A significant amount of the sector's contribution comes from pelagic resources that are potentially shared with other countries such as the highly migratory species of tunas, billfishes, oceanic sharks and small pelagics. An average of 1.09 M metric tonnes have been caught from 1993 to 1997 of which a great majority is being taken by commercial fishing boats numbering to about 3,416 in 1998.

In this paper, the status and management of potentially shared pelagic fishery resources are presented including the problems being encountered in research and management and also the past, present and future national resource surveys.

a. Introduction

In 1996, the Philippines is 13th among the top fish producing country in the world. Around 1.8 M metric tons of fish has been contributed by the country to world catch and in terms of aquaculture, it contributed a total of 26.4 M metric tons of fish and shellfish valued at 41.5 M US Dollars. The country is 9th in the world aquaculture production (FAO Yearbook, 1996 as cited in BFAR, 1998a)

Locally, the fishing industry's contribution to the Philippines' Gross Domestic Product (GDP) which is placed at P 2,667.1 B (current price) and P 888.1 (constant price), is P 74.1 B (2.8%) and P 34.7 B (3.9%) at current and constant prices respectively. From 1989 to 1998, the fisheries sector posted positive growths of 4.7% and 4.4% in the aquaculture and commercial sectors respectively while the municipal fisheries declined by 2.3%. In 1998 the Bureau of Agricultural Statistics recorded a total fish production of 2.79 M metric tons valued at P 84.86 B. Also in the same year, total fishery exports amounted to P 20.6 B lead by tuna @ P 8.0 B, shrimp/prawn @ P 5.0 B and seaweed exports @ P 2.6 B (BAS 1998). The industry employs around one million or five percent of the country's labor force, where around 258,480 are engaged in culture, 675,677 in municipal and 56,715 in commercial fisheries (BFAR, 1998a).

While generally the fishing sector has contributed significantly to the country's economy, it is faced by the problem of resource depletion and environmental degradation (Barut et al., 1997). Economical and biological overfishing have already been observed in coastal demersal stocks, small pelagic and tuna fisheries (Silvestre et al., 1986; Trinidad et al., 1993 and BFAR 1995). Because of this, various national and local management interventions and initiatives are being implemented to ensure the sustainability of the fishery resources. However, for resources thought to be shared by 2 or more countries e.g. the highly migratory species of tunas and billfishes, aside from existing management, a higher level of multilateral cooperative management between and among range states is being recommended (Devaraj and Vivekanandan, 1997; MFRDMD, 1998).

In this paper, the status of pelagic fishery resources that are potentially shared by the Philippines with neighboring countries is presented. Various topics on current regional, national and local management interventions, as well as past, present and future research undertakings, ans issues are discussed.

b. Pelagic species in the Philippines potentially shared with other countries

Due to very limited information on the extent of the populations of aquatic resources in Southeast Asian region, it is rather difficult to pinpoint which particular species are shared by the Philippines with neighboring countries. Previous workshops (FAO/SEAFDEC, 1985; Yanagawa, 1997) have identified several small pelagic stocks and their extent across the region based on catch data. However, recent genetic studies, although preliminary have indicated the presence of a wider extent of stocks of some small pelagics e.g. with *Euthynnus affinis* (Santos, 1999) and some *Decapterus* spp. (Arnaud et al., 1999)

The Philippines exhibits a high diversity of fish species with a listing of more than 2,200 species (Herre, 1950). Of these, around 27 genera and 2 families of bony fishes and about 4 families and 1 genus of oceanic sharks could be considered as potential transboundary shared pelagic resources as proposed by Isa (1998) in Table 1 and as specified in the Annex I of the United Nations Convention on the Law of the Sea or UNCLOS (Table 2).

Table 1. Small Pelagic Resources of the South China Sea (Potential Transboundary Shared Stocks) as Listed by Isa (1998) and as recorded in the Philippines

Scientific Name (Isa, 1998)	English Name (Isa, 1998)	Philippine Local Name (Ganaden and Gonzales, 1999)
Rastrelliger spp.	Mackerels	Hasa-hasa, Alumahan, Anduhaw, Kabalyas
Decapterus spp.	Roundscads	Galunggong, Burot, Budboron
Selar spp.,	Scads	Matangbaka, Tamarong
Atule mate	Scad	Salay-salay, Kalapato
Megalaspis cordyla	Torpedo Scad	Oriles, Pak-an, Atulay
Sardinella spp.,	Sardines	Tamban, Lapad, Tunsoy
Dussumieria spp.	Rainbow sardines	Tulis
Auxis thazard, Euthynnus spp., *Thunnus tonggol, Sarda* spp.)	Small Tunas	Tulingan, Pirit,
Scomberomorus spp.	Spanish Mackerels	Tangigue
Caranx spp., *Carangoides* spp.	Jacks and Trevallies	Talakitok, Mamsa
Stolephorus spp.	Anchovies	Dilis, Bolinao, Tuakang
Scomberoides spp.	Queenfish, Leatherskin	Lapis, Talang-talang, Dorado
Sphyraena spp.	Barracudas	Torsillo, Baracuda
Parastromateus niger, Stromateus spp.	Pomfrets	Pampano
Chirocentrus spp.	Wolf-herrings	Parang-parang, Balila
Trichurius spp.	Hairtails	Espada, Liwit
	Mullets	Banak, Aligasin, Talilong

Table 2. Large pelagic marine organisms considered as highly migratory species in the UNCLOS Annex I, which are also recorded in the Philippines.

Scientific Name (UNCLOS)	English Name (UNCLOS)	Philippine Local Name (Ganaden and Gonzales, 1999)
Thunnus albacares	Yellowfin Tuna	Tambakol, Bariles
Thunnus obesus	Bigeye Tuna	Tambakol
Katsuwonus pelamis	Skipjack Tuna	Gulyasan, Budlisan
Euthynnus affinis	Kawakawa	Tulingan, Katsorita, Pirit
Auxis thazard	Frigate Tuna	Tulingan, Pirit
Auxis rochei	Bullet Tuna	Tulingan, Pirit
Makaira mazara	Indo-Pacific Blue Marlin	Malasugi, Marlin, Manumbok
Makaira indica	Black Marlin	Malasugi, Marlin
Istiophorus platypterus	Pacific Sailfish	Malasugi, Kandayan
Xiphias gladius	Swordfish	Malasugue, Palmbela
Coryphaena hippurus	Dolphin fish	Dorado, Pandawan
Bramidae	Pomphrets	Pampanong Laot
Oceanic sharks		
- *Rhincodon typus*	Whale shark	Butanding, Tawiki, Balilan
- *Hexanchus griseus*	Cow shark	Pating
- *Alopiidae*	Thresher sharks	Pating
- *Carcharhinidae*	Requiem sharks	Pating
- *Sphyrnidae*	Hammerhead sharks	Pating

In addition, based on genetic evidence, no genetic heterogeneity was detected on *Euthynnus affinis* sampled from the Philippines and West Coast Malaysia (Santos, 1999) and so with *Decapterus macarellus, D. ruselli and D. macrosoma* in the South China and Sulawesi Seas via Java Sea and Makassar Strait (Arnaud et al., 1999) indicating further that these four (4) small pelagic species are shared by countries in the Southeast Asian region.

c. Fishing boats targeting potential shared species

Fishing vessels in the country are generally classified into two: a) Municipal Fishing Boats (MFB's) having a weight of less than 3 gross tonnes (GT) and 2) Commercial Fishing Boats (CFB's) which are 3 gross tonnes and above. CFB's by law are generally restricted to fish inside the 15 km Municipal waters except if allowed by the Municipality to enter the area of 10 to 15 km. Table 3 shows the breakdown of Municipal and Commercial Vessels by region based on available data. All of these gears, directly targets and or indirectly affects the shared species enumerated previously.

In 1998, there were about 3,416 commercial fishing vessels operating in the country with a combined gross tonnage of about 299,886 GT (BFAR, 1998a). This was reflected mainly from the records of commercial fishing licenses being issued by BFAR. A historical account of the total number of commercial fishing vessels by gear type and tonnage in the country from 1967 to 1994 is presented in Barut et al, (1997).

On the other hand, a 1985 survey showed that there are a total of 464,395 registered municipal fishing vessels, 193,976 of which were non-motorized and 270,419 were motorized. Unfortunately this type of survey, has not been conducted mainly due to financial considerations.

Table 3. Number of Municipal and Commercial Fishing Vessels operating in the Philippines by Region (Source: BFAR, 1998)

Regions in the Philippines	Municipal Fishing Vessels (1985) (< 3GT)	Commercial Fishing Vessels (1998) (= or > 3GT)
National Capital Region	3,553	1,502
Region I	12,720	60
Region II	3,085	20
Region III	21,433	32
Region IV	54,617	120
Region V	49,303	159
Region VI	28,327	390
Region VII	64,740	98
Region VIII	40,702	102
Region IX	113,459	330
Region X	20,370	49
Region XI	35,174	482
Region XII	16,912	13
Region XIII (CARAGA)	*	52
Autonomous Region in Muslim Mindanao (ARMM)	*	7
Total	**464,395**	**3,416**

** CARAGA and ARMM were only created recently hence the number of municipal fishing vessels would be reflected in Region IX, X, and XII where the former would eventually be formed.*

d. Production estimate of fishing boats targeting potential shared species

The total average production of major fish species in the country from 1993 to 1997 was about 1,402,403 metric tonnes, brokendown to 804,989 mt by commercial fishing and 597,414 mt by municipal fishing (BAS, 1998). Below is a summary of the average production by potential shared species from 1993 to 1997 although there are other potential spp. that may not be included in the list.

Table 4. Average production (mt) of potential shared resources from 1993 to 1997 (BAS, 1998)

Species	Total	Commercial	Municipal
Roundscad	243,171	217,332	25,839
Indian Sardines	172,293	137,170	35,123
Frigate Tuna	101,204	53,594	47,610
Skipjack	96,567	77,598	18,969
Fimbriated Sardines	86,062	47,894	38,168
Anchovies	74,102	30,759	43,343
Yellowfin Tuna	58,168	27,917	30,251
Indian Mackerel	52,779	24,356	28,423
Big-eyed Scad	44,911	20,186	24,725
Indo-pacific Mackerel	25,591	15,311	10,280
Cavalla	21,526	3,840	17,686
Eastern Little Tuna	25,922	17,726	8,196
Crevalle	18.770	11,201	7,569
Mullet	14,288	1,270	13,018
Flying Fish	17,949	3,479	14,470
Round Herring	16,852	15,460	1,392
Spanish Mackerel	10,917	1,747	9,170
Hairtail	12,416	4,198	8,218
TOTAL	**1,093,488**	**711,038**	**382,450**

The total average production of selected pelagic species that are potential transboundary stocks from 1993 to 1997 amounted to about 1.09 M mt broken down to 711,038 mt for commercial fisheries and 382,450 mt for municipal fisheries. Roundscads posted the highest catch volume at 217,332 mt for the commercial while for the municipal it was the frigate tunas (which would probably include bullet tuna) at 47,610 mt.

e. Problems on potential shared stocks within Philippines

e.1. Problem on the identification of what species are shared

Majority of the highly migratory pelagic finfishes e.g. tunas, billfishes and oceanic sharks, as well as offshore marine mammals could generally be considered as comprising a single stock in the Philippines mainly because of their migratory form of behavior and larval dispersal. Various studies (morphologic, biochemical and genetic) although preliminary would seem to indicate such dynamics in the Philippines (Santos, MD, 1999). However, for other groups there is at present difficulty in identifying which and what are the species exhibiting clades or not. This is evident in small pelagics such as anchovies and demersal fishes which exhibits some form of geographic affinities. The lack of studies and data to identify subpopulations magnify the inability to determine such processes.

e.2. Lack of information on the extent of sharing of populations

Aside from lack of the studies on the extent of sharing among and within populations in the Philippines, the complex network of islands, bathymetry, oceanic processes and a diverse composition of resources add to the problem of studying relationship of populations. These factors affect population dynamics as could be seen from various studies (Graves, 1996).

e.3. Problem of utilization between commercial and municipal fishermen

As mentioned, the country's marine fisheries regime is divided in two: Municipal fishing grounds (shore to 15 km) and commercial fishing grounds (15 km and beyond). This type of management strategy is geared towards the rehabilitation of nearshore areas from the high fishing effort of the commercial vessels. However, a lot of the pelagic fish species tends to dwell in both areas, because of their behavior, such that a need to understand the extent of population mixing between and among these arbitrary fishing zones is important.

Moreover, there is still at present a need to determine the delineating line of these boundaries. Although it is clear that boundary delimitation is a priority work under existing laws, actual ground work has yet to start because of lack of manpower and logistics.

e.4. Problem of utilization between and among municipalities and provinces

By virtue of the Local Government Code (LGC), the local government's political autonomy and decentralization, and resource generation and mobilization was enhanced. The LGU's were tasked to have a greater responsibility in the management and maintenance of areas under their territorial jurisdiction subject to the provisions of the LGC and National Policies. This type of arrangement have important implications to the management of shared resources very similar to the set-up existing among countries having shared stocks. To attain resource sustainability, concerned LGU's are needed to implement a unified and cooperative form of management since they will be managing one population, otherwise collapse of the resource could happen.

e.5. Problem on accurate catch and effort data.

As applicable to the whole fisheries, there is a need to enhance collection of accurate catch and effort data to help in studying the true status of the resource. Furthermore, current management strategies for some aquatic resources require species-specific data that are both cost and labor intensive.

f. Current management interventions affecting shared species

Various management efforts by the national and local government, and by the private sector and NGO's have been placed primarily to help in the rehabilitation of overexploited fishery resources and ensure its sustainability in the future. Since, these interventions are also geared for potential shared stocks, the same are presented in this section.

f.1. Major National Legislations

- *Philippine Fisheries Code of 1998 (Republic Act 8550)*

The recently promulgated Philippine Republic Act 8550 otherwise known as the "Philippine Fisheries Code of 1998" has set forth the directions the Government will take towards the utilization, development, management, conservation and protection of the fisheries and aquatic resources to ensure food sustainability and security in the country. This law primarily replaced and enhanced the old and obsolete fishery law, which is the Presidential Decree 704 and integrated other pertinent laws.

The specific objectives which the State shall ensure to attain under RA 8550 are 1) conservation, protection and sustained management of the country's fishery and aquatic resources, 2) Poverty alleviation and the provision of supplementary livelihood among municipal fisherfolk, 3) Improvement of productivity of aquaculture within ecological limits, 4) optimal utilization of offshore and deep-sea resources and, 5) upgrading of post-harvest technology.

Examples of management interventions under the code include the following:

- Ban on illegal and destructive fishing methods e.g. fishing though explosives, noxious or poisonous substance, fine mesh net, Muro-ami etc;
- Reduction of fishing effort in overexploited areas through closed season, catch quota, fishery reserves and sanctuaries, regulation on fishing boats;
- Establishment of Fisheries and Aquatic Resources Management Councils (FARMC's) in all levels of government
- Encouragement of Community Based- Coastal Resource Management
- Monitoring, Control and Surveillance (MCS)
- Ban on taking of endangered and threatened spp. such as corals and other CITES listed species.

☞ *Agriculture and Fisheries Modernization Act (AFMA)*

AFMA was promulgated on December 1997. Its objective was to prepare the country for globalization and liberalization by modernizing the fisheries sector for profitability. Furthermore it also sets the goal of the country to develop the agriculture and fisheries sector in accordance with the principles of sustainable development.

Although little fisheries management provisions has been stipulated in this law (Israel and Roque, 1999), a more important aspect to note, which would have an impact on shared stocks would be a stipulation of an increase in research and development Government funds allocation for agriculture and fisheries to at least 1% of the Gross Value Added (GVA) by year 2001. If materialized, R&D activities in the country particularly on shared resources could be enhanced and be given more emphasis.

☞ *Local Government Code (Republic Act 6975)*

With this law, local governments are tasked to be responsible with the development and management of their area of jurisdiction including municipal waters. Many of the functions of the national government agencies were devolved and decentralized to the local government units such as enforcement of national laws, issuance of permits, boat registrations etc.

f.2. Major Coastal Resource Management Related Projects in the Philippines

☞ *Fisheries Resources Management Project (FRMP) by DA-BFAR/ADB/OECF*

The Fisheries Resources Management Project (FRMP) is a follow-up project for the Fisheries Sector Program (1990 to 1995). It is being funded by the Overseas Economic Cooperation Fund (OECF) and the Asian Development Bank and will be implemented for 6 years from 1998 to 2004. A total of 17 priority bays was targeted by the project, 12 of which were under the Fisheries Sector Program (FSP) and the 7 are additional priority bays (Table 4).

Table 4. List of Priority Bays under the Fishery Sector Program and the Fisheries Resources Management Project.

Fishery Sector Program (FSP) Priority Bays	Fisheries Resources Management Project (FRMP) Additional Bays
1. Manila Bay	1. Davao Gulf
2. San Miguel Bay	2. Lingayen Gulf
3. Tayabas Bay	3. Gingoog Bay
4. Sorsogon Bay	4. Butuan Bay
5. Calauag Bay	5. Honda Bay
6. Panguil Bay	6. Puerto Princesa Bay
7. Sogod Bay	7. Sapian Bay
8. Lagonoy Gulf	
9. Carigara Bay	
10. San Pedro Bay	
11. Ragay Gulf	
12. Ormoc Bay	

FRMP's objectives are geared towards the principle of Community Based – Coastal Resource Management. It has four (4) main components which are the Fisheries Resources Management Component, Community Base Law Enforcement, Income Diversification Component and the Capacity Building Component.

☞ *Coastal Resource Management Project (CRMP) by DENR/USAID*

The Coastal Resource Management Project is a Philippine government project supported by the United States Agency for International Development (USAID). It is a 5 year project (1996 to 2000) which is being implemented by the Department of Environment and Natural Resources (DENR) in partnership with the Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR), Department of Interior and Local Government (DILG), local government units (LGU's) and non-governmental organizations (NGO's).

The ultimate objective of the project is the widespread and sustainable application of coastal resource management in our coastal communities. To achieve this, the project is implementing the following project activity components: 1) Identifiaction and development of coastal leaders, 2) Development and institutionalization of community-based CRM processes and systems, 3) Local government capacity- building, 4) Building constituency groups and empowerment of coastal communities, 5) Training in skills relevant for CRM implementation, 6) Policy analysis and formulation, 7) Public education and mobilization, 8) Alternative enterprise development and 9) continuing research on and development of community-based CRM approaches.

Six (6) areas were involved in the project namely: Olango Island, Cebu; San Vicente, Palawan; Malalag Bay, Davao del Sur; Negros Oriental; Bohol and Sarangani Province.

☞ *Fisheries Management and Conservation Project for the Sulu-Sulawesi Marine Ecoregion (SSME) by KKP (WWF Philippines)*

The Project covers the general area of the Sulu and Sulawesi Seas with an approximate area of 600 sq.km., and it is bounded by three countries: the Philippines,

Malaysia and Indonesia. Particularly, the areas in Anilao, Batangas; Donsol, Sorsogon; Dimakya Island, Apo Reef; El Nido; Sibuyan; Roxas; Quiniluban Islands; Green Island Bay; Tubbataha Reef; Talisayan; Jessie Beazly Reefs; Pamilacan Island, Bohol; San Miguel Islands; Turtle Islands; Tawi-Tawi Coastal Wetland; Semporma and Sipadan, Malaysia and Bunaken, Indonesia. This is being implemented by Kabang Kalikasan ng Pilipinas or World Wildlife Fund – Philippines, a Non-Governmental Organization (WWF-Philippines, 1999).

The Project is generally aimed to address coastal poverty, resource depletion, overfishing and destructive practices, use conflicts and law enforcement. The objectives of the project includes a) strengthen local government capability and develop self reliant coastal communities, b) develop an effective law enforcement system and resource management with active community participation and strong government support, c) identify protected area sites, d) establish an inter-governmental mechanism to implement SSME. To achieve this, the project will undertake fisheries resource management, capacity building, community development, community-based law enforcement and income diversification.

Relative to this project, a Presidential Executive Order No. 1028 was issued in 20 June 1997, which declared the entire Sulu and Celebes Seas as an Integrated Conservation and Development Zone and created the Presidential Commission for the Integrated Conservation and Development of the area.

☞ *Community Based Resource Management Project (CBRMP) by DOF/WB*

The Community Based Resource Management Project (CBRMP) is a 3-year project being headed by the Department of Finance (DOF) supported by 4 other government agencies namely the Department of Environment and Natural Resources (DENR), Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR), the Department of Interior and Local Government (DILG) and the National Economic Development Authority (NEDA) (CBRMP, 1999). It is being funded by a World Bank Loan of $50 M with counterpart funds of $17.5 M from the Philippine National and Local Governments. The Region's V, VII, VIII and XIII are the areas being covered by the project.

CBRMP's goal is to reduce rural poverty and environmental degradation by supporting locally generated and implemented natural resource management projects. Specifically, it aims to raise the income of rural households by 25% and enhance the environment through the provision of technical and financial assistance for the generation and implementation of natural resources management subprojects to local government units and concerned government agencies.

f.3. Memorandum of Understanding on Fisheries Cooperation

Taking into account the need to ensure sustainable development of the fisheries and following the provisions of the 1982 United Nation's Convention on the Law of the Sea (UNCLOS), the Philippines is currently negotiating into bilateral agreements on fisheries with other countries. To date, there are several bilateral agreements on fisheries cooperation being negotiated with other countries namely: Indonesia, Brunei, Spain, Peru, China, Vietnam, Palau, Malaysia. These arrangements when finalized should provide for an increase

cooperation on joint venture activities, aquaculture, processing, joint fisheries research and joint fisheries conservation and management activities for the benefit of both countries.

f.4. Adherence to International Conventions/ Commitments

The Philippines is also signatory to various international conventions relating to the management and conservation of fisheries and aquatic resources and as such is abiding and implementing the different requirements, rules and regulations set forth by the said conventions. Notable of which are the: United Nations Convention on the Law of the Sea (UNCLOS), Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES), World Trade Organization (WTO), Convention on Biological Diversity (CBD), Convention on Migratory Species (CMS), Brunei-Indonesia-Malaysia-Philippines - East ASEAN Growth Area (BIMP-EAGA), and most recently but still under discussion, the Multilateral High Level Conference (MHLC).

g. Resource survey/ assessment studies

Past, present and future national resource survey and assessment studies in the Philippines are summarized in Appendix I and II. There are an estimated 14 resource surveys conducted from 1900 to 2000 not only in the marine waters but also in lakes as well as surveys on non-fish species like seaweed, corals and other invertebrates. There are also some 45 major and minor trawl surveys recorded to be undertaken in Philippine waters since the pioneering expedition of the Danish Vessel "Galathea" in 1845 (Silvestre and Pauly, 1997).

h. Conclusion

Just like the global problem of resource depletion, which is both complicated and difficult, so is the problem of managing fishery resources that are shared by 2 or more management bodies, whether it be within the country like in the Philippines or between and among countries. For this case, there is a need for a collaborative and cooperative type of research, development, management and conservation of fishery resources between and among management bodies for the resources to be sustained.

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Appendix I. List of Major National Fishery Resource Survey in the Philippines from 1990 to 2000

Survey Project	Duration	Target Area	Vessel / Gear Used	Implementing Agency	Funding Agency
1. Resource Assessment and Oceanographic Research of the Philippine Exclusive Economic Zone (EEZ)	2000 to 2005	Exclusive Economic Zone (EEZ)	M/V DA-BFAR	BFAR	BFAR
2. Joint Philippines – Indonesia Marine Mammal Survey of the Celebes and Sulawesi Seas	2000 (proposed)	Celebes and Sulawesi Seas	Modified Patrol Boat	BFAR – RIMF, Indonesia - US	Convention on Migratory Species, BFAR
3. Resource and Sociological Assessment of 7 Bays under the Fishery Resources Management Project (FRMP)	1999 to present	7 Bays (Butuan Bay, Lingayen Gulf, Gingoog Bay, Sapian Bay, Davao Gulf, Honda Bay and Puerto Princesa Bay)	Trawl in some areas	BFAR	BFAR
4. Joint Philippines – Indonesia Tuna Stock Assessment of the Celebes and Sulawesi Seas Project	1998 to present	Celebes and Sulawesi Seas	Major Landing Areas; Pole and Line Vessels for Tagging	BFAR, RP – RIMF, Indonesia	BFAR RI-WB
5. National Stock Assessment Program (NSAP)	1997 to present	Major Landing Areas in the Philippines	N/A	BFAR	BFAR
6. National Seaweed Assessment Project	1990 to present	Sorsogon Bay, Carigara Bay, Western Samar, La Union Province, Calauag at Quezon, Southern Leyte, Southern Palawan	N/A	BFAR	BFAR. FSP, UNDP
7. National Survey and Assessment of Invertebrate Resources (crabs, shrimps, spiny lobster, bivalves, cephalopods and crustaceans	1990 to present	Sorsogon Bay, Northern Cagayan waters, Negros Occidental/ Guimaras Strait waters, Asid Gulf, Pilar Bay, Maqueda Bay Samar,	N/A	BFAR	BFAR

		Southern Palawan waters			
8. Biological Assessment of Major Lakes in the Philippines	1997 to 1999	Major Lakes e.g. Laguna de Bay, Lake Paoay, Lake Naujan, Lake Sebu, Lake Mainit, Lake Bato, Lake Wood and Lake Taal	N/A	BFAR	Gov. of Spain
9. Interdepartmental Collaborative Research in Area III: Western Philippines	1998	Western Philippines (South China Sea)	MV SEAFDEC	SEAFDEC – BFAR	SEAFDEC
10. Resource and Ecological Assessment of the 12 Priority Bays under the Fisheries Sector Program (FSP)	1990 to 1995	12 Bays (Manila Bay, Sogod Bay, San Pedro Bay, Ormoc Bay, Panguil Bay, Calauag Bay, Sorsogon Bay, Lagonoy Gulf, San Miguel Bay, Tayabas Bay and Ragay Gulf)	Trawl in some areas	DA-PMO Subcontracted	ADB
11. Philippine Tuna Research Project under the Fisheries Sector Program (FSP)	1990 to 1995	Major Tuna Landing Areas in the Philippines; Tagging conducted in Sulu Sea, Celebes Sea, etc.	Pole and Line Vessel "Te Tautai"	DA-PMO PRIMEX	ADB
12. Convention on the International Trade in Endangered Species (CITES) Coral Project 13.	199	All areas	N/A	UPMSI, BFAR	CITES
14. Marine Mammal Distribution and Abundance, and Interactions with Humans in the Southern Sulu Sea	1996	Southern Sulu Sea; Northeastern Sabah	Modified Shrimp Trawler	Philippines-Malaysia- US	CMS, WWF, Hongkong

Appendix II. List of Trawl Surveys conducted in Philippine waters (Source: Silvestre and Pauly, 1997)

PHILIPPINES (exploratory surveys in different areas)				
Area/ Survey no.	**Period (date)**	**Vessel**	**Results/notes**	**References**
1	1845-1847	**Galathea** Danish vessel	☞ Survey Manila Bay, Dinagat and Surigao	Warfel & Manacop (1950) Sebastian (1951); Ronquillo (1959)
2	1872-1877	**British H.M.S. Challenger** Deep Sea Expedition	☞ Surveyed Philippine Deep Seas	Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959)
3	1907-1909	**Albatross Philippine Expedition** Sponsored by the US Bureau of Fisheries	☞ Extensive investigation of marine life in the Islands	Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959)
4	1909	English Steam Trawler	☞ Explored trawlable grounds from Manila to Visayas	Warfel & Manacop (1950); Sebastian (1951); Ronquillo (1959)
5	1940	Experiment of the Philippine Bureau of Fisheries		Warfel & Manacop (1950)
6	1947-1949	**Theodore N. Hill** 400 hp and David Star Jordan	☞ 24 areas Lingayen Gulf, West of Bataan, Manila Bay approach, Manila Bay, Tayabas Bay, Mangarin Bay, Ragay Gulf, Burias Pass, Alabat Sound Tabaco Bay, Samar Sea, Carigara Bay, San Pedro Bay, Leyte Gulf, West Visayan Sea, Guimaras Strait, Panay Gulf, Panguil Bay, Sibuguey Bay and Off Taganak Island	Warfel & Manacop (1950)
7	1951-1952	Danish Deep Sea **Galathea** Expedition	☞ Trawled deepest part of Philippine trench	Megia et. Al. (1953)

PHILIPPINES (MANILA BAY)				
Area/ Survey no.	**Period (date)**	**Vessel**	**Results/notes**	**References**
1	1956	Fishing craft, 2.5-9 hp	☞ Manila Bay	Manacop & Laron (1950)
2	Nov 1956-Oct 1958		☞ Manila Bay between Cavite and Bataan	Tiews and Caces-Borja (1959)
3	Apr 1957 – Oct 1958		☞ Manila Bay between Cavite and Bataan	Tiews and Caces-Borja (1959)
4	1957-1959	**M.V. Ildefonso** I 18.77 GT, 80 hp **M.V. Ildefonso IV** 48.37 GT, 80 hp **M.V. Leonor V** 60.43 GT, 160 hp **M.V. Dona Lina D** 83.85 GT, 325 hp	☞ Manila Bay	Ronqiollo et al. (1960)
5	1960-1962	Commercial trawls	☞ Manila Bay	Caces-Borja et al. (1972)
6	Dec 1978	Commercial Medium-sized Trawlers, 40-44 GT, 225 hp	☞ Manila Bay	Caces-Borja (1972)
7	Nov 1970 – Feb 1971	**F.B. Carlos Renato II** 44.9 GT, 2x225 hp and **F.B. Maria Cynthia II** 40.01 GT, 2x250 hp Nonwegian Star Trawl Net Horsenet (locally made) German Trawl (418-160 mm)	☞ Central Manila Bay	De Jesus (1976)
8	15-29 Feb	Fishing Boat	☞ Manila Bay (Bulacan, Batangas and Cavite coasts)	Bautista and

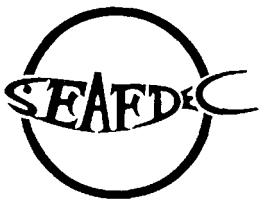
	1980	8.18 GT		Rubio (1981)
9	Nov 1992 – Oct 1993	Baby trawler FUSO 2DR5 LOA: 13.5 m Fishing boat with Outriggers	☞ Manila Bay: 1782 km^2	MADECOR & National Museum (1994)
10	Sep 1995 – May 1996	Commercial trawler FUSO 4DR5 LOA: 13.5 m	☞ Manila Bay approaches	Pura et al. (1996b)

PHILIPPINES (SAN MIGUEL BAY)

Area/ Survey no.	Period (date)	Vessel	Results/notes	References

ANNEX 10

Annex 10



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
BRUNEI DARUSSALAM

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Status Report of Pelagic Fisheries in Brunei Darussalam

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1. Introduction

The total fish production in 1998 was estimated at 12,641 metric tons and about 51% or roughly, 6,415 metric tons are pelagics. The estimated potential yield of small pelagic fishes from Brunei Darussalam's EEZ is around 7,660m.t. ad currently an average of only about 38% of the potential yield have been exploited annually. Fisheries play an important role as one of the major sources of animal protein in Brunei. The average fish consumption annually is roughly 42-kg per person.

Most of the traditional or small-scale and commercial fishing activities are carried out in the near coastal waters, mainly within the 3-40 nautical mile offshore waters with very little fishing being done beyond the 40 nautical mile zone. Up to 1999, the small-scale fisheries contributed around 85% of the total fish production while the rest 15% being contributed by the commercial sector. However, with the addition of more commercial vessels beginning the year 2000 increased contribution from the commercial sector is anticipated in the subsequent years to come.

2. STATUS OF FISHERIES

2.1 Catch and effort (CPUE) of fishing gears

Fig. 1 shows the CPUE trends for the major fishing fears for the last 10 years. The general trend is on the decline but there are some oscillations in the purse seine and ring net. The purse seine virtually ceased operation towards the last quarter of 1996 due to some problems. However, towards the end of 1999 four new purse seine licenses were issued. During the 1997-1998 *El Nino / La Nina* phenomena there was a sudden increase in the ring nets CPUE, which corresponds to an increase in the pelagic fishes landed. The drift gill net has been banned since 1992 due to some conflicts and ever since has been replaced by the bottom set gill net. Lampara net also lost its popularity after 1991 and fishermen began switching to the use of ring net.

2.2 Production estimates

Fig. 2 indicates production estimates for the 10-year period of the major gears. Peak production occurred in 1991 but gradually decline with the lowest in 1997 during the *El Nino* occurrence. Interestingly the following year in 1998 there was an increase in the production of the pelagics, notably from the ring net from a low 374 metric tons in1997, to 6,415 metric ton in 1998. A similar

situation has also been observed during the last *El Nino* occurrence in 1990 whereby the following year in 1991 there was a tremendous increase for pelagics being landed.

The magnitude of the production of ring net during the post *El Nino* year of 1991 and 1998 are of course of a varying degree. Significant landings were noted during the 1991 compared to 1998 at 17,230 metric exceeded the potential yield of 7,660 metric tons annually for the small pelagic.

Two traditional gears namely ring net and hook and line have been the major contributors to the total capture fisheries productions for the last 10 years with a combined contribution of about 46%.

2.3 Catch composition

For the purpose of getting the pelagic composition, statistical data were obtained from the regular weekly fish landing monitoring at selected sampling stations. Table 2 shows the production breakdown of selected fishing gears for 1999.

Small pelagics comprised about 35% of the total production of the major fishing gears for 1999. Among the pelagics, about 65% are composed of *Sardinella fimbriata.* Other pelagics include *Caranx* spp and *Selar mate* at 9% and 5% respectively

3. DATA COLLECTION

Data collection has been going on for the past few years covering both the pelagic and the demersal species. Randomly selected fishermen using various gears have been monitored for the last six years for the collection of catch and effort data as well as the catch composition according to gear.

The Department of Fisheries however, is having difficulty in its effort to obtain enough samples for the genetic and morphometric studies. Collaborative work wit the University of Brunei Darussalam (UBD) is being planned this year especially in the genetics of shared stocks involving pelagic and demersal fishes.

Very little oceanographic work is being done but water quality sampling and monitoring is been done on regular basis and more sampling stations are being proposed offshore.

4. SUMMARY AND CONCLUSION

- Despite the sudden surge in the pelagic landings of 1998, the general trend is that it has been declining for the last six years.

- The species composition was dominated by *Sardinella fimbriata* in 1999. This may be due to the aftermath El Nino/La Nina phenomena. A more detailed analysis regarding these is being done and the collaboration with neighboring countries and institutions in the region is sought.

➢ Most of the pelagic species belongs to the shared stocks therefore, exchange of information such as the genetics of these species are necessary to manage the resources properly.

Fig 1: CPUE of major fishing gears, 1989 - 1999

CPUE (mt)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
TRAPS	0.06	0.10	0.32	0.09	0.09	0.07	0.08	0.01	0.00	0.04
HOOK AND LINE	0.02	0.04	0.04	0.04	0.04	0.04	0.05	0.03	0.50	0.02
BTTM SET GILL NET	0.00	0.01	0.04	0.06	0.06	0.00	0.00	0.02	0.00	0.06
TRAWL	0.59	0.36	0.54	0.65	0.28	0.26	0.31	0.27	0.28	0.26
P. SEINE	0.41	0.97	1.15	0.64	0.46	0.20	0.44	0.34		
RING NET	0.44	0.68	1.74	0.50	0.50	0.18	0.17	0.19	0.11	0.36
DRIFT GILL NET	0.24	0.41	0.80	0.49						
LAMPARA NET	2.00	0.90	1.46							

Table 1: ESTIMATED ANNUAL FISH PRODUCTION FROM MAJOR FISHING GEARS IN BRUNEI DARUSSALAM (mt)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1
HOOK AND LINE	262	2,120	547	2,213	2,277	2,222	3,036	1,467	1,344	
GILL NET	45	421	397	1,294	1,160	35	59	63	37	1
TRAWL	2,297	1,807	3,307	3,607	2,843	3,043	3,330	3,820	4,230	4
TRAP	339	1,642	1,720	1,011	1,146	585	1,119	87	15	
RING NET	943	2,394	9,604	2,033	2,098	776	1,090	822	374	6
P. SEINE	317	563	663	371	459	66	111	71	-	
DRIFT GILL NET	790	892	289	-	-	-	-	-	-	
LAMPARA NET	810	1,222	703	-	-	-	-	-	-	
TOTAL	5,802	11,061	17,230	10,528	9,983	6,727	8,745	6,329	6,000	12

* Data from January to October only
** trawl figure include 70% discards

Fig 1: CPUE of Major Fishing Gears, 1989 - 1999

CPUE (mt)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TRAPS	0.06	0.10	0.32	0.09	0.09	0.07	0.08	0.01	0.00	0.04	0.03
HOOK AND LINE	0.02	0.04	0.04	0.04	0.04	0.04	0.05	0.03	0.05	0.02	0.03
BTTM SET GILL NET	0.00	0.01	0.04	0.06	0.06	0.00	0.00	0.02	0.00	0.06	0.05
TRAWL	0.59	0.36	0.54	0.65	0.28	0.26	0.31	0.27	0.28	0.26	0.17
P. SEINE	0.41	0.97	1.15	0.64	0.46	0.20	0.44	0.34			
RING NET	0.44	0.68	1.74	0.50	0.50	0.18	0.17	0.19	0.11	0.36	0.29
DRIFT GILL NET	0.24	0.41	0.80	0.49							
LAMPARA NET	2.00	0.90	1.46								

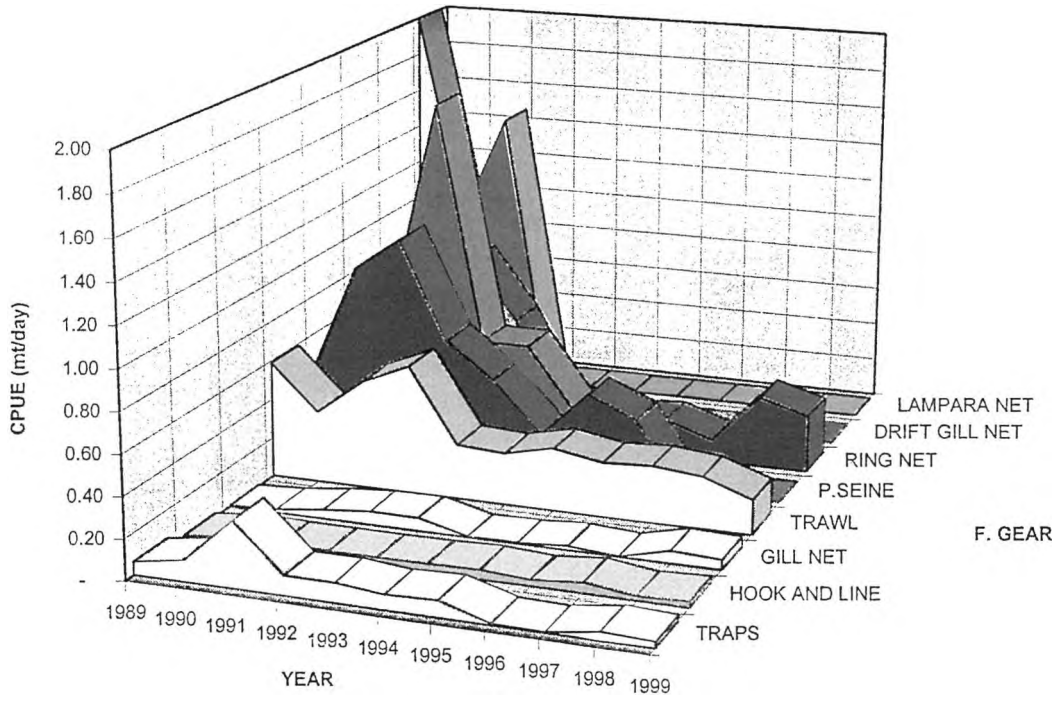
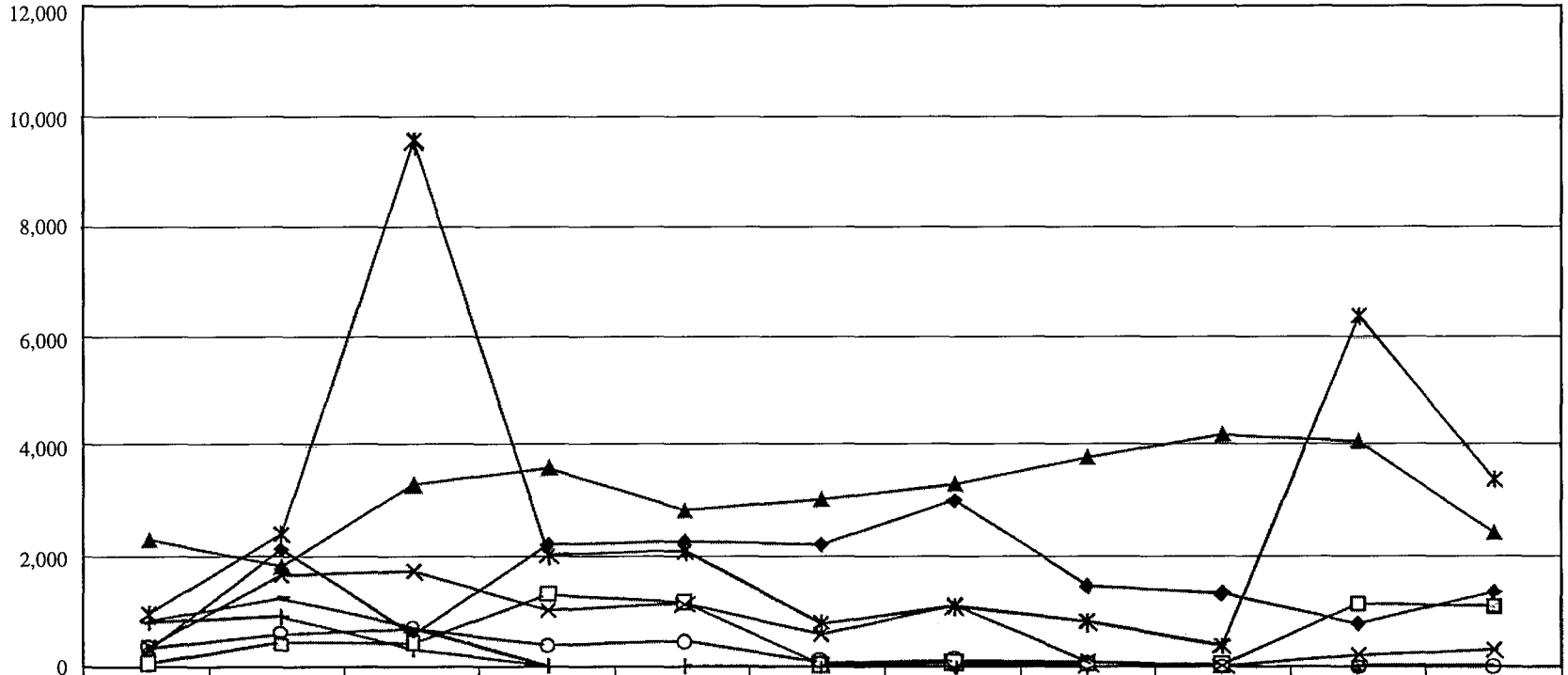


Fig 2: Production Trend of Major Gears, 1989 - 1999



	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
HOOK AND LINE	262	2,120	547	2,213	2,277	2,222	3,036	1,467	1,344	776	1,359
GILL NET	45	421	397	1,294	1,160	35	59	63	37	1,142	1,109
TRAWL	2,297	1,807	3,307	3,607	2,843	3,043	3,330	3,820	4,230	4,103	2,443
TRAPS	339	1,642	1,720	1,011	1,146	585	1,119	87	15	205	305
RING NET	943	2,394	9,604	2,033	2,098	776	1,090	822	374	6,415	3,414
P. SEINE	317	563	663	371	459	66	111	71	-	-	-
DRIFT GILL NET	790	892	289	-	-	-	-	-	-	-	-
LAMPARA NET	810	1,222	703	-	-	-	-	-	-	-	-

TABLE 1 : ESTIMATED ANNUAL FISH PRODUCTION FROM MAJOR FISHING GEARS IN BRUNEI DARUSSALAM (mt)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	avg	10yr total	%
HOOK AND LINE	262	2,120	547	2,213	2,277	2,222	3,036	1,467	1,344	776	1,359	1,602	17,622	17.00%
GILL NET	45	421	397	1,294	1,160	35	59	63	37	1,142	1,109	524	5,762	5.56%
TRAWL	2,297	1,807	3,307	3,607	2,843	3,043	3,330	3,820	4,230	4,103	2,443	3,166	34,829	33.59%
TRAPS	339	1,642	1,720	1,011	1,146	585	1,119	87	15	205	305	743	8,174	7.88%
RING NET	943	2,394	9,604	2,033	2,098	776	1,090	822	374	6,415	3,414	2,724	29,962	28.90%
P. SEINE	317	563	663	371	459	66	111	71	-	-	-	238	2,620	2.53%
DRIFT GILL NET	790	892	289	-	-	-	-	-	-	-	-	179	1,971	1.90%
LAMPARA NET	810	1,222	703	-	-	-	-	-	-	-	-	249	2,735	2.64%
TOTAL	5,802	11,061	17,230	10,528	9,983	6,727	8,745	6,329	6,000	12,641	8,630	9,425	103,677	100.00%

* data from January to October only

** trawl figures include 70% discards

TABLE 2 : PELAGIC SPECIES COMPOSITION FROM THE CATCH OF SELECTED FISHING GEARS IN BRUNEI DARUSSALAM 1999

Scientific name	BS GNET	RING NET	FISH POT	HOOK & LINE	FISH CORRAL	TIDAL WEIR	BARRIER NET	LIFT NET	TRAWL	TOTAL	% PELAGICS
Caranx spp.	112.66		47.87	666.79	11.97	15.38			1.85	856.52	18.20%
Caranx ignobilis	-	-	-	-	0.66	-	-	-	0.03	0.68	0.01%
Carcharhinidae	55.55	-	-	18.70	-	-	-	-	23.53	97.78	2.08%
Caesio sp	-	-	9.12	-	-	-	-	-	-	9.12	0.19%
Drepane puncatata	7.70	-	-	-	-	-	-	-	1.62	9.32	0.20%
Euthynnus affinis	-	57.46	-	-	-	-	-	-	0.41	57.87	1.23%
Parastromateus niger	-	-	-	-	4.06	-	-	-	0.48	4.54	0.10%
Megalaspis cordyla	162.62	-	-	-	-	-	-	-	1.97	164.59	3.50%
Rastrelliger brachysoma	-	-	-	-	5.88	-	-	-	8.65	14.53	0.31%
Rastrelliger kanagurta	-	-	-	-	1.96	-	-	-	0.20	2.16	0.05%
Sardinella fimbriata	-	2,932.52	-	-	86.73	-	20.02	10.20	-	3,049.47	64.81%
Sardinella gibbosa	-	41.80	-	-	28.13	-	-	-	-	69.93	1.49%
Scomberomorus guttatus	74.80	-	-	-	-	-	-	-	0.30	75.10	1.60%
Selar crumenopthalmus	-	-	-	56.10	-	-	-	-	0.15	56.25	1.20%
Selar mate	188.38	23.96	-	3.07	-	-	-	-	0.11	215.51	4.58%
Stolephorus indicus	-	21.92	-	-	-	-	-	-	-	21.92	0.47%
Total	489.04	3,077.66	9.12	77.87	127.41	-	20.02	10.20	37.44	3,848.77	81.80%
% of total production	3.61%	22.74%	0.07%	0.58%	0.94%	0.00%	0.15%	0.08%	0.28%	28.44%	

ANNEX 11

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

COUNTRY STATUS REPORT
INDONESIA

By:

KETUT WIDANA
Chief of Management for Capture
Directorate of Resources Management

DIRECTORATE GENERAL OF FISHERIES
DEPARTMENT OF MARINE EXPLORATION AND FISHERIES
JAKARTA, INDONESIA

MANAGEMENT OF SHARED STOCK IN INDONESIA

KETUT WIDANA
Chief of Management for Capture
Directorate of Resource Management
DIRECTORATE GENERAL OF FISHERIES
DEPARTMENT OF MARINE EXPLORATION AND FISHERIES
JAKARTA, INDONESIA

I. INTRODUCTION

Indonesia is an archipelagic country, which is located between two large oceans, the Pacific and Indian Oceans. It has 17.508 islands, sea area 0f 5,8 million Sg Km, and the coast line of 81.000 Km. Various species of fish can be found in Indonesian waters.

The potential of marine fisheries resources is estimated around 6,2 million tons annually, consisting of 4,4 million tons from Indonesian waters and 1,8 million tons from Indonesian EEZ. From this potential resources, the total allowable catch (TAC) is 5,01 million tons annually.

Compared with the estimated production in 1998 of 3,6 million tons, the rate of exploitation is around 62%.

As the a coastal state, Indonesia has some close neighboring countries such as Malaysia and Singapore in the North West, Kampuchea, Vietnam and Brunei boundering to South China Sea in the North. Philippines in the North East, Papua New Guinea in the East and Australia in the Southeast. Therefore, they of course should together taking measure for managing shared fish stocks occurring within these transboundary area and they are responsible to keep the stock to be sustained.

In identifying the shared stocks in the region, the definition adopted by the United Nations Convention of the Law of the Sea (UNCLOS) 1982 was used, i.e., "Shared stocks are the stocks occurring within the EEZ of two or more coastal states, or both within the EEZ and in area beyond and adjacent to it".

According to Gullard (1980) and Caddy (1982) shared stocks have been divided into two groups "transboundary" and "migratory shared stocks".

A transboundary shared stocks was taken to be in which the fish are non – migratory, but where the area of distribution is crossed by a common boundary between the exclusive fishing zones of two adjacent countries.

The most common transboundary of stocks are the multi-species of demersal fish which show predominantly a random feeding movement in relation to spawning or monsoons. Other transboundary stocks are those small pelagic species where there is no definite migration but a more or less continuos mixing through the area in which the stocks lives.

The migratory shared stocks include all those migratory species which have a definite migration beyond the border of one EEZ. The migratory shared stocks can be separated into two groups. The first, which includes stock composed of the largest number of species are restricted sea areas which are closely within the limit of two or more adjacent EEZs, while the second group comprises those stocks with occur in one or more EEZs and also extend to the open sea beyond. The latter are primarily the larger tuna and bill fish .

The identification of shared stocks requires clarity on what is to be regarded as a stocks and it was clear that in the region a some what flexible definition has at present to be accepted.

To manage the stocks occurring within the EEZs of two or more coastal states, article 63 paragraph 1 of UNCLOS prescribes "States shall seek, either directly or through appropriate sub – regional or regional coordinate and ensure the conservation and development of such stocks" Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations , weather sub-regional, regional or global, where appropriate and with participation by all states concerns, including states whose nations are allowed to fish in the EEZ."

In managing the stock occurring both within the EEZ, and in an area beyond and adjacent to it Article 63 paragraph 2 of UNCLOS prescribes " The coastal state and the states fishing for such stocks in the adjacent area shall seek, either directly or through appropriate sub-regional or regional organization, to agree upon the measures necessary for the conservation of these stocks in the adjacent area" . Prescription on contribution and exchange of information relevant to the conservation of the species all states concerned at Article 61 paragraph 5 of UNCLOS is also applied for this type of species.

Indonesia, as a coastal state, has some species indicated as shared stock is deeply concerned about the shared stock management of the certain stocks occurring in the adjacent area, both transboundary shared stocks and migratory shared stocks.

Indonesia has made serious efforts to manage the species indicating shared stock as the implementation of responsible fishing principle, however the effective management obligated and should be carried out by the sub-regional, regional or international cooperation.

At present, the fisheries management agreement between sharing countries both bilateral or and multilateral dealing with shared stocks is not sufficient enough. The problems are among others: lack of information of shared stocks in the region, lack of consensus on what species indicated as the shared stocks in the region, model of sharing for the stocks varies greatly according to distribution, migration and movement / displacement patterns of the particular stocks. And to the type of employment and characteristics of fishing in each of the countries concerned.

It appears that presently available information on these two aspects above mentioned is not yet sufficient for all purposes.

Therefore, we proposed the SEAFDEC to be a facilitator in the region in planning and implementing the research/studies in join research on the management of shared stocks and necessary to take priority in certain species to be shared.

II. UTILIZATION AND MANAGEMENT FOR THE RESOURCES OF SHARE STOCKS

After accepting the UNCLOS 1982 (as The International law) Fisheries Management principles include shared stocks began to be discussed regionally as well as internationally.

To take the management of shared stocks, I propose that SEAFDEC should carry out together with sharing countries to conduct the research about shared stocks. Indonesia also responsible for this research, management and control. To plan this program it is important to identify the problem, research activities that will be done and choice of strategic management. The basic management principles gained from the research is important for national as well as international in exploiting the fish resources and insuring the conservation of the fish resources at the same time, particularly for shared stock.

In order to manage the shared stocks prior the implementation of management measure, principally could be identified:

- Formulation the share stocks include, definition, identification and distribution of the stocks and other relevant biological factor.
- Monitoring the utilization of the stocks (improving fishing data) of respective countries
- Preparing the appropriate management measures of the stocks.

Therefore, the policy taken to implement the shared stocks considered national and international interest of fishing operation on fishing ground within state jurisdiction.

In terms of the utilization and management of fisheries resources (shared stock) in general there are several in balance situation shown at border area of Indonesia.

First, a heavy fishing pressure is shown tend at border area between the Republic Indonesia and neighboring countries such as: Thailand, Vietnam, Malaysia in the South China Sea. The rapid expansion of the marine fisheries will affect to fully exploited for both pelagic and demersal fish which include mackerels (Indo Pacific and Indian Mackerels), scads, sardines and anchovies. Almost the species group of demersal fish probably over-exploited.

Second, it seemed also a heavy fishing at border area between Indonesia and Malaysia in Malaca strait especially for demersal fish and prawn. The demersal fish and prawn in Malaysia territory probably were subject to tend intensive fishing pressure, due to increased number of trawlers operated compared to Indonesia, that prohibited the trawl.

Third, it is also happened in border area between the RI and Philippine while in general, Philippine has already exploited these resources intensively especially for pelagic species include oceanic tuna and skipjack compared to Indonesia fishermen who caught big pelagic species by the use of pole and liner or hand liner, while Philippines fishermen caught by the use of purse seiner and payaos (as an fishing aggregate).

In other area, although the management of the shared stocks is insufficient such as in border area between R.I and Australia and R.I and PNG it has not shown the apprehensive condition yet, the management of the shared stocks in Indonesian border as a whole has urged to be handled.

It is well known that Indonesia has not been able yet to evaluate fish resources or shared stock resources in the territorial waters regularly like doing cruise track trawl every month rather than Australia, which they very interested in managing the species indicated shared stock especially scout and shark. Indonesian government concerns for this, however, due to lack of data, budget and these species do not the target species of Indonesian fishermen, Indonesia can not full participate in this activities.

III. RESEARCH PROGRAM AND MECHANISM FOR SHARED STOCK MANAGEMENT

3.1. Research Program

Pursuant to the result of the previous workshop regarding the relevant species identified to be shared stock management that has been determined lot of species could be grouped as the shared stock, however in terms of taking management for those species of course will faced difficulties.

For managing that we propose conducting a management studies should be started by a preliminary study (dealing with shared stock management) due to impossible to cover all species in the area, in detail in the certain time of period.

We propose in setting up the research program should be taken priorities, by taking consideration as follows:

- What kind of species has the main role in supporting the income (fisheries welfare) in these countries which can be grouped as commercial fishes, like : tuna, skipjack tuna.
- What species mainly have biological interrelation or dependent one to the others such as: anchovies, mackerel, scads.

Those researches should be focused on taking data to support in setting up the management criteria by gradually collecting relevant biological data and other matters that can support in taking management measure for shared stock. The data or information among others are migration pattern, behaviors, fish distribution, the kind data in accordance with food chain, inter relation among species, stock abundance, rate of exploitation, natural mortality and other matter that relevant to answer the status of biological condition in each area (of bordered area).

We propose in taking management measure on shared stock should not be formulated limited in one year or in one meeting, however need a period of time and the research should be designed (or programming) in short and long term period. It is considerable to design an effective management measure by sufficient basic data that gained from those research.

It is important to understood that in relation with research activities in South East Region , currently there are several bodies concerned to fisheries studies other than SEAFDEC namely Indonesia, Malaysia, Thailand Growth Triangle (IMTGT). Group expert for South China Sea Brunei, Indonesia, Malaysia, Philippines, East Asia Growth Area (BIMP EAGA), even the members or non member Countries of SEADEC also has their own research for fisheries. It is important to take into account that activities, in other to avoid any duplication. That is suggested to make joint research among those institution or countries to carry out the similar surveys program.

As we know, currently the research program or activities of this regional bodies among others:

1. The experts groups of South China Sea (for managing potential conflict of the area). Those experts as individual capacity basis had identified several important topics to be the subject research in South China Sea such as: to achieve way out or problem solving of over exploitation in the area mainly in coastal area and due to the increase of uncontrolled fishing vessels. That objectives may be enhance by shared stock survey.

2. Fisher research carry out by IMTGT.
   Currently, IMTGT has the fisheries research proposal was prepared by Thailand dealing with:
   - Experimental fishing (for bottom vertical long-line, tuna long-line and squid jigging);
   - Fishery resources research focused on tuna, demersal and oceanic squid stock.

3. Currently, Indonesia conducting several research programs as follows :
   - Enhancement of tuna fisheries in Indonesia supporting by OECF (Japan);
   - Management and conservation of sardinella terubuk in Riau or SCS water;
   - Tuna tagging research in the North Sulawesi Water and Pacific Ocean.
   - This research collaborated between Indonesia and Philippines (BFAR). The research had been conducted in 1997. This research will be continued, and in the next coming year (year 2000) will be conducted a work shop in Indonesia to discuss the result of the tagging program (technical assistant from International Body (South Pacific).
   - Other regular research such as :1) demersal and pelagic survey in South China Sea and Jawa Sea (for migration pattern and resource stock), 2) research on bait fish, 3) Malalugis scad stock abundance and their migration etc.

3.2. Research Mechanism

Establish a working group to discuss a kind of shared stock research need to research measure, the need of data to support in establishing management measure etc. Regularly, the working group (expert working group) should carry out a meeting to make project proposal and agreement. The proposal should be submitted to the

respecting government in order to take endorsement. For this purpose I purpose as follows : The member of group experts compose of the fisheries expert of respective countries. They would be come from fisheries or biological scientific basis. From Indonesia they would be come from Marine Fisheries Research Institute, Ministry of Maritime Exploration and Fisheries.

- Research program should be formulated together among experts group and should supported by counterpart budget. It is responsible to need the support from each country because these coastal states have obligation to establish regional cooperation dealing with management and conservation of living resources in accordance with the UNCLOS 1982.

- In formulating a research program and their implementation should be done by joint together between countries and SEAFDEC. Establishing research base in each countries is important. Other way is by sharing the program which a part of the program done by countries and SEAFDEC, in order to give some comment in term to improve the research program.

For the realization of the research program it should be taken efforts :

- To identify what kind of research and the facilities of each country available to support the activities i.e. : research vessels, shore facilities (office / research base)
- To identify fisheries experts (biological, oceanography, legal etc.) obtained by each country.
- The targets of the research, in short or long term mainly to formulate a specific management measures for shared stock. It is may be in first step the targets limited of primer production and their movement, food chain linkage, and other general biological aspect such as : first maturity, maximum length, size composition, general (prediction) of fish migration of certain species (tuna and tuna like fish, anchovy etc.).

One of the research aspect is tagging program, it is very considerable action to be continued.

- It is very important to look for a contact persons (beside of the formal institution or body) of each country. It would be easily to do exchange information of the research situation or problem and of course in solution or improving the program or activities (immediately prepared).

Finally to answer what kind of shared stock management measures should be applied (base on same perception of bordered countries), is not like the instant product, however should be setting up step by step, by

improving the fisheries research activities in compliance with the UNCLOS 1982 provisions and code of counduct for responsible fisheries particularly for taking measure based on scientific evidence.

IV. CONCLUSION AND RECOMMENDATION

In order to manage the shared stocks, first step is necessary to establish an expert team, members of the team are the experts of each relating countries that involved to manage the stocks. The main tasks of the team expert are :

- To carry out together a research about shared stock such as kind of stocks to be shared, stock abundance (and MSY), utilization and conservation of the stocks.
- To raise the exchange information about the stocks.
- To formulate management measure (simple method) that applicable, and compliance with to the fishermen in respective country.

In operational of the team, it is necessary to be pointed out a contact person. In Indonesia we proposed, Directorate General of Fisheries (for management aspect) and the research institute (for research aspect) to act as a contact person.

After research done and gain a recommendation for shared stock management it is necessary for the respective country to socialize the management measure.

Finally, as a concrete way in managing the shared stock, it should be pointed out an effort dealing with conservation management.

The utilization of marine resources must be envisaged in the context of their long-term development and must take into account the concept of maximum sustainable yield (MSY). Fisheries management must pay due regard to and be in harmony with the environment in accordance with common standards and responsibilities. In respect of shared stock, the resources management must be based on the principle of the biological unity of the stock and the best scientific advice available.

The objective of conservation requires that the measures taken should establish a conservation policy within the area of national jurisdiction and in the adjacent area, whilst respecting the rights of all the parties concerned. The effective protection of these stocks can only be carried out by cooperation between coastal states fishing in accordance with common guidelines. Anything

else would fail to protect the environment through the conservation and management of these fish stocks through out their are of distribution.

It is necessary for the next workshop to discuss :

1. Probability to establish To do international cooperation under umbrella of Government to Government (G to G) Cooperation

   In Indonesia, Ministry of Foreign Affair is in charge in G to G cooperation. International co.-operation must-constitute one of the foundation strong for the management of shared stock. Universal actions should be avoided and states should adopt effective measures within a bilateral on a multilateral co-operation framework (without ignore the management principles).

2. After G to G was designed, it is important to establish

   The ability of developing countries fo fulfill conservation and management objectives is dependent upon the financial, scientific and technological measures at their disposal. Adequate financial, scientific and technological coopaeration should be provided to support action by these countries to implement these objectives.

3. The result of G to G Cooperation such as basic principal for management measures should be endorsed and ratified by each country.

Annex II

FISHERIES SITUATION OF INDONESIA IN BORDERED AREA 1997

1. MALACCA STRAITS

a. Marine Fishery Production, 1997

Province	Production
DI. Aceh	158.901
Sumatera Utara	50.982
Riau	18.391
Total	228.274

b. Number of Marine Fishermen by Catagory of Fishermen

Province	Full Time	Part time (Major)	Part time (Minor)	Total
DI. Aceh	21.016	3.360	551	24.926
Sumatera Utara	101.706	26.503	3.066	131.274
Riau	7.504	1.753	813	10.070
Total	130.226	31.616	4.430	166.270

c. Number of Marine Fishing Units by Type Fishing Gear

Fishing Gear	DI. Aceh	Sumut	Riau	Total
Payang	472	436	35	943
Purse Seine	407	728	68	1.203
Drift gill net	1.189	3.525	522	5.236
Long Line	-	-	-	-
Drift long line	24	-	18	42
Skipjack	-	-	-	-
Troll line	611	22	110	743
Others	4.157	18.268	3.113	25.538
Total	6.860	22.979	3.866	33.708

d. Marine Fishery Production

No.	Fishes	DI Aceh	Sumut	Riau	Total
1	Indian Mackerels	2.779	32.761	402	35.942
2.	Eastern litle tuna	3.558	13.639	1.184	18.381
3.	Anchovis	3.009	12.806	631	16.446
4.	Trvallies	2.363	11.703	428	14.494
5.	Scads	1.969	9.960	275	12.204
6	Fringescale sardinella	1.021	5.074	4.999	11.094
7	Crackers/drums	497	5.547	828	6.772
8	Narrow baret king mackerel	948	3.959	639	5.546
9	Red snappers	1.115	1.938	1.322	4.375
10.	Bombay duck	132	1.878	932	2.942

2. SOUTH CHINA SEA

a. Marine Fishery Production

Province	Production
Riau	165.521
Kalimantan Barat	47.443
Jambi	5.862
Sumatera Selatan	26.475
Total	245.301

b. Number of Marine Fishermen by Catagory of Fishermen

Province	Full Time	Part time (Major)	Part time (Minor)	Total
Riau	67.535	15.781	7.315	90.631
Kalimantan Barat	14.548	14.878	5.837	35.263
Jambi	2.225	1.636	628	4.489
Sumatera Selatan	7.341	5.882	2.462	15.685
Total	91.649	38.177	16.242	146.068

c. Number of Marine Fishing Units by Type Fishing Gear

Fishing Gear	Riau	Kalbar	Jambi	Sumsel	Total
Payang	310	697	165	195	1.367
Purse Seine	608	58	-	-	666
Drift gill net	4.694	1.022	274	549	6.539
Long Line	-	-	-	-	-
Drift long line	161	179	71	-	6.950
Skipjack	-	-	-	-	-
Troll line	988	197	-	-	1.185
Others	28.032	5.192	874	2.346	36.444
Total	34.793	7.345	1.384	3.090	46.612

d. Marine Fishery Production

No.	Fishes	Riau	Kalbar	Jambi	Sumsel	Total
1.	Eastern litle tuna	10.657	5.901	-	628	17.186
2.	Red snappers	11.895	1.272	25	803	13.995
3.	Indian mackerels	3.618	7.040	167	1.406	12.231
4.	Indo Pasific king mackerel	5.751	3.481	428	1.243	10.903
5.	Trevallies	3.850	5.013	3	1.701	10.567
6.	Wolf herrings	6.530	2.524	343	986	10.383
7.	Anchovies	5.682	2.096	-	1.978	9.756
8.	Sea cat fishes	3.027	3.716	742	1.648	9.133
9.	Fringescale sardinella	4.490	2.140	-	1.698	8.328
10.	Threadfin breams	5.662	364	54	438	6.518

3. SULAWESI SEA AND PASIFIC OCEAN

a. Marine Fishery Production

Province	Production
Kalimantan Timur	9.256
Sulawesi Utara	123.640
Maluku	158.732
Irian Jaya	47.219
Total	338.847

b. Number of Marine Fishermen by Catagory of Fishermen

Province	Full Time	Part time (Major)	Part time (Minor)	Total
Kalimantan Timur	5.441	2.557	1.024	9.022
Sulawesi Utara	34.852	41.447	28.364	104.663
Maluku	22.752	10.355	23.234	56.341
Irian Jaya	13.147	18.535	7.506	39.190
Total	76.192	72.894	60.128	209.216

c. Number of Marine Fishing Units by Type Fishing Gear

Fishing Gear	Kaltim	Sulut	Maluku	Irja	Total
Purse Seine	13	427	269	12	709
Drift gill net	398	875	1.914	428	3.615
Long Line	10	249	133	10	402
Drift long line	33	-	725	-	758
Skipjack	-	139	351	19	509
Troll line	19	2.942	4.108	1.615	8.694
Others	3.112	25.286	18.934	8.608	55.940
Total	3.585	29.918	26.434	10.692	79.237

d. Marine Fishery Production

No.	Fishes	Kaltim	Sulut	Maluku	Irian Jaya	Total
1.	Tunas	-	23.004	12.032	3.031	73.103
2.	Skipjack tuna	235	32.409	26.282	3.795	62.721
3.	Scads	387	22.160	4.669	1.978	29.194
4.	Eastern litle tuna	478	13.698	6.638	1.430	22.244
5.	Trevallies	319	3.935	6.451	1.075	11.780
6.	Anchovies	144	4.004	3.660	2.109	9.917
7.	Indian mackerels	669	1.405	4.818	2.434	9.326
8.	Barramudi	325	576	1.016	6.185	8.102
9.	Sharks	150	1.088	2.148	750	4.136
10.	Red snappers	473	412	511	226	1.622

ANNEX 12

Annex 12

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

IMPLEMENTATION OF PAST RECOMMENDATIONS FROM THE SHARED STOCKS WORKSHOPS: THE SEAFDEC EXPERIENCE

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Implementation of Past Recommendations from the Shared Stocks Workshops: the SEAFDEC Experience

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1. Background

The FAO/SEAFDEC Workshop on shared stocks in the Southeast Asian region was first held in Bangkok on 18-22th February 1985. During the Workshop, several main issues regarding the shared fish stocks in the South China Sea were discussed.

The Workshop highlighted that sustainable fisheries resources management was one of the important roles that each country has to implement within its jurisdiction. Stocks of fish that lie entirely within the EEZ of a country can be duly managed by the country concerned without affecting the interests of other countries. However, most stocks are not limited to a single EEZ but instead cover more than one EEZ waters, or extending into an area of open sea beyond the single EEZ, such that they are actually shared by two or more countries. Intensive fishing on one part of this shared stock, even though this is carried out in one's own EEZ, is likely to affect the catches on the other parts of this stock in the other EEZs. To ensure rational utilisation of the resources and harmonious fishing, any management measure that need to be implemented on the shared stock would thus need to be carefully coordinated among the countries concerned.

The workshop has also identified possible shared stocks of the region, covering coastal pelagic fish, demersal fish, prawns/shrimps and cephalopods (see Table 1). The United Nations Convention of the Law of the Sea (UNCLOS) defines the shared stock as "stock occurring within the EEZ of two or more coastal states, or both within the EEZ and in an area beyond and adjacent to it." Gulland (1980) and Caddy (1982) classified different types of shared stocks, *i.e.* as "migratory shared stocks" and "trans-boundary shared stocks".

Table 1. Listing of shared stocks occurring in the Southeast Asian region

Migratory shared stocks

1. Mackerels, *Rastrelliger* spp.; *R. brachysoma, R. kanagurta* and *R. faughni*
2. Round scads, *Decapterus* spp.; *D. maruadsi, D. macrosoma, D. russellii*, and *D. kurroides.*
3. Sardines, *Sardinella* spp.; *S. fimbriata, S. gibbosa, S. leiogaster, S. longiceps* and *S. sirm.*
4. Anchovies, Stolephorus spp.; *S. heterolobus* and *S. indicus.*
5. Trevallies: *Caranx* spp., *Carangoides* spp., *Alectis* spp. and *Selaroides* spp. and *Selar* spp.
6. Hardtail, *Megaslaspis cordyla*
7. Spanish mackerels, *Scomberomurus* spp.
8. Small tunas: Frigate and bullet tunas (*Auxis* spp.), Kawakawa (*Euthynus affinis*), Longtail tuna (*Thynnus tonggol*).
9. Shrimps and Prawns, Penaeidae; *Penaeus, Metapenaeus* and *Parapenaeopsis.*
10. Large species of cuttlefish and squid.

Trans-boundary shared stocks

1. Demersal Fish: Nemipteridae, Synodontidae, Priacanthidae, Lutjanidae, Serranidae, Sphyraenidae and Sciaenidae.
2. Cephalopods: Octopus, Small species of cuttlefish and squid.

Migratory shared stocks include those migratory species of fish, crustacea or mollusk which have a definite migration beyond the border of one EEZ. **Trans-boundary shared stocks** are non-migratory fish, whose area of distribution is crossed by a common boundary separating the exclusive fishing zones of two adjacent countries.

The FAO Fisheries Report (FIRM/R337, 1985) has identified some preliminary estimates of the shared fish stocks in the South China Sea. However, the stocks units were not differentiated scientifically, and further studies were very much needed.

A brief outline of the recommendations drawn during the FAO/SEAFDEC workshop on shared stocks is as follows:

i) Identification of some species must be settled.
ii) Participating countries should exchange specimens and information at regular intervals.
iii) Distribution of pelagic shared stocks through acoustic survey needs to be determined and FAO was requested to organise training courses on acoustic survey techniques.
iv) It was also recommended that participating countries should carry out tagging experiments on important shared fish stocks of pelagic fish.
v) Reviewing the information gaps between areas in the region was also proposed.
vi) Cephalopod was identified to potentially increase the catch in the region, and FAO was therefore requested to organise workshops on the assessment of this stock.
vii) Participating countries were also requested to continue monitoring their length frequency data collection so as to obtain the stocks population dynamics.
viii) Catch-effort statistics were recommended and data collection need to be improved by each participating country.
ix) Resource surveys were strongly recommended.
x) Some of the stocks are definitely shared between two or more countries, therefore co-operative research must be developed.
xi) Fisheries oceanography was also stressed and each participating country must try to conduct such studies.

We believe that respective countries around the South China Sea region have implemented, to some extent, most of the items recommended at this Workshop.

Following the FAO/SEAFDEC workshop on shared stocks in 1985, a number of meetings/workshops were organised by relevant authorities, such as the "Working Group Meetings on mackerels and roundscads in the Straits of Malacca" which was organised by FAO/BOBP in 1985-1987, and Meeting on shared stocks as organised by AFPIC in 1996.

2. Research Work Implementations

Since the establishment of MFRDMD in July 1992, being the fourth department of SEAFDEC, three regional workshops on shared stocks have been successfully conducted. These were held in Terengganu. The first Workshop was held on 28-30th March 1994, followed by the second on 18-20th July 1995, and the third, on 6-8th October 1997.

The present Fourth Regional Workshop on Shared Stocks in the South China Sea is also held in Terengganu on 24-26th January 2000. The objectives of this workshop are:

i) To identify the problems in the management of shared stocks in the South China Sea,

ii) To identify appropriate management systems for the shared fish stocks in the South China Sea, and

iii) To develop appropriate regional fisheries research and resources survey mechanisms in the South China Sea area.

3. Past recommendations and Implementations

From the last three Regional Workshops on shared stocks, a number of recommendations have been agreed upon. These are listed in Appendices I, II and III.

Some of these recommendations are subjected for implementation by SEAFDEC/MFRDMD, while others are for due consideration and implementation by the respective SEAFDEC Member Countries.

4. Research works on shared fish stocks in the South China

Research works carried out from recommendations at the workshops are listed below:

4.1. Research works

4.1.1. Collaborative Surveys

Following the recommendations (Item 3) agreed during the First Regional Workshop on Shared Stocks, four Interdepartmental Collaborative Research Surveys were successfully implemented by SEAFDEC. The surveys were:

i) AREA I (the Gulf of Thailand and the east coast of Peninsular Malaysia), 1995/1996

ii) AREA II (West coast of Sabah, Sarawak and Brunei Darussalam), 1997

iii) AREA III (Philippine waters), 1998 and

iv) AREA IV (Vietnam waters), 1999.

Two technical reports of the Interdepartmental Collaborative Surveys have been prepared and published by the SEAFDEC Secretariat;

a) Proceedings of the First Technical Seminar on Marine Fishery Resources survey in the South China Sea, AREA I: Gulf of Thailand and the east coast of Peninsular Malaysia, and

b) Proceedings of the Second Technical Seminar on Marine Fishery Resources survey in the South China Sea, AREA II: West coast of Sabah, Sarawak and Brunei Darussalam.

A seminar of the Collaborative Research Survey for AREA III was recently held in Manila in 1999, and the reports are still being compiled and prepared by the SEAFDEC Secretariat.

4.1.2. On-going research works

Besides the collaborative surveys, some of the works directly or indirectly related to the shared fish stocks were also taken into consideration in the three-year plan proposed by MFRDMD, as follows:

i) Fish taxonomic studies in the South China Sea. Fish specimens were collected, photographed, identified and preserved at the taxonomic room of MFRDMD. A field guide book entitled "Field Guide to Important Commercial Marine Fishes of the South China Sea" has been prepared and published by MFRDMD in 1998.

Similar works are being carried out in Vietnamese waters since 1998, probably ending by the end of year 2000. The work is a joint cooperation between MFRDMD and Research Institute of Marine Products (RIMP), Vietnam.

Taxonomic and biological studies on shark and ray resources are also included.

ii) Standardised methodology on data collection

Standardising the methodologies and formats of data collection was one of the recommendations agreed upon at the previous workshop, and currently being prepared by MFRDMD. The document entitled "Field manual for fishery biology: Methods for measurement and collection of samples" has been published and distributed to member countries. While the standard methodologies mentioned are still not complete, they may serve for the purpose for young scientists to understand the work procedures involved in data collection, particularly on similar works implemented by each member country on the issues of shared fish stocks.

iii) Population dynamics studies on Spanish mackerels in the South China Sea
iv) Tuna tagging
v) Catch-effort statistics
vi) Tuna Statistics
vii) Establishment of the guideline for acoustic survey methodology and analysis in the South China Sea.
viii) Remote sensing for fish forecasting
ix) Fisheries oceanographic and fish resource surveys (M.V. SEAFDEC)

4.2. Training

A series of training on acoustic methodology for researchers of the SEAFDEC Member Countries have been conducted, as follows:

i) Regional training course on acoustic methodology. During the training the acoustic data obtained from the Interdepartmental Collaborative survey were used and analysed.
ii) Regional training course on operation of FQ-70. Training conducted in April 1999, especially for researchers who are directly involved in the Interdepartmental Collaborative Survey.
iii) On-job training on cooperative tuna tagging in Brunei-Sabah waters, followed by tuna tagging in Malaysia-Thailand waters

5. Future research works (2001-2003) related to shared stocks

- Fish taxonomic studies
- Biology and population dynamics of pelagic fishes of the South China Sea

- Oceanographic processes in the South China Sea and their influence on the fish resources
- Bio-economic analysis in fisheries management
- Tuna Statistic
- Catch-effort statistics
- Kinds, abundance and distribution of fish juveniles and larvae in the South China Sea
- Application of satellite data for fish forecasting
- Regional training course on acoustic methodology
- Verification of stock assessment in the South China Sea by hydro-acoustic method
- Technical working group meetings/Regional workshop on research and management of shared fish stocks in the South China Sea

6. Conclusions and recommendations

MFRDMD is hopeful that the discussions made during this workshop would give some guidance to the Department, especially in the planning of regional research works related to shared fish stocks for the future.

Fish biology and population dynamics studies on selected fish species of interest, as determined by the member countries, and stock determination and identification using biological parameters, as well as cooperative fish resource surveys and studies on environmental conditions that influence fish distribution should also be formulated. These works should be taken into the national research program of participating countries.

A Technical Working Committee, consisting of members from participating countries, should be established, and yearly meeting should be planned to report the progress of this program.

Working mechanism must be clearly recognized. As SEAFDEC is not a funding body for such projects, the implementation of this work at national level should be borne by respective country.

At the previous workshop, three major fish groups had been identified as the prime focus. These are Roundscads, Mackerels and small tunas. Study on fish population biology of these species may be necessary, and each country is suggested to incorporate this study in the national research plan.

The recommendations of the above issues are subjected for further discussion, and we hope this workshop could agree to some extent on research for the management of shared fish stocks, for benefit of the SEAFDEC Member Countries in the Southeast Asian region.

Appendix I:

Recommendations of the first regional workshop on shared stocks in the Southeast Asian region: Data collection and management related to shared stocks in the Southeast Asian region.

1. Collaborative research effort on shared stocks should be undertaken between and among Member Countries.
2. Individual countries should start on their own, to identify and verify whether there are national stocks which may probably be shared with their neighboring countries.
3. The Collaborative Research Project of the shared stocks for regional implementation for the identification and verification of shared stocks in the Southeast Asian region.
4. The program should include in its subsequent phases, the Assessment of the Status of Shared Stocks, and the Formulation of Management Strategies for these stocks.
5. Sufficient funds should be made available to SEAFDEC/MFRDMD and participating countries to implement the Programme.
6. SEAFDEC/MFRDMD should develop standard methodologies and format for data collection, processing and analysis to be used by participating countries in implementing the Programme. The methodologies shall include genetic analysis (mitochondrial DNA analysis) for stocks identification, and acoustic method for stock assessment.
7. The participants of the First Workshop on Shared Stocks should be considered as a permanent Working Group on Shared Stocks for the implementation of the programme, in order to forge continuity and commitment of national research inputs, and to sustain the enthusiasm of the scientist and research involved.
8. On-the job training, seminars and workshops should be organised by SEAFDEC/MFRDMD, for researchers from the participating countries.
9. The governments of participating countries should fully support the activities of the above-mentioned collaborative research project by providing the necessary logistics and manpower requirement.
10. Technical workshop agreed that the recommendations should submitted to the SEAFDEC program Committee and Council, for their consideration and approval.

Appendix II:

Recommendations of the Second Regional Workshop on Shared Stocks in the Southeast Asian Region.

1. In line with the Region's implementation of the provision of the UNCLOS regarding shared stocks of species between and among ASEAN and SEAFDEC Member Countries, it is imperative that information on these resources, as well as the environmental conditions affecting their distribution and abundance, be obtained.
2. Collaborative research efforts should focus on the assessment of the resources in the EEZ and international waters to serves as the scientific basis for recommending management option which can be agreed upon to properly utilise and shared these resources. Data exchange should be further promoted.
3. To prove the possibility of interactions between the shared/straddling/trans-boundary stocks of some species of round scads, mackerels, naritic tunas and other pelagic groups between and among coastal countries in the Southeast Asian region, there is a need to do collaborative works to determine similarity, dissimilarity in stocks and structure of their population through tagging, electrophoretic and mitochondrial DNA studies, morphology or any other means.
4. Very limited information on the relationship between production and environmental parameters in most SEAFDEC Member Countries is available. It has been observed that the environment has affected production of small pelagic fishes in the SEA region. In view thereof, collaborative oceanographic cruises and experimental fishing in contiguous areas of the Region should be conducted.
5. Statistical system on catch and effort for all species, in general, and those regarded as shared stock, in particular, should be established and made accurate as soon as possible.
6. Collaborative research works on shared stocks of round scads, mackerels and tuna should be organised and conducted among the countries in the Southeast Asian region.
7. Some kind of management measures be instituted by member countries to arrest the continual decline in production of roundscads.
8. Researchers from other countries should also be invited to participate as observers in the collaborative studies by M.V.SEAFDEC.

Appendix III:

Recommendations of the Third Regional Workshop on Shared Stocks in the Southeast Asian Region.

1. There is still very limited information on the hydrodynamics of the South China Sea in most SEAFDEC member countries. Recognising that a better understanding of this issue is deemed important especially in its relationship to the distribution of small pelagic fish resources, and consequently their overall production, it is recommended that more efforts and studies are needed to map accurately the various natural phenomena occurring in these waters. Moreover, there is strong need to comprehend the biological and physical processes working in the South China Sea.
2. For the short term, priority should be given to the study on the shared stocks of mackerels, roundscads and tunas. The study should focus on stock identification through various means (morphometric, meristics, DNA, tagging).
3. Due to increasing avalability of information exchange and communication through the use of e-mail and internet, researchers in this region are strongly encourage to make use of such facilities for exchanging fisheries data or contacting on another.
4. As over-exploitaion of shared stocks by any individual country will have an impact on the fisheries of neighboring countries, effort should be focused on establishing a joint management among the countries concerned.
5. SEAFDEC/MFRDMD need to play a more effective role in the collection and compilation of data/information published elsewhere for the use of researchers in the region.
6. SEAFDEC/MFRDMD needs to established better working relationships with other external and international agencies/organisations for the implementation of various regional programs.

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ANNEX 13

Annex 13

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

REVIEW ON STATUS AND BIOMASS OF PELAGIC FISHERY RESOURCES IN THE SOUTH CHINA SEA AREA

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Review on Status and Biomass of Pelagic Fishery Resources in the South China Sea Area

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Abstract

A series of acoustic survey had been conducted by MFRDMD by using MV SEAFDEC in collaboration with TD and other SEAFDEC Member Countries for the last 4 years. Since then four areas have been covered namely the Gulf of Thailand and East Coast of Peninsular Malaysia, Sarawak-Brunei and Sabah, Western Philippines and Vietnam waters. A similar study using KL CERMIN was also conducted in the EEZ of Malaysian waters in 1998. Both vessels were equipped with the scientific echo sounder FQ70, which is very reliable to collect back scattering values (sv) data that is useful for stock determination. Biological information for dominant species is provided through sampling program or fishing operations. Estimation of pelagic biomass was made based on biological parameters of representative species in each survey area. This paper will present the status and estimation of pelagic biomass based on collaborative study and national surveys conducted by Member Countries.

Keywords, Scientific echo-sounder, back scattering layers, species composition, biomass estimation.

1. Introduction

The ocean resources especially fisheries resources are the common treasure of human that should be kept and utilized in proper manner to secure as protein supply for future generations. Fisheries resources could be estimated with various tools, one of which by proper acoustic survey. SEAFDEC has conducted a series of acoustic survey by deploying MV SEAFDEC in South China Sea area. South China Sea is one of the major fishing grounds in the world where many country depend, on fisheries for export, livelihood and other economic benefits. However, fishing activities in certain areas are limited due to climatic conditions. During southwest and northeast monsoon seasons, only few large-scale fishermen operate in offshore area while the artisanal fishermen concentrate along the coastal waters. Anyway, it might be necessary to assess the potential of the fish resources before they are being exploited.

Fish stock assessment is a growing necessity in many countries in Southeast Asian countries. Previously in many countries, stock assessment is only based on landed catch data or swept area method survey. However, there is a potential to adopt a new method in determining fish stocks i.e. hydro-acoustic. As in other tropical regions, South China Sea area has a similar fish biological characteristic such as the distribution and abundance of multi-species and all year round spawning. The inherent characteristics of fisheries hinder the collection of reliable landing statistics throughout the area. A suitable fish stock assessment methods is not readily available in this region. SEAFDEC has been making efforts to develop appropriate methods using hydro-acoustics (Rosidi *et al.*, 1998). Application of scientific hydro-acoustic equipments in assessing fish population seems to be a more appropriate means among others to meet overall goal of the rapid fish resources assessment, although the method does not give a complete answer for the tropical multi-species condition. But, it is an

effective way to assess new fishing grounds where statistics are not sufficient and to provide baseline information for the fishery management.

This paper will present the status and estimation of pelagic resources in the South China Sea based on acoustic study conducted by SEAFDEC and other national research institute of Member Countries.

2. Materials and Methods

2.1 Survey area and period

Table 1 indicates the survey areas and periods for SEAFDEC acoustic survey since 1995. The first survey covers area of the Gulf of Thailand and East Coast of Peninsular Malaysia. The second one surveyed in Sarawak, Brunei and Sabah. While the third and fourth cruises, devoted to the western part of Philippines and Vietnamese waters respectively. A similar survey in the EEZ of Malaysia was also carried out in 1998. The survey was conducted in three consecutive periods from March to August 1998. Survey was repeated for the West Coast of Peninsular Malaysia after a critical advice by the project consultant. The second survey had spent more time as the vessel speed was reduced from 10 knot to less than 8 knot. However both cruises had covered the same number of stations but started from different location. The first cruise had begun from Langkawi to Johore while the second cruise started from Johore to Langkawi.

The acoustic survey in the East Coast was kick off from Genting while for Sarawak and Sabah waters was departed from Kuching. Map 1 and 2 shows the cruise tracks in the West and East Coast of Peninsular Malaysia and Sabah & Sarawak waters respectively.

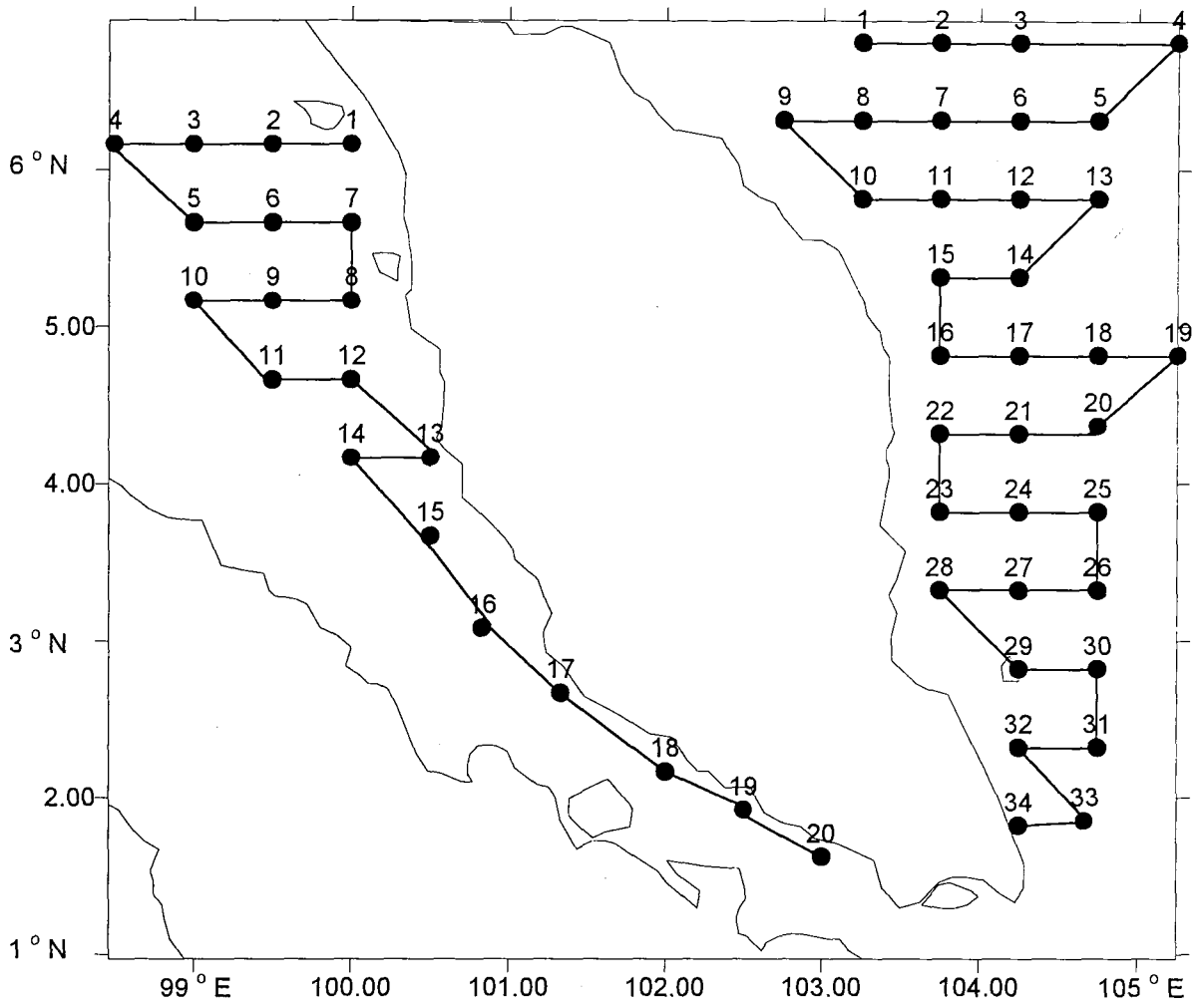
A total of 16 tracks were covered during the 1st survey in the West Coast of Peninsular Malaysia, while 19 tracks were recorded in the 2nd survey. The first survey not covered the parallel or perpendicular tracks to the coastline whilst all transects were surveyed during the second cruise. Only a single track was designed from station number 14 to station no. 20 due to narrow navigation area and quite not safe for fishing boats.

The same characteristics of cruise track were designed for the East Coast of Peninsular Malaysia to cover the coastal waters as well as offshore areas. Restricted areas such as the oil field grounds were excluded from the survey. A total of 23 tracks were recorded for the east coast with the total distant travels about 690 nautical miles.

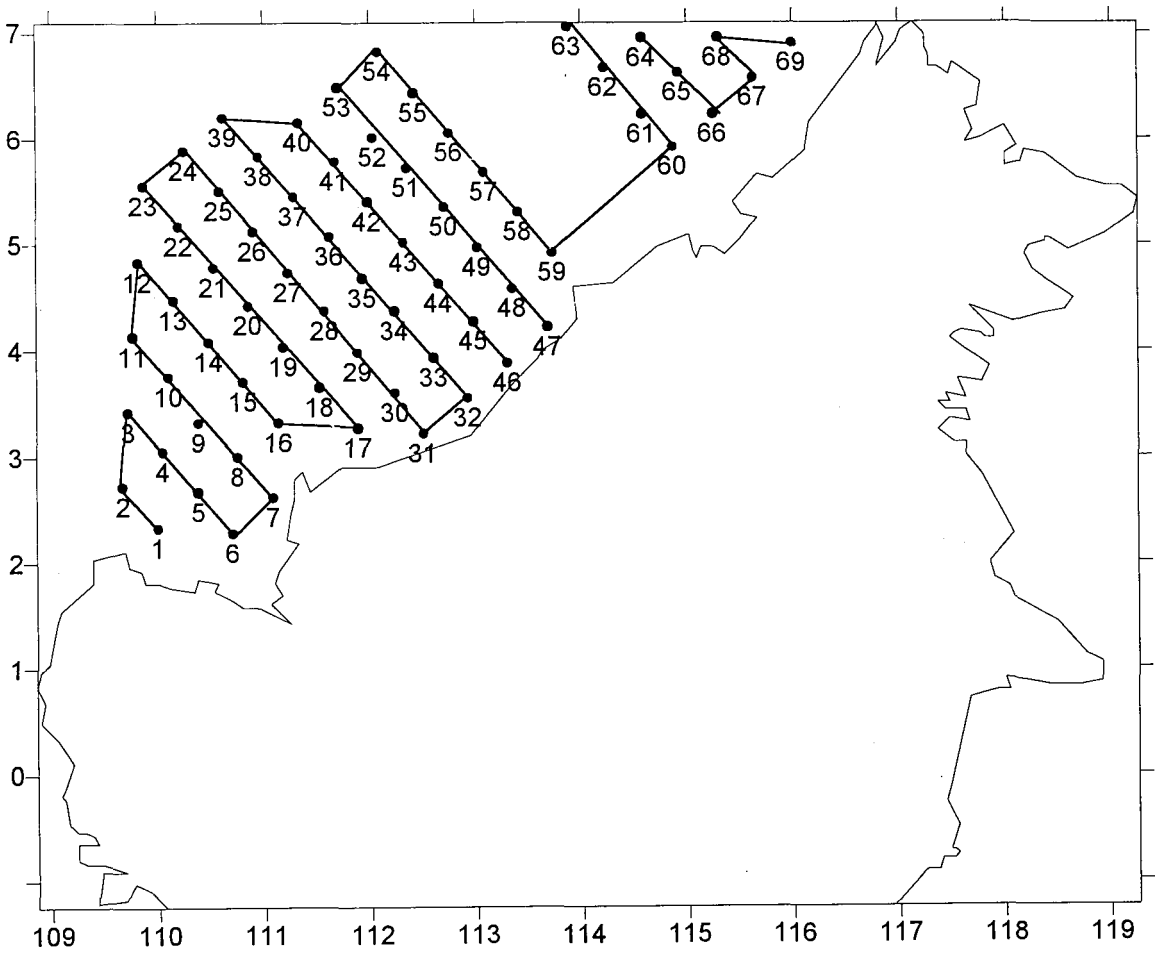
In Sarawak and Sabah (Map 2) a total of 56 transect were surveyed from 8th July to 5th August 1998. However these area not covered the coastal and offshore area of Brunei Darussalam. It is also not covered the East Coast of Sabah due to safety reasons.

Table 1: Survey areas and periods

Survey area	Period	Duration	Remarks
Gulf of Thailand and East coast of Peninsular Malaysia	5th to 28th September 1995	24 days	Pre-NE monsoon (1st Area)
Gulf of Thailand and East coast of Peninsular Malaysia	24th April to 17th May 1996	24 days	Post- NE monsoon
Sarawak, Brunei and west coast of Sabah	10th July to 2nd August 1996	22 days	Pre-NE monsoon (2nd Area)
Sarawak, Brunei and west coast of Sabah	1st May to 24 May 1997	24 days	Post-NE Monsoon
Western Philippines	18th April to 7th May 1998	20 days	(3rd Area)
West Coast of Peninsular Malaysia (KL CERMIN)	24th to 30th March 1998	7 days	First survey *national project
	8th to 24th November 1998	10 days	Re-survey
East Coast of Peninsular Malaysia	24th May to 6th June 1998	14 days	Post-NE Monsoon
Sabah & Sarawak waters	8th July to 5th Aug. 1998	29 days	Post-NE Monsoon
Vietnam waters	29th April to 29th May 1999	30 days	(4th Area under SEAFDEC)



Map 1: Survey transects for acoustic off West Coast and East Coast of Peninsular Malaysia (Number indicates the oceanographic survey stations)



Map 2: Acoustic tracks for Sarawak and Sabah

MV SEAFDEC carried out two acoustic surveys in the Gulf of Thailand and off the East Coast of Peninsular Malaysia. The first survey was conducted during the pre-Northeast (NE) monsoon season from September 5 to 28, 1995. The second survey was carried out during the post-NE monsoon season from April 24 to May 1996 (Albert *et al*, 1997).

MV SEAFDEC carried out another two acoustic surveys off Sarawak, Brunei and West Coast of Sabah from July 10 to August 2, 1996 and the second one from May 1st to May 24, 1997.

In April-May 1998, the interdepartmental collaborative research program in the South China Sea (Area III) off western Philippines commenced through SEAFDEC/MFRDMD coordination. The study was conducted with the inclusion of ocenographic and other activities. This is the first ever acoustic survey done in Philippines waters.

The fourth phase of SEAFDEC collaborative study has been decided in Vietnamese water in the South China Sea area. The survey runs simultaneously with the oceanographic survey and other fishery related projects from 29 April to 29 May 1999.

2.2 Research Vessel

MV SEAFDEC (Photo 1) was deployed to carry out research activities under a special program called "SEAFDEC interdepartmental collaborative research" with two major players, Training Department (TD) and the Marine Fishery Resources Development and Management Department (MFRDMD). The other partner is the Member Countries where the survey area was decided.

For the national project, the survey was carried out by training vessel KL CERMIN (Photo 2) which is 162 GRT purse seine vessel with 29.05 m overall length and 7.2 m width. She cruising with full compliment of 12 crew members and manage to accommodate another 10 scientific members on board. The vessel has the capability to stay at sea for 12 days.

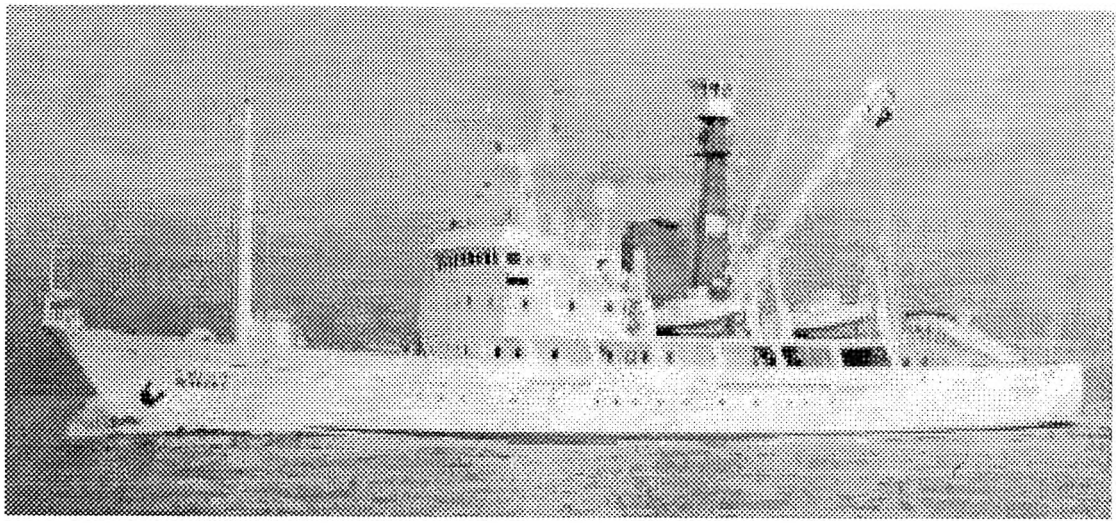


Photo 1: MV SEAFDEC used for SEAFDEC collaborative study

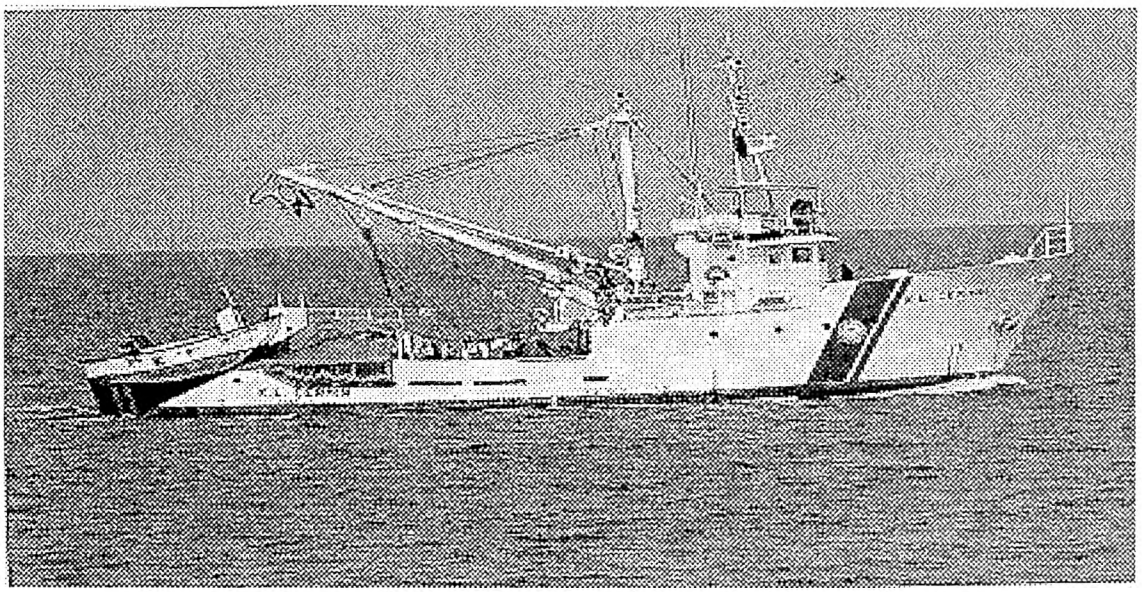


Photo 2: Picture of KL CERMIN used for national acoustic survey

2.3 **Biomass Estimation**

The following expression is used to estimate the fish biomass.

$$Q = (sv / ts).w.a.d \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where; Q = Biomass

$sv = 10^{(sv/10)}$: Backscattering strength

$ts = 10^{(ts/10)}$: Target strength

w = average fish weight (g)

a = survey area (m^2)

d = layer depth (m)

Target strength (TS) was estimated using the Furusawa (1990) equation

$$TS = 20 \log SL - 66 \quad \ldots\ldots\ldots\ldots \quad (2)$$

Where, TS = Target strength (dB)

SL = Fish Standard Length (cm)

3. **Results**

Table 2 indicates the estimated biomass and density of pelagic fish in the South China Sea area. It was obvious that estimation during pre and post Northeast monsoon produced significant different of pelagic resources. Pre-monsoon observed more abundant of pelagic in the survey area.

Table 2: Estimation of biomass and fish density in the South China Sea.

Survey Area	**Area (km2)**	**Density (tonnes/km2)**	**Biomass (tonnes)**
Gulf of Thailand			2,7574,770 (pre) 1,323,150 (post)
East Coast Peninsular	111,129	2.07 1.74	230,037 (pre) 193,364 (post)
East Coast Peninsular	117,892	6.2	730,930 (post)
West Coast Peninsular	31,579	9.8	309,651 (post)
Sarawak and Sabah	303,679	5.6	1,710,703 (post)
Coastal Sarawak	61,378	1.61 5.87	98,819 (pre) 360,289 (post)
Sarawak, Brunei, and Sabah			1,717,852 (pre) 956,396 (post)
Western Philippines	88,749	18.9	1,677,356 (post)
Vietnam waters (coastal)	24,000	17.5	420,000 (post)

In general observation, pelagic fish were found more abundant in coastal area than offshore. It was clearly shown in Vietnamese water and the Gulf of Thailand. However in Sarawak, pelagic were found in large school in between the contour line of 100m to 200m. Similar observations were recorded during pre and post NE monsoon season.

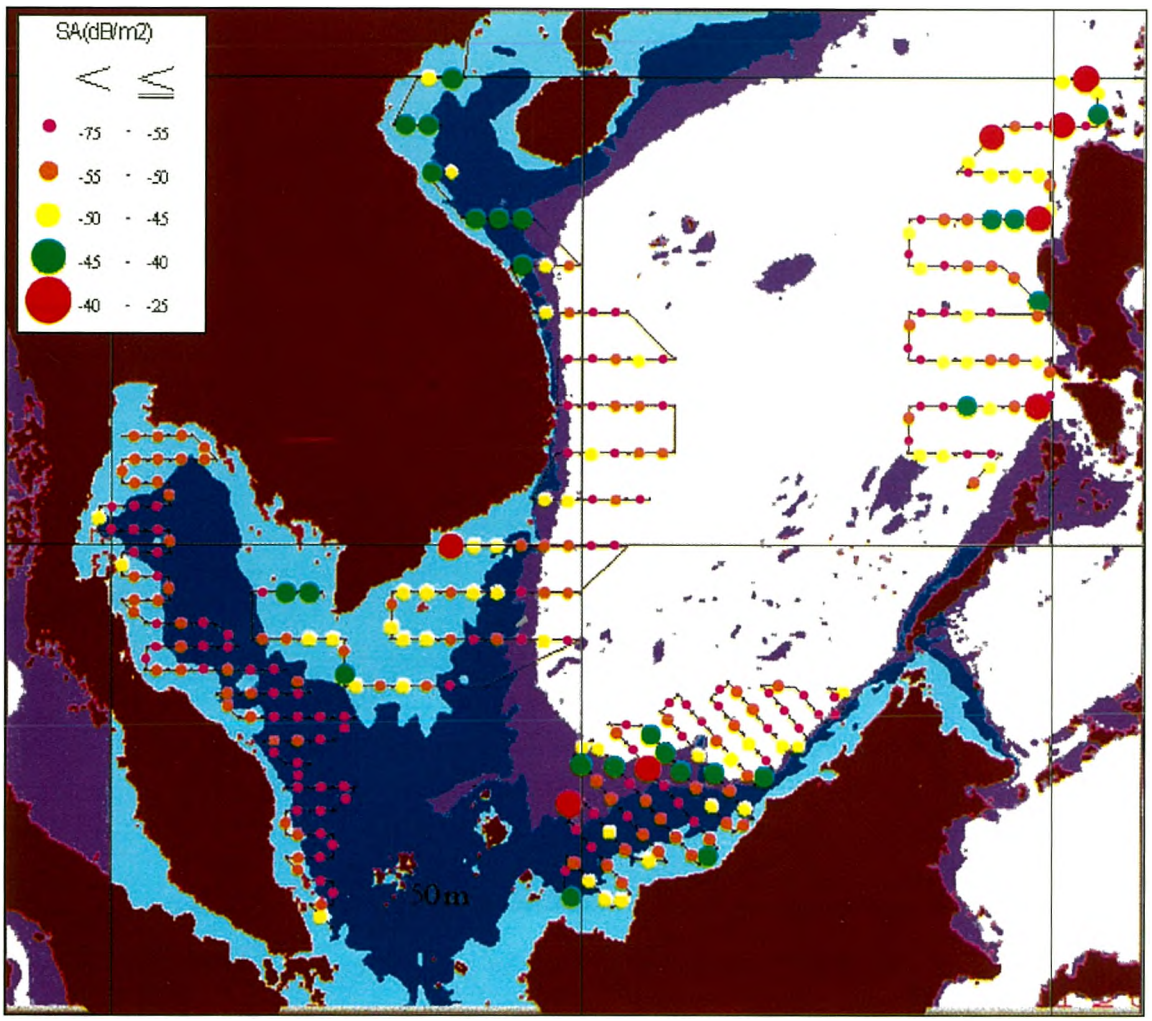


Figure 1: Distribution Map of SA in the South China Sea (created by Mr. S Fujiwara)

In the Philippines, pelagic were recorded higher in the North and South compared to the other parts in Philippines. However, this occurrence was believed correlated to the convergence and divergence process in that area (Penjan *et al*, 1999).

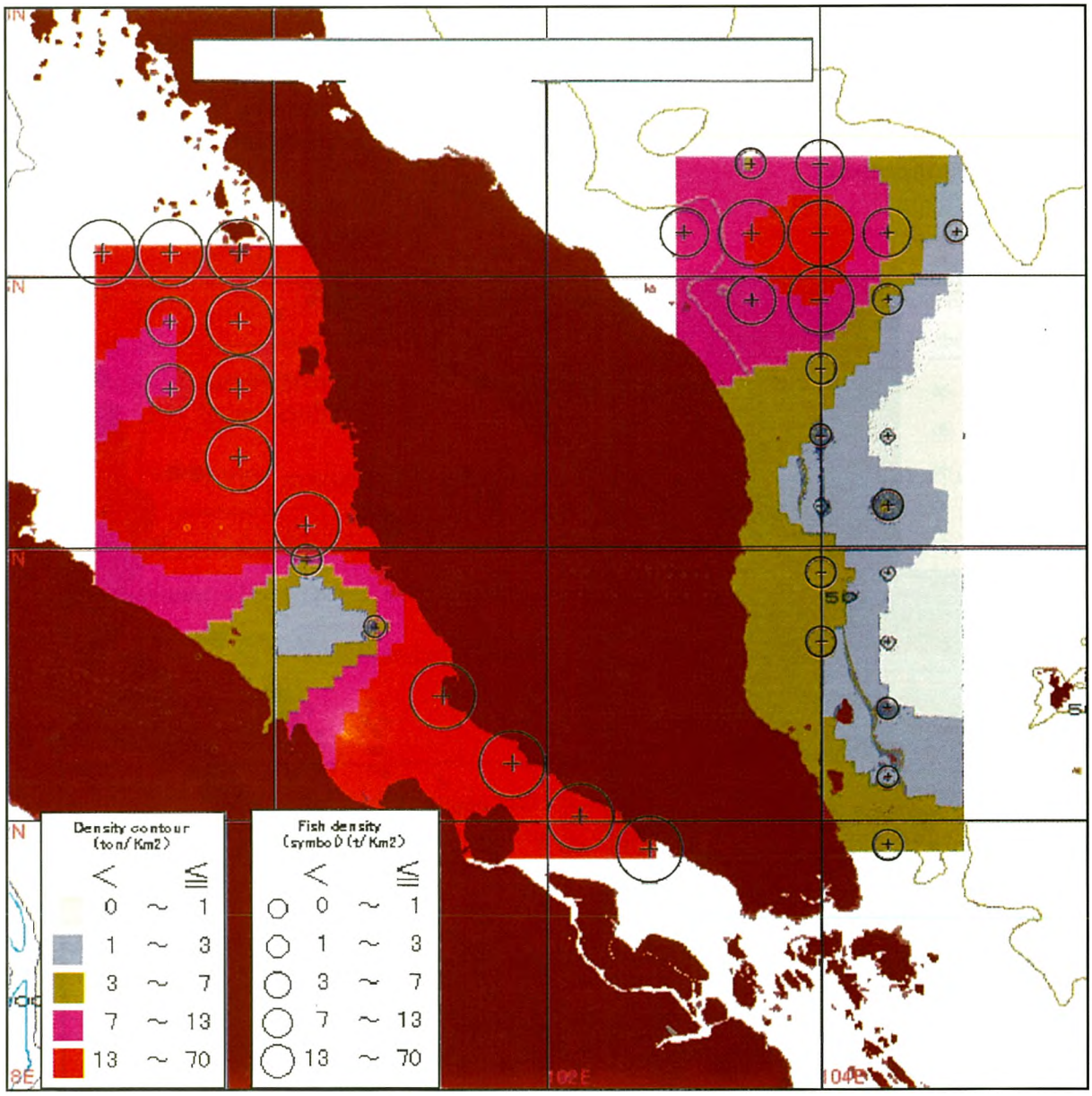


Figure 2: Distribution of pelagic fish density in the west and east coast of Peninsular Malaysia

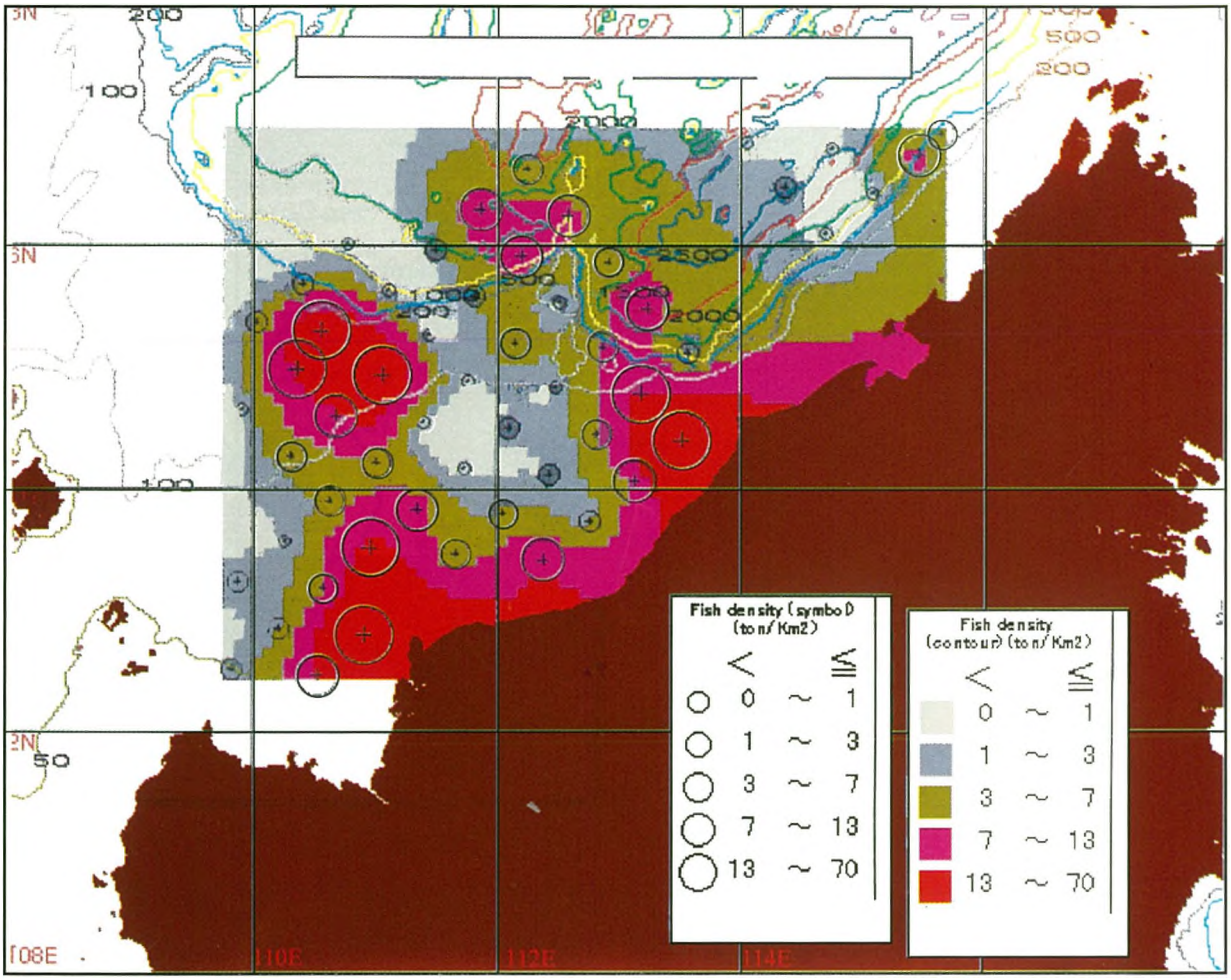


Fig 3: Distribution of pelagic fish density in Sarawak and Sabah

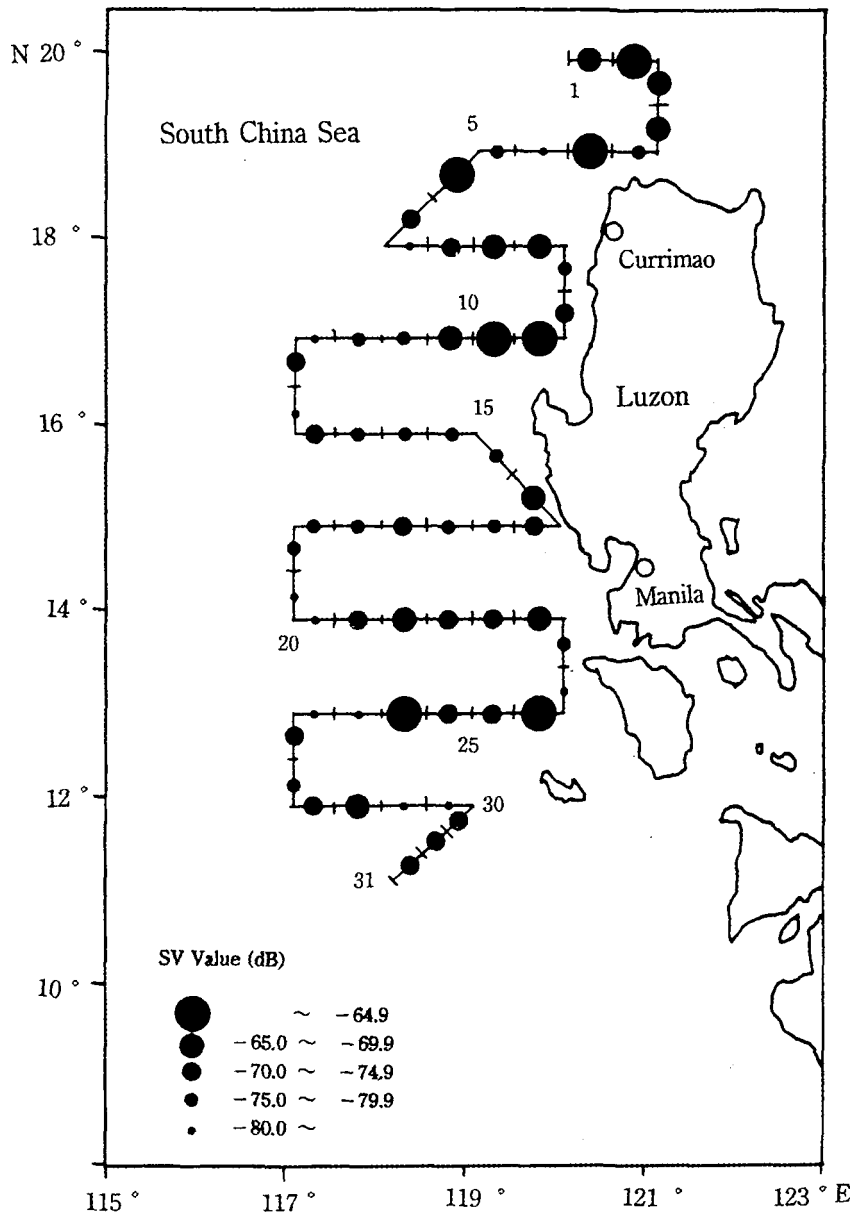


Figure 4: Distribution pattern of SV along the Transect off the western coast of Philippines in April/May, 1998. Numbers indicate the oceanographic stations.

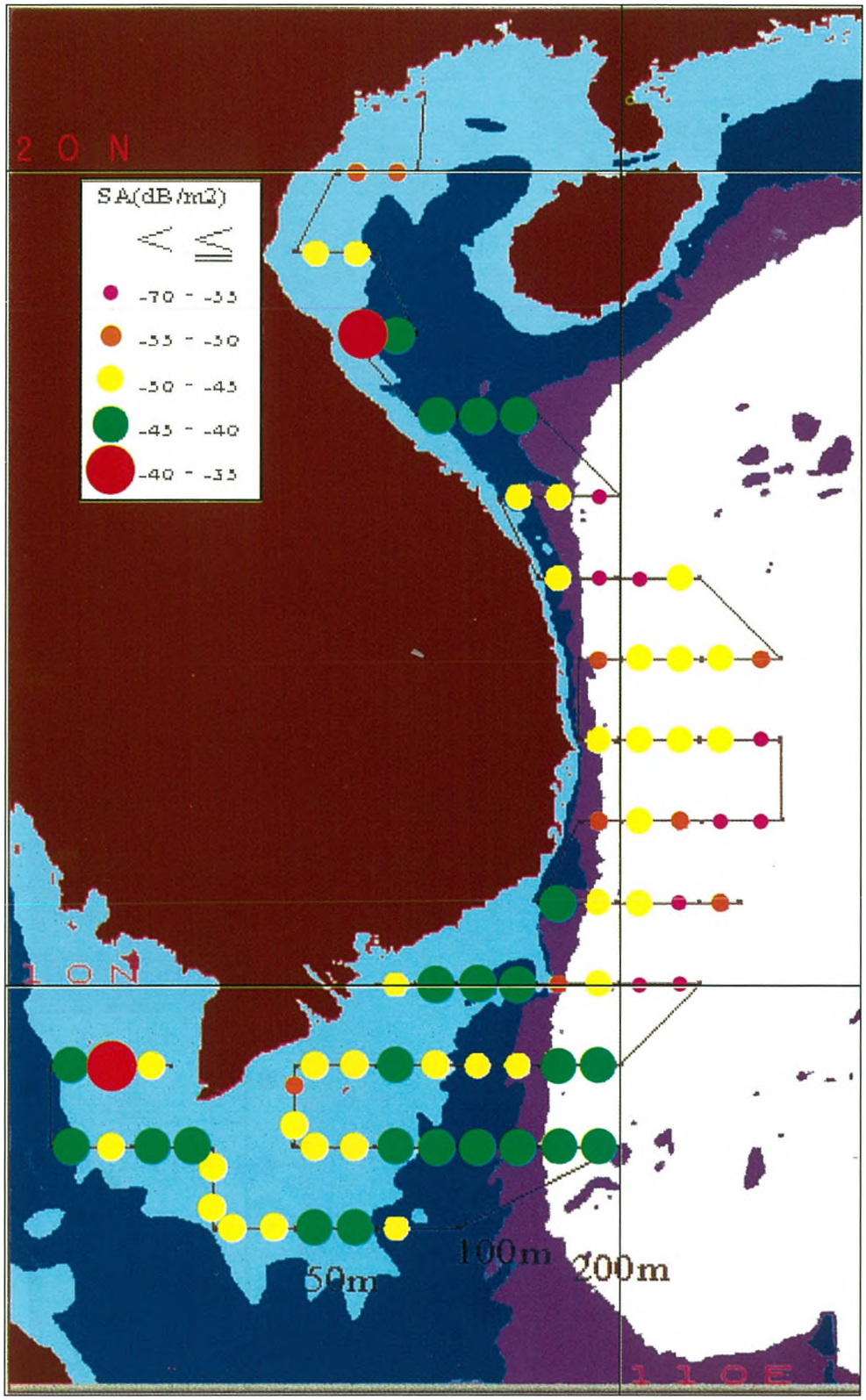


Figure 5: Distribution of SA during post Northeast monsoon (low freq.)

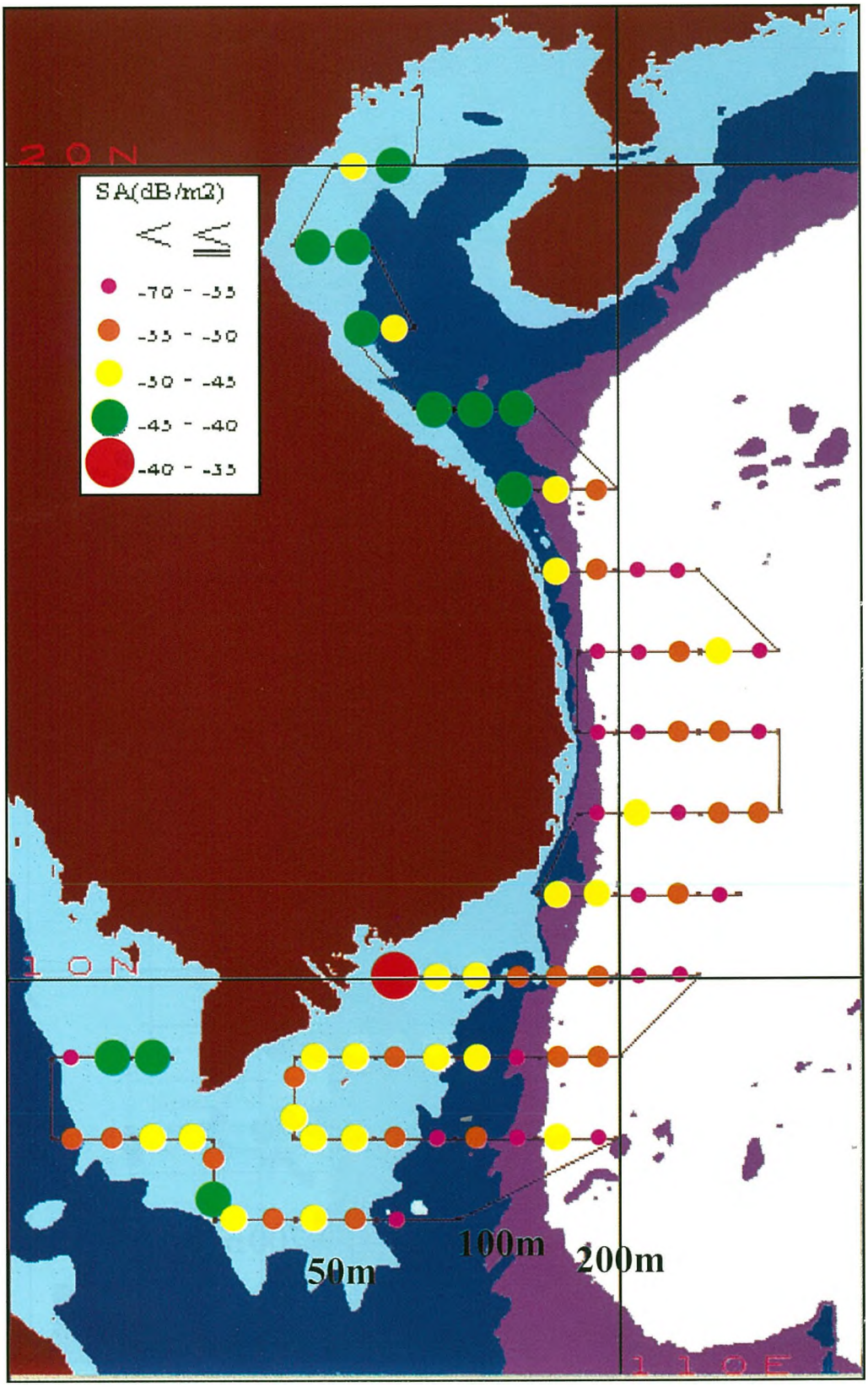


Figure 6: Distribution of SA during post Northeast monsoon season (High Freq.)

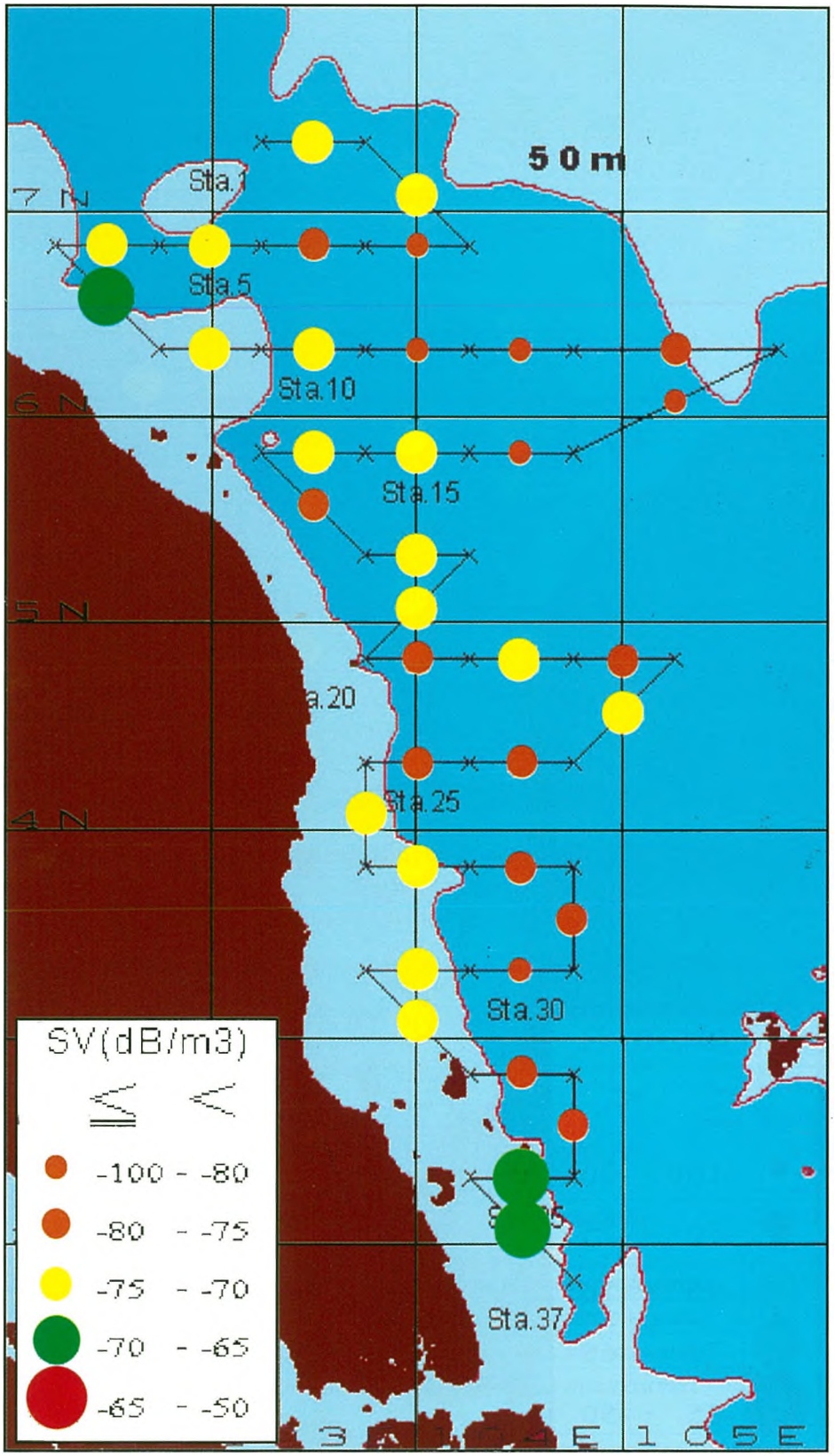


Figure 7: Distribution of SV for the east coast of Peninsular Malaysia (low freq.)

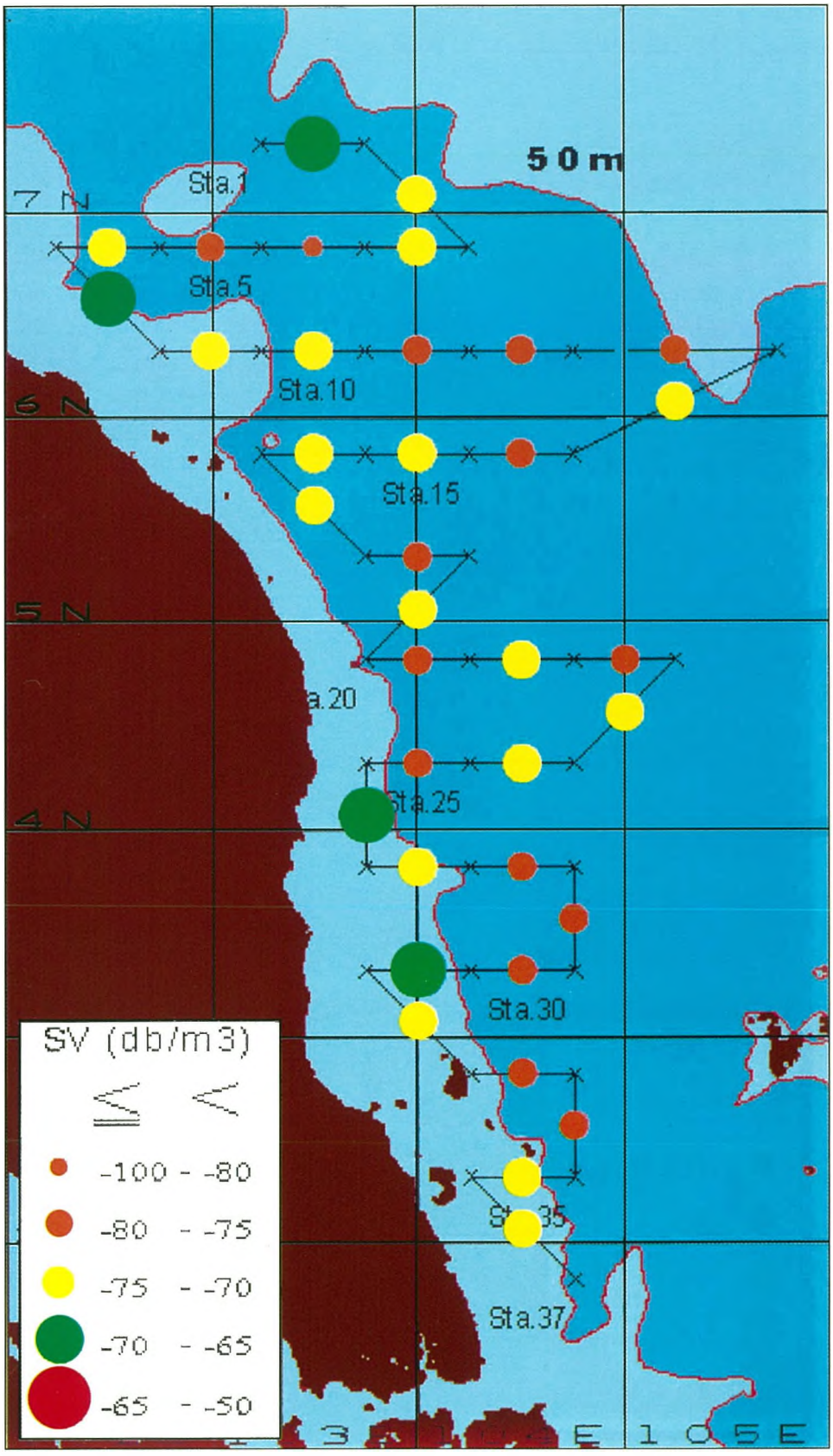


Figure 8: Distribution of SV for the East Coast of Peninsular Malaysia

4. Discussion

4.1 *Resource fluctuation*

Pelagic resources were very well known that fluctuate from time to time depending on season and availability of food source in the area. As the species migrate, it would influence the abundance of such species in the area. Other oceanographically parameters were also important to determine occurrence of these resources. Plankton and thermocline layers were considered as dependant factors for occurrence of pelagic such as tuna. Temperature may also influence but not clearly shown in tropical waters.

4.2 *Dominance pelagic species*

Table 3 indicates the dominant pelagic species used for calculation of estimated biomass in the South China Sea. Species determination was based from the results of sampling program or fishing operations and the annual fishery statistics of the countries concern. In area I, no fishing operation was carried out to determine the dominance species. As the result, historical data from national statistics were used during data analyses.

Scads, Sardin and Indian mackerels are the common species found in the South China Sea. Scads which comprising the roundscads were harvested widely by purse seiners in Sabah and Sarawak and the East Coast of Peninsular Malaysia. The same group of pelagic was also found in Philippines and Vietnam waters. In the West Coast of Peninsular Malaysia recorded higher percentage of Indian mackerel in catch.

Fishing operations for sampling were conducted in area III and IV, but the data collected not good enough to portray the whole survey area. In such cases, the estimated biomass most probably incurred some level of error either overestimated or underestimated.

Table 3: Dominant and representative species used for biomass estimation

Survey Area	**Author**	**Species**	**Estimated Biomass**
Gulf of Thailand	Yutana *et al.*	*Sardinella gibbosa*	2,754,770 (pre) 1.323,150 (post)
East Coast Peninsular	Albert *et al.*	*Decapterus russelli*	230,000 (pre) 190,000 (post)
East Coast Peninsular	DOF	*Selar crumenophthalmus*	730,000 (post)
West Coast Peninsular	DOF	*Rastrelliger brachysoma*	130,000 (post)
Sarawak and Sabah	DOF	*Decapterus macrosoma*	1,710,000 (post)
Coastal Sarawak	Hadil *et al.*	*Decapterus macrosoma*	100,000 (pre) 360,000 (post)
Sarawak, Brunei and Sabah	Yutana	*Sardinella gibbosa*	1,717,852 (pre) 956,396 (post)
Western Philippines	R. Bidin *et al.*	*Decapterus macrosoma*	1,672,000 (post)
Vietnam waters (coastal)	R. Bidin *et al.*	*Decapterus maruadsi*	420,000 (post)

5. Conclusion

The contribution of pelagic fishery to the total landings of Member Countries is significant. In Malaysia about 30 % of the total landings were contributed by surface fishery. A similar trend was observed in Thailand, where pelagic catch accounted about 33% to 38% of the annual total landing. In Indonesia, many purse seiners were used, as trawlers were not allowed fishing in their waters. Therefore contribution from the surface fishery is higher compared to other Member Countries. Brunei also recorded higher percentage of pelagic in their catch or accounted more than 50%.

Acoustic techniques provide rapid and continuous measurements throughout the water column and more complete information on the distribution and behavior of pelagic schooling fishes. Compared to temperate area, the schooling bahavior in tropical waters were more scattered and loose. In addition, the school itself is mixed with multi-species and size which hinder proper recording of the specific target strength.

Biomass estimation using acoustic method would be more meaningful, if representative species of pelagic could be determine for every survey transect. So far, only single species of pelagic was used for calculation of the whole specific study area. The current procedure is not an ideal one due to limited technology and resources for proper sampling.

6. Acknowledgement

The authors would like to thank the Director General of Fisheries Malaysia, Y. Bhg. Dato' Mohd. Mazlan b Jusoh for his permission to conduct the surveys and present this paper. Appreciation also goes to Mr. Ismail Taufid Mohd. Yusoff, the Chief of MFRDMD for his encouragement and guidance to the project success.

Thanks also due to Dr. T. Sasakura, the president of SASA Labo Company for his critical comments during operation of this project. Last but not least, the authors would like to thank acoustic researchers from TD, MFRDMD, BFAR, RIMP, FRI and PPN Sabah for their active participation in data collection and processing.

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ANNEX 14

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

STOCK SHARING AMONG NEIGHBORING COASTAL STATES

By:

K. KATSUYAMA

Japan Fishery Agency

Stock Sharing Among Neighboring Coastal States

K. KATSUYAMA
Japan Fishery Agency

1. Introduction

In 1992, the United Nations Convention on the Law of the Sea (UNCLOS) took effect. Following the entering into force and the increasing of ratification of the Law, the international reinforcement of management concerning highly migratory fish species and straddling fish species is being pursued by the establishment of the U.N. Implementation Agreement. In general, the straddling fish stock is broadly divided into three categories;
(1) those distributed across exclusive economic zones of more than one coastal states,
(2) those distributed both in the exclusive economic zone of a coastal state and the high seas, and
(3) those distributed in the exclusive economic zones of more than one coastal states and the high seas.
Some of them have been already subjected to fishery management under bilateral or international frameworks.

It is my understanding that this meeting will seek and discuss management system with a special emphasis on small pelagics in the Southeast Asian coastal/offshore waters. It is also my understanding that, in this effort, advice or suggestion from Japan is being sought. However, in the Northeast Asian waters including areas adjacent to Japan, regional fishery organization for the managemnt of small pelagics has not yet been established. For the time being, bilateral discussion between countries involved is made on a gradual basis within the framework they belong. Management measures are introduced starting with the species for which management is possible, based on the perspective to build up a multilateral agreements in a longer term.

Consequently, it is our wish to promote, through this meeting, discussion with Southeast Asian countries on ways how to cope realistically with this situation and improve it. For this purpose, I introduce several cases in the world and touch upon my personal idea possibly suitable for sustainable fisheries in this region.

2. Multilateral agreements regarding straddling fish species

Bottom fish--a predominant portion of straddling fish species--have been used historically from olden times not only in Asia but also in Europe. As fisheries were modernized and their scale was enlarged, competition and, in consequence, conflict among user countries tended to intensify. One representative case was what is known as the "War of Cod", which erupted in the North Sea between the United Kingdom and Iceland in the 1970s. Both countries attempted to maintain and expand their respective fishing activities even with the backing of their naval forces. In recent years, we witness intensifying confrontation and politicization of the conflict in the Northwest Atlantic over blind goby between Canada and Spain. Besides these large-scale conflict, there are numerous strifes in smaller scale. In some cases there arose obstructing actions in which fishermen resorted to destruction of each other's fishing gear.

Such conflicts are futile in essence, and incessant attacks and retribution simply frustrate fishermen. From such bitter experience in the past, regional fisheries management organizations were established in the Atlantic, and democratic decision-making means approach to stock management and other purposes through consensus and majority votes became general. At present, any action resorting to naval power to solve such confliction is at least not acceptable in the international common sense.

Unfortunately, traditional regional fisheries management organizations such as NAFO(Northwest Atlantic Fisheries Organization) and NEAFC (Northeast Atlantic Fsiheries Commission) witness the stock status of major fish species subjected to fisheries deteriorating visibly, suggesting that stock management to date have not been successful. This is due to the fact that management measures tended to be lenient so as to be accepted by all the parties concerned since decision-making by any regional organization is taken by means of consensus or based on a wide range of support votes. In addition to this fundamental tendency, where a fish stock tended to decline, small-size fishes with low market value are continuously discarded on the ocean with the aim to achieve maximum profit out of the catch quota granted to fishermen under the quota control system. This hampers reproduction capability of fish stocks conspicuously, further accelerating deterioration of their status.

I refrain from going into detailed discussion with respect to positive or negative aspects of the quota control system, but it is my understanding that, at the "FAO Fish Rights 99 conference" held in Western Australia in November 1999, there was a clear recognition that at least the current quota control system such as ITQ is not functioning properly for sustainable fisheries.

As one of the invited panelists at that meeting, I presented a paper titled "Direction of Future Fishery Management", in which I pointed out issues arising from excessive expectation or dependence on catch quota management. In response to such criticisms of mine, some countries depending on ITQ management asserted that community-based management could provide supplementary functions. However, it could not be denied, it seems to me, that in doing so, they are merely shifting the government's management responsibility onto fishermen. Further, as there was no mention of the feedback management system on fisheries, which is considered to form the basis of community-based management, there is much to be expected in the future discussion on practical basis.

On the other hand, "Precautionary approach" has been promoted, centering on FAO, with a view to hold in check the deterioration of stock and ensure its recovery. However, doubts have been expressed by more than one regional fisheries organization about the contents of the provisions of Appendix II of UNIA. Thus it does not seem to be effective remedy for the improvement of stock management method.

3. Situation in the areas surrounding Japan

Japan has bilateral fisheries agreements with Russia, the Republic of Korea, People Republic of China, respectively, and issues reciprocal fishing permits and cooperate in management of straddling fish stock. With respect to the Sea of Japan (called "Eastern Sea" by the ROK), a regional fisheries management organization consisting of Japan, the ROK, China, and Russia needs to be established as the fishery stocks are being used diversely by those countries. In bilateral consultations as well, the possibility and need to discuss such an

organization have been raised by more than one country, including Japan. However, at present, any substantial framework of international management in which all these countries concerned can participate has not been built up yet.

Several possible causes can be considered for this difficulty. One possible obstacle is that the goal of fishery policy of the countries involved differ substantially from one to another. Japan is interested in stabilized and sustainable utilization of marine resources, while other countries attach greater emphasis on expansion of fishing activities. This is closely linked to fishing capacity management of how to harmonize the differences in developing stages in fishing technology with the management system of the administration among States concerned.

On the whole, the present status of fish stock does not provide an optimistic outlook. With respect to bottom fish population which is now on a downward trend or stays at low levels, Japan is positively coping with hatching and releasing projects, while China is striving to strengthen protection of spawning ground. As a matter of fact, recovery, although gradual, is being witnessed for some fish species. However, destruction of spawning ground and nursery ground by man-induced causes such as artificial development of coastal zone or marine pollution from land-based causes or large-volume catch of juveniles for use in aquaculture still continue, making environmental rehabilitation(/mitigation) an urgent task to be implemented.

4. Issues facing the Southeast Asian region

a. Catch Data

In the areas under national jurisdiction of SEAFDEC member States, including Japan, Multi-Species Utilization has been implemented thoroughly, which naturally leads to formation of fishing communities.

Furthermore, the presence of artisanal and seasonal small fishing practices further complicates the implementation of fisheries management programs. In the case of Japan, catch landing statistics are required, and the license system is adopted for major fisheries. Among conditions to obtain license, fishermen are obliged to submit their catch reports which should include catch quantities, fish species, number of days fished and operation position. In this sense, catch data is relatively well established. Unlike in Japan, major catch data are lacking in the Southeast Asian countries over a long period due to shortage of human and financial resources.

This obviously constitutes a fatal flaw to the implementation of stock management. When I exchanged views with a number of officials from this region at the first meeting of the SEAFDEC Statistics Working Group, I stressed the need to improve the data collection system expeditiously and reinforce education and publicity activities for fishermen regarding the need to make adequate data available.

It is essential to grasp the stock trend accurately from the viewpoint to decide on fishery policy, stabilize fishery house keeping and ensure food security for domestic consumption. At least, fishery statistical data covering catch quantities, number of fishing vessels or fishermen by fish species or by colony. In addition to this, more precise estimation of stock trend would become possible if scientific data such as size composition are collected by MFRDMD and/or TRD.

Concerning data requirement, its contents were discussed in detail with the participation of developing nations, and specific items were presented for each level at FAO Technical Consultation on Measurement of Fishing Capacity WG2, held in Mexico City last December. I would like to draw your attention to the documents of the meeting for your reference.

b. Boundaries

The issue to be taken up after catch statistics would be that of boundaries with adjacent waters. The issue of boundaries could develop into a political issue in some cases because boundaries of semi-closed areas close up each other as they further advance into the offshore area, in addition to the difficulty to establish boundaries due to complex coastal shape. Although it is not easy to find solution to this issue, the situation in the Mediterranean Sea and the areas around Japan would probably present a considerable reference. In the former, no demarcation of exclusive economic zone or median line has been established, with simply twelve miles from the coast being accepted and the area beyond the twelve miles being treated as the high seas.

With regard to the area where it is not possible to establish a median line and demarcation between Japan/ROK and Japan/China, a joint fishery management zone,which is not including any other political aspects was established to carry out management of fishing ground.

Based on my personal observation, such areas as the Thailand Bay are a common fishing ground of neibouring states. Especially, as regards small pelagics, I consider it would be appropriate to enforce management in the form of joint management by States concerned. In this case, it will be necessary to require submission of reports on catch quantities to neutral international organizations such as SEAFDEC through appropriate and fair method. Following this approach, there is little or no possibility of occurrence of unregulated and disorderly joint management.

The Southeast Asian region also constitutes boundaries between the competence of regional fisheries management organizations. In the Indian Ocean, IOTC(Indian Ocean Tuna Commission) has already been in place, and for the Central Western Pacific, an early establishment of a regional fisheries management organizations is being considered by MHLC(Multilateral High Level Confference). On the other hand, APFIC has competence only for coastal and aquaculture, and with respect to straddling fish species and highly migratory fish species, the Southeast Asian region is still treated merely as an adjacent waters. With regard to MHLC, it is not possible to predict the course of its discussion because some countries argue that the Southeast Asian region should be included in the Convention area. At least the Philippines and Indonesia--both participants in MHLC-- support the position with the condition of excluding archipelagic waters that the area should be incorporated into the Convention area.

c. Stock Rebuilding

Lately, various types of development have been advanced at a fast speed in the coastal area of Southeast Asia, and there have been an increasing number of cases where beaches and shallow-water areas are transformed by artificial construction. Further, pollution issues as those experienced by Japan in the past have been occurring. Such a situation would not only cause losses of coastal fishery resources but also visibly hamper reproduction capability of fish stock, thus driving it further toward decline or collapse.

When fishery stock is abundant, there may be no need to make substantial effort for Stock Sharing. But, when the stock is declining, the codes and criteria concerning Stock Sharing should be made stringent. Expressed reversely, if Stock Rebuilding is successful, it might be possible to lower the hurdles of political demand for Stock Sharing.

Backside wetland, tideland or mangrove and weed bed and coral reef are essential as environmental components related to fisheries stock in the coastal zone. Shallow-water areas could function properly as spawning and/or nursery ground only when those components are properly in place. From past experience of failure, Japan has been coping with mitigation measures including formation of artificial tideland and seaweed bed. Based on my personal observation, I can cite a case where artificial tideland enabled an 80% recovery of ecological community in half a year, and almost 100% including large-size organisms after three years. I look forward that such mitigation measures in the coastal zone of Southeast Asia would be considered as well.

While environmental rehabilitation is an indirect means of stock recovery, I can point to promotion of ranching and releasing as a direct means of stock rebuilding. This approach is generally known as Stock Enhancement.

In Japan, the Japan Sea Farming Association(JASFA) is taking the lead role in technical development and promotion on breeding and releasing of fish species which suit the regional requirement respectively. For responding the regional requirements individually, the association has sixteen branches throughout Japan. The projects in these branches are covering diverse areas from subarctic to subtropical zones, and the process from fostering of parental fishes, spawning and hatching, nurturing the juveniles to the size eligible for release, and actual liberation into the natural environment are being implemented continuously. The results of these projects have been transferred to prefectural bodies, and hatching and releasing programs are actively promoted in major coastal areas throughout Japan.

5. Conclusion

It has been widely recognized that demersal fish stocks in the Southeast Asian region, especially in the coastal area, are in a stringent situation. Coastal fishermen, in some cases, are forced to move to offshore fishing ground in order to sustain their fishery house keeping or to contribute to national food supply. Further, shift from demersal fish-based fisheries into small pelagics which have relatively high stock elasticity should also be considered. There may be the possibility in the future to advance into distant-water fisheries in accordance with the development of fisheries, including accumulation of capital.

In case transition is intended from coastal fisheries to offshore fisheries or from demersal fishes to pelagic fishes, joint regional and global stock management will be required, and each State is required to straighten up its catch statistics as the minimum obligation to such regional or international organization. Obviously, such a development would harshly oppress entrepreneurial management of fishermen in terms of stock management costs for semi-artisanal fisheries, although pressures are not so severe for large-capital fisheries operating primarily for earning foreign exchanges.

There are no clear-cut international standards in management of shared stock, and framework of management has been constructed over a long span of time on a regional basis

after numerous compromise. In the mean time, many fishery stocks suffered decline.

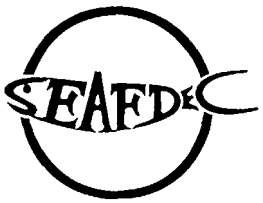
Further, introduction of stock management usually results in control of fishing activities mostly to the discouragement of fishermen. Therefore, it is difficult from realistic point of view to impose control on fishermen without giving them positive future outlook.

It is on the basis of such a perspective that I touched on the possibility of environment rehabilitation and fish farming. As another possibility, one can consider promotion of inland-water fisheries and aquaculture. Especially in case reduction of fisheries production and decline in fishery income is anticipated because of the regulation of fisheries in the coastal area and joint management area, consideration of the possibility of inland-water fisheries must provide a great hope for fishermen.

On a global scale, reduction of fishing capacity is required under the FAO Plan of Action for the management of fishing capacity, and abolition or regulation of illegal unregulated and unreported (IUU) fisheries is called for. Fisheries in some of the Southeast Asian areas are Unregulated and Unreported. The work to develop FAO international plan of action concerning IUU, due to start this year, is sure to affect SEAFDEC member States.

In this circumstances, the establishment of preliminary branch to examine the promotion of inland water fishery and aquaculture by the decision of SEAFDEC deserves high evaluation as an practical effort to reduce the burden on coastal fisheries and to develop a further production of fish.

ANNEX 15



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

MANAGEMENT OF SHARED STOCKS IN SOUTH CHINA SEA: ARE WE READY?

By:

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MANAGEMENT OF SHARED STOCKS IN SOUTH CHINA SEA: ARE WE READY?

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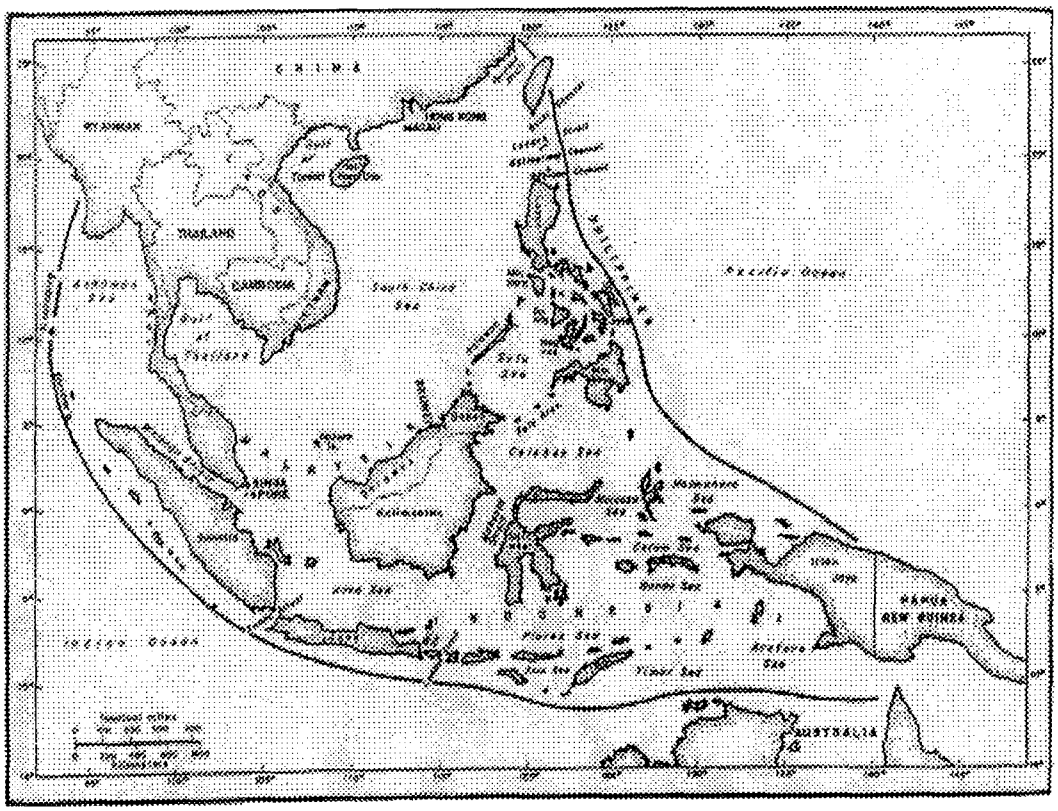
1. INTRODUCTION

South China Sea is bordered by several countries in Southeast and East Asia, including Brunei Darussalam, Cambodia, China, Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam and Taiwan Province of China (see Figure 1). About a half of the South China Sea are shallow continental shelf, most of which located in the south and south-west part and it becomes deeper as we go towards north and north-east area which ends up in the Philippines archipelago. The freshwater influence originates from rivers in the Asian continent and among the big rivers include Chu-Lung Chiang, Pearl and Lien Chiang in China, Red and Mekong in Viet Nam and Chao Praya in Thailand.

Figure 1. The South China Sea region (adopted from Menasveta, 1997)



The South China Sea harbours typical tropical living resources comprising of multitude of species and many of them have short life span. Around hundred species

belonging to more than 40 families are common in the catch of one hour of trawling, except in the overexploited area such number drops drastically. The dynamics of the South China Sea is very much governed by the monsoon regime. Strong wind during North-east monsoon (November to January and sometime extend to February and March) causes relatively uniform surface water layers in the Gulf of Thailand and east coast of Malaysian peninsula due to mixing. During this period the thermocline is indistinct, contrary to the situation in the pre and post North-east monsoon. Typical tropical environment, temperature variation in the water is relatively small, being 28.40 to 29.51 C (average 28.97 C) in the surface water during pre-NE monsoon and 27.78 to 30.76 C (average 29.91 C) during the post-NE monsoon (SEAFDEC, 1999).

Large part of the catches in the South China Sea comes from fishing in the coastal waters by the surrounding countries. Some distant-water fishing nations that have been fishing in the South China Sea for years, such as Japan and Korea, have reduced fishing activities in the region. Taiwan Province of China and Thailand, are the two coastal states bordering the South China Sea that some of their fleet fished outside their EEZ and expanded to the EEZ of neighbouring countries through special arrangement.

2. FISHERIES AND ITS DEVELOPMENT

The fisheries in the South China Sea performed rapid development in the 1970s when global economy started to influence the region. Higher price of fish commodities abroad compared to those in the local market resulted in the boom of fisheries export from coastal states. High demand of shrimp in international market had led to the development of shrimp trawling in various coastal states in Southeast Asia. Rapid development of shrimp trawling in the region has led coastal states preoccupied with development of management measures to response to the urgent needs. The fact that shrimp resources inhabit shallow water, trawl fishing targeting shrimp has resulted in conflicts with small-scale fishermen using other gears such as gillnets, trammel nets and other stationary gears. Various measures were introduced, to reduce such a conflict through enactment of zoning regulation, or regulation on zoning combined with time (day and night) of fishing. Rapid development of shrimp trawling has resulted in the overexploitation of coastal resources. The decline of catch in many coastal states appeared as early as late 1970s or 1980s. Unsuccessful in stopping conflict between small-scale fishermen and trawl fishermen, the Government of Indonesia introduced a drastic measure by banning trawl fishing for area in the western part of the country in 1980.

Due to the decline of shrimp catch from capture fisheries, shrimp culture started to develop in Southeast Asia in mid 1980s through adoption of culture technique previously developed in Japan and later in Taiwan. As a result, shrimp export from the region has revived and the production of shrimp culture has slowly bypassed the production of capture fisheries. Development of shrimp culture has also impacted indirectly on trawl fishing since the demand of trash fish for fishmeal production as main component of feeds has also increased. The rising demand of trash fish led to price increase which gives an incentive for trawl fishing and as a result fishing pressure also intensified.

Another important development of fisheries in the region is the development of tuna fisheries. Similar to shrimp fisheries, the development of tuna fisheries has also been driven by global market. Despite limitation of tuna resources in their own exclusive economic zone (EEZ), Thailand, through various incentive policy, has managed to become the centre for

tuna processing in the region. The processed tuna are exported to global market, many of them to USA. This has been followed by the Philippines, which relies largely on tuna catch from the Pacific Ocean than the South China Sea. Tuna catches in the South China Sea are dominated by kawa-kawa (*Euthynus* spp.) and bonito (*Auxis* spp.). They belong to shared stocks resources as they migrate across EEZ of various states in the region. The presence of skipjack (*Katsuwonus pelamis*) and yellowfin tuna (*Thunnus albacares*) in this region seems to be common to the most eastern part of the South China Sea close to the Philippines as such species are not reported in the statistics of Cambodia, Viet Nam, Thailand and Malaysia. Seerfish, *Scomberomorus* spp., is another important tuna group common in the region while sailfish (*Istiophorus* spp.) and marlin (*Makaira* spp.), are only common in the north-eastern part of the region.

Other important potential shared stock resources in the South China Sea are those belonging to the small pelagic group such as mackerels (*Rastrelliger* spp.), scads (*Decapterus* spp.), sardines (*Sardinella* spp.), anchovies (*Stolephorus* spp.). The development of these small pelagic fisheries is not so rapid compared to shrimp and tuna fisheries as those are mostly for domestic consumption. The exception is the anchovy fishery which has recently showed fast development in Thailand, a similar case as was driven by the high price of anchovy in the neighbouring countries especially Malaysia, Hong Kong, Singapore. Despite the existence of these shared stocks in the region and the awareness of officials in the coastal states on the need for regional management, there has been no such a regional management initiative in place.

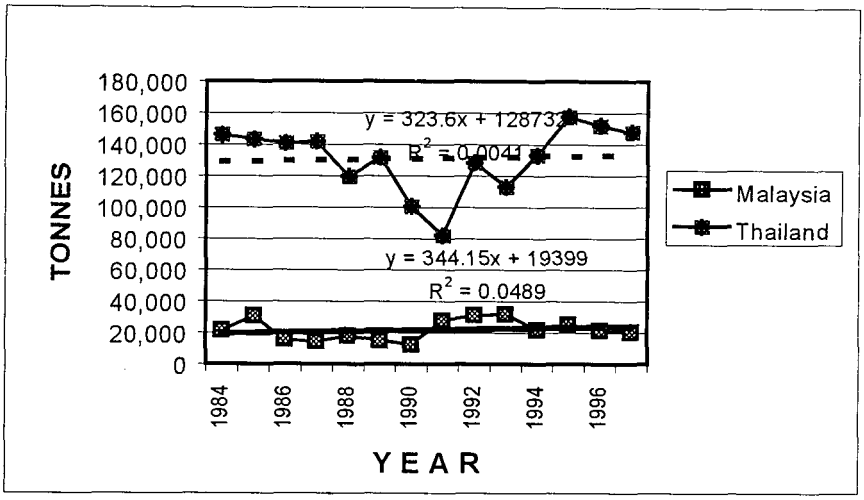
3. TREND OF CATCHES OF SOME SHARED STOCKS

Although information on potential shared stocks and their distribution have been gathered by SEAFDEC through a series of workshop and a review study by APFIC (Asia-Pacific Fisheries Commission, see Devaraj and Martosubroto, 1997), it is still difficult to be able to see trend of catches by stock. This is because the catch statistics by country do not differentiate stock by stock, and catches of species groups for some countries are lumped together. Only catch of some potential shared stocks is available in the FAO statistics (for some countries) which lends some analysis as presented below. The statistics of Malaysia and Thailand have been used to see the trend of catch of those potential shared stock. Catches from other countries were not included either because they were not broken down into detailed species group (in the case of Cambodia and Viet Nam) or they were mixed with catch from area outside the South China Sea (Indonesia and the Philippines).

3.1 Short mackerels (*Rastrelliger* spp.)

Trend of catch of this group in Thailand and Malaysia in the period of 1984 to 1997 shows similar trend. Although catch of Thailand had been higher than that of Malaysia (see Figure 2), both shows similar level of trend. The catch of Thailand had fluctuated between 80,000 to 160,000 tonnes during the period, while the Malaysian catch fluctuated between 15,000 and 25,000 tonnes. The overall catch difference between these two countries could be attributed to the different level of fishing pressures in those countries.

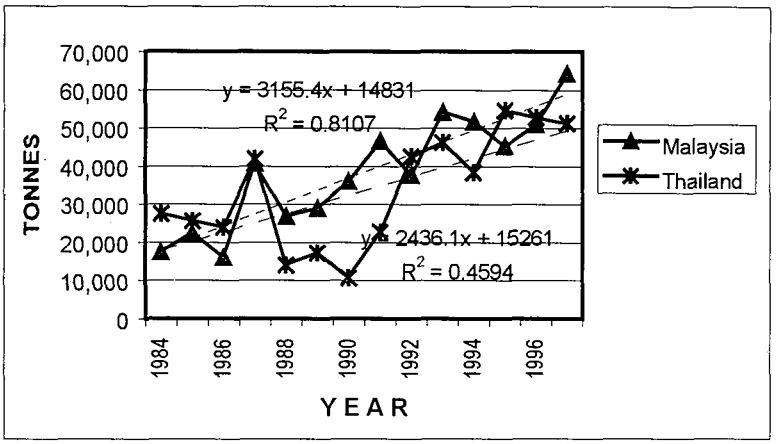
Figure 2. Trend of short mackerels, *Rastrelliger* spp. in the South China Sea off Thailand and Malaysia



3.2 Round scads (*Decapterus* spp.)

In the case of round scads the catch of Malaysia had been a bit higher than that of Thailand, although the fluctuation of catch seems to be not much different (see Figure 3). It appears that the rate of increase of the Malaysian catch is higher than that of the Thai catch during the period 1984 to 1997, although the rate in the last five years (1992-1997) looks similar.

Figure 3. Trend of catch of round scads, *Decapterus* spp. in the South China Sea off Thailand and Malaysia

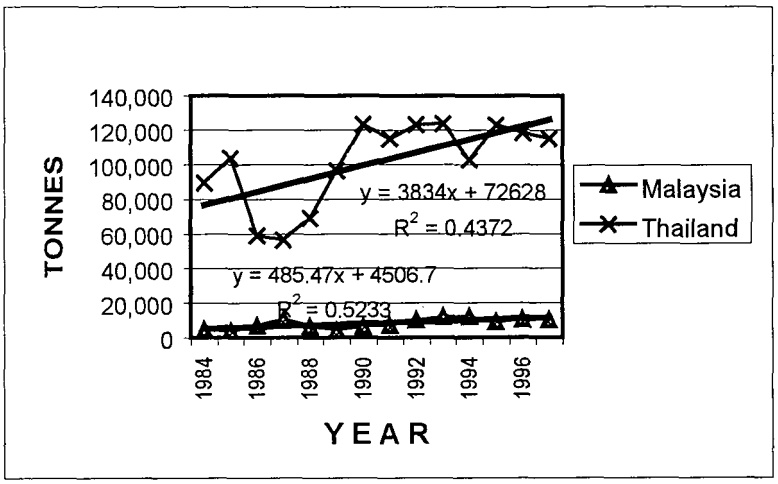


3.3 Anchovy (*Stolephorus* spp.)

In the case of anchovy, not only the amount of catch in Thailand had been much higher than in Malaysia but also the catch showed higher fluctuation (see Figure 4). The catch of Thailand has been relatively constant around 120,000 tonnes from 1990 to 1997 with a special drop in 1994 to around 100,000 tonnes. In Malaysia the catch had fluctuated between

5,000 and 10,000 tonnes during 1984 – 1997. High level of fishing pressure in Thailand may explain this difference.

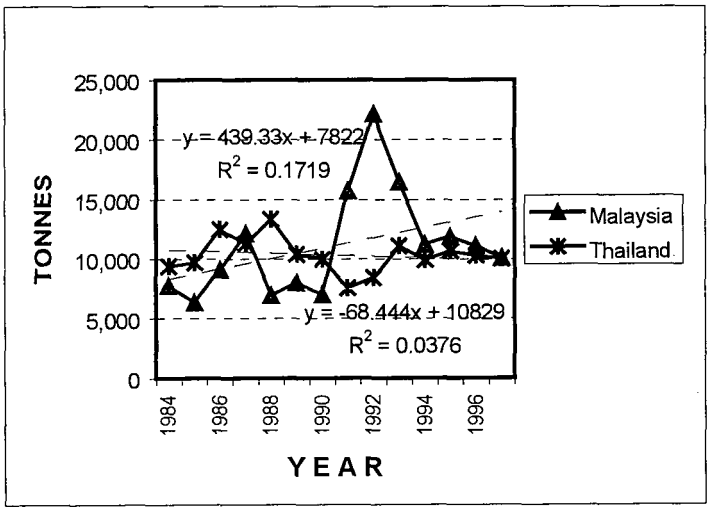
Figure 4. Trend of catch of anchovy, *Stolephorus* spp., in the South China Sea off Thailand and Malaysia



3.4 **Seerfish** (*Scomberomorus* spp.)

For the seerfish, the catch of Malaysia and Thailand around 10,000 tonnes each in the last 5 years (see Figure 5), although there was a sharp jump in 1992 for Malaysia which reached 20,000 tonnes. The Malaysian catch showed an overall increasing trend, while the Thai catch somewhat decreasing trend.

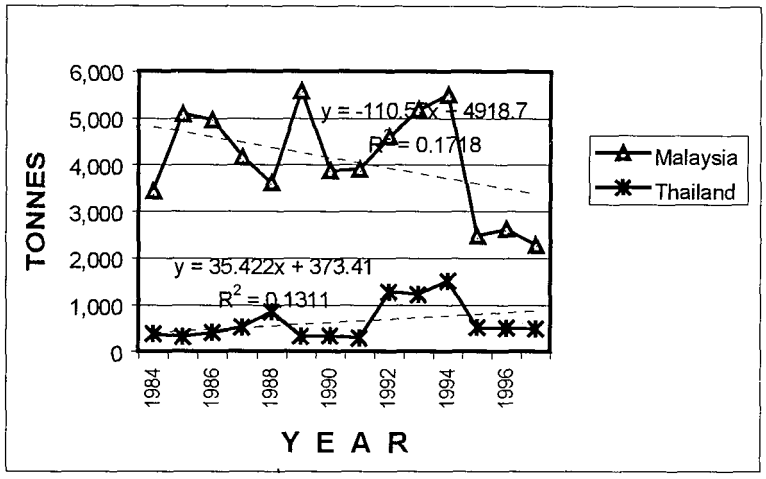
Figure 5. Trend of catch of seerfish, *Scomberomorus* spp., in the South China Sea off Thailand and Malaysia



3.5 **Pomfret** (*Stromateus* spp.)

Pomfret is one of the high priced fish in Southeast Asia. It is interesting to see that trend of catches of Malaysia and Thailand is on the opposite direction. The catch of Malaysia shows a declining trend in the last four years (see Figure 6), the catch was around 5,000 tonnes in 1985 and dropped as just over 2,000 tonnes in 1997. On the other hand, the catch of Thailand had increased from less than 500 tonnes to more than 1,000 tonnes in 1994 but then declined again to around 500 tonnes. The lower catch in Thailand compared to Malaysia is interesting phenomena as in most catches the figure is in reverse. It could be that the high catch of Malaysia has been contributed by the high catch of Sabah and Serawak.

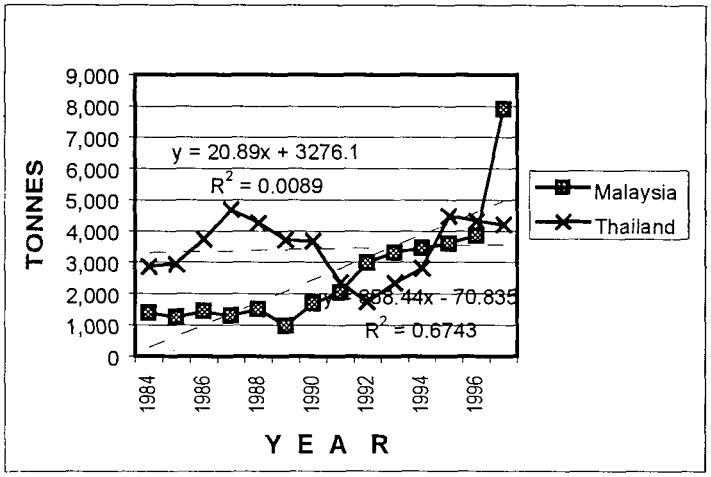
Figure 6. Trend of catch of pomfret, *Stromateus* spp., in the South China Sea off Thailand and Malaysia



3.6 **Hairtail** (*Trichiurus* spp.)

It is interesting to see that the catches of hairtail in Malaysia showed a steady increase from 1984 to 1997 and in particular in the last 7 years (see Figure 7) with the top catch of 8,000 tonnes in 1997. While for Thailand the catches had shown a clear fluctuation in the range of 2,000 to 4,500 tonnes. It is not clear whether the rapid increase of catch in Malaysia beginning in 1990 was attributed to the development of offshore fishing promoted in this country.

Figure 7. Trend of catch of hairtails, *Trichiurus* spp., in the South China Sea off Thailand and Malaysia



4. BRIEF REVIEW OF FISHERIES MANAGEMENT IN THE REGION

4.1 National context

Fisheries in many coastal states in the South China Sea that started in 1970s underwent rapid development. Cambodia and Viet Nam are those who came later due to social conflict and wars that occurred in those countries before 1970s. The rapid development of fishery in many coastal states has led to overexploitation of resources in the coastal areas, especially for those high valued resources such shrimp. Another impact is emerging conflict in the coastal area between small-scale fishermen using traditional gears and trawl fishermen. Various management measures have been enacted by many coastal states to cope with problems arisen in the fisheries (see Table 1). Some countries were able to reduce this conflict but by enlarge the conflict stopped only temporarily as it very often emerged again in different time and in certain case it could lead to the complete ban of the gear as it happened in Indonesia for the trawl fishery.

Table 1. Type of management measures enacted in the South China Sea

Type of management measure	BR	CA	CN	INS	MA	PHI	TH	VIE
• Mesh size limit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Spatial & temporal closure	No	No	Yes	No	No	No	Yes	No
• Zoning (area allocation)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
• Complete gear ban	No	No	Yes	Yes	No	Yes	Yes	No
• Use of BED (by-catch excluder device)	No	No	No	Yes	No	Yes	No	No
• Limited entry	Yes	No	No	Yes*)	Yes	Yes	No	No

Note : BR = Brunei Darusslam; CA = Cambodia; CN = PR China; INS = Indonesia; MA = Malaysia; PHI = Philippines; TH = Thailand; VIE = Viet Nam; *) only for Arafura Sea

Management measures adopted, in many cases, are not specific for a certain area or a certain management unit but rather for the whole EEZ of a country. The complex nature of tropical resources characterized by unclear discrete stocks seems to have hindered application of the concept of management by stocks. This seems to have resulted in the absence of management unit and thus also management plan for certain fisheries or resources.

It seems that open access principle is still in the mind of many fisheries officials of countries in the region as reflected by the absence of limited entry in many fisheries. Added to this is the concept of integrated approach that seems to have been popular in the region, unfortunately only in theory and lack in practice. A good example is powerless of the Department of Fisheries in making decision for matters closely link to fisheries, e.g. construction of fishing boats and processing plants. Very often DOF does not have MCS units and therefore it relies on the work of other agencies to support the management of fisheries.

Overexploitation of fishery resources is not limited to South China Sea but it is common globally. This has led to the initiative by world community in curbing overexploitation problems in fisheries and has resulted in the formulation of the Code of Conduct for Responsible Fisheries (CCRF) which was finally adopted in 1995. CCRF provides general principle and guidelines of responsible fisheries. Technical Guidelines in various thematic aspects are also available as companion to CCRF. FAO was requested by member countries to monitor the implementation of CCRF.

Review of the fisheries management framework in coastal states bordering the South China Sea by APFIC disclosed that despite the availability of management institutions and legal framework supporting the management in most of the countries, overexploitation and habitat degradation are still rampant in this region (Menasveta, 1997). Therefore, opportunities to strengthen existing fisheries management agencies in the region to assure sustainable and responsible fisheries are still open. FAO through funding support from Norway has assisted some countries in the region in improving provision of scientific advice to fisheries management and in strengthening MCS, the two important elements of fisheries management. The principle of developing management plan for a fisheries has been addressed and discussed thoroughly during the workshops in Denpasar (Indonesia), Penang (Malaysia) and Cha-am (Thailand) (FISHCODE, 1999). The concept of developing a management plan for a fishery is important, however any management plan would not be fruitful if the concept of limited entry is not advocated. Implementation of management is a painful undertaking as it involves trade-off of interests among stakeholders concerned. It is a prerequisite that representatives of all stakeholders concerned should participate in the development of management plan. No management plan is perfect as it evolves through time during which regular review is normally conducted.

4.2 Regional context

There are regional organizations in the area that deals with fisheries. FAO/APFIC is the oldest organization in the region dealing with fisheries as it was established in 1948 as IPFC (Indo-Pacific Fisheries Council). The role of APFIC is to assist member countries in the provision of advice in fisheries development and management. SEAFDEC is another organization that assists member countries in the region and SEAFDEC has been active in organizing training, research and development for capture fisheries as well as aquaculture. The presence of SEAFDEC in the region has allowed various regional surveys in the South China Sea in the effort to develop base line information on oceanography and other environmental parameters, an important component towards understanding the dynamics of shared resources in the region.

Another important organization that specifically deals with fisheries research and development is the International Center for Living Aquatic Resources Management (ICLARM) who became a member of CGIAR in 1995. ASEAN (Association of Southeast Asian Nations) is a political organization in the Southeast Asian region which in the past had its subsidiary unit dealing with fisheries (ASEAN Coordinating Group of Fisheries), however its abolishment in 1989 has led to the *ad hoc* approach by ASEAN as it be formed when special issues arises. However, the private sector in fisheries has established ASEAN Fisheries Federation where cooperation among businessmen in fisheries sector meet, although their agenda are far from discussing management issues. None of the existing organizations in the region has a mandate for the management of fisheries. Most countries

bordering the South China Sea are members of two or three regional organizations (see Table 2 and Fig. 8).

Table 2. Regional organizations and their individual members bordering the South China Sea

COUNTRIES	APFIC	ASEAN	SEAFDEC
Brunei Darussalam	No	Yes	Yes
Cambodia	Yes	Yes	No
China, P.R.	Yes	No	No
Indonesia	Yes	Yes	No
Malaysia	Yes	Yes	Yes
Philippines	Yes	Yes	Yes
Singapore	No	Yes	Yes
Thailand	Yes	Yes	Yes
Viet Nam	Yes	Yes	Yes
Japan*)	Yes	No	Yes

Note : Japan is the only country not bordered by the South China Sea

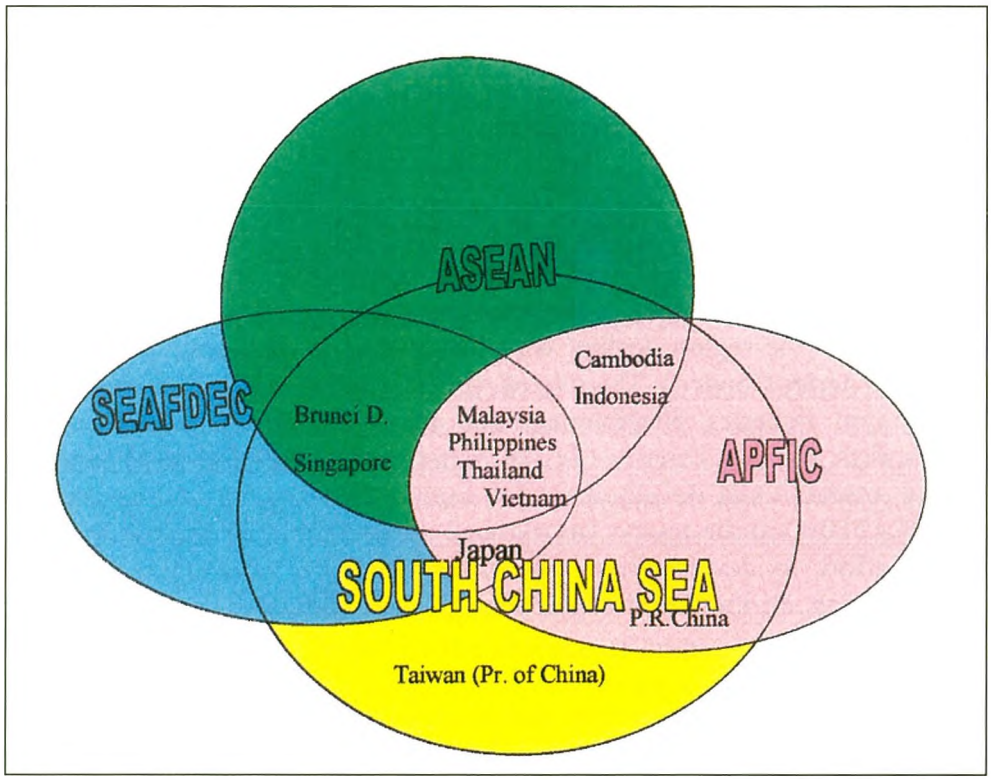


Figure 8. Regional organizations and their members in the South China Sea.

5. MANAGEMENT OF SHARED STOCKS

The development of fisheries management in countries in the region should now be enhanced by the availability of CCRF including its various technical guidelines. Fisheries management deals with allocation of resources and therefore participation of stakeholders in the process of developing management plan is a forefront requirement. It is the responsibility of fisheries management agency to promote this CCRF among stakeholders, in particular for those parts dealing with fisheries management. Therefore, management agency in individual countries should be well in place, should have a strong support of MCS unit, research establishment and more over it should also be supported by stakeholders. Only through an established and strong national management unit an initiative for management of shared stocks would have a good foundation. The incomplete boundary of EEZ in the South China Sea should not be an impediment in enhancing co-operation but on the contrary it should be an incentive for coastal states in addressing the need for management of stocks shared by them. ASEAN Fisheries Working Group has identified various places in the border area of two or more countries as joint development area, but it is not clear whether CCRF is already part of it. It is opportune for this ASEAN working group to take into account the principle of responsible fisheries in developing joint co-operation scheme, thus, shared stock management should be a part of it.

With the increase of globalisation, some developed countries have used trade as a tool to promote sustainable and responsible fisheries (Deere, 1999). Eco-labelling is one of the emerging practices in the global trade. USA has used TED/BED issue as a means to reject shrimp import from any country which do not use TED/BED in the shrimp fisheries. Dolphin safe is another label that required for tuna imported to USA. Through time this kind of international pressure will keep emerging. It becomes clear therefore that strengthening national management institution by coastal states bordering the South China Sea should form an important agenda for the Fisheries Department in the individual countries. Regional and international organizations will then play an important role in enhancing management of shared stocks, hand in hand with the management of national stocks by individual coastal states to enable them ready with the management of shared resources.

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ANNEX 16

Annex 16

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

REGIONAL FISHERIES STATISTICS OF THE SOUTHEAST ASIAN REGION

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REGIONAL FISHERIES STATISTICS OF THE SOUTHEAST ASIAN REGION

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1. INTRODUCTION

Purpose of the Paper

The purpose of this paper is to introduce briefly SEAFDEC planned strategies and actions for improving fishery statistics and its systems of Southeast Asian countries in light of development and management of sustainable fisheries with an emphasis on management of shared stocks. The paper also emphasizes that strengthening of national fishery statistical systems as well as sustainable data collection systems should be promoted as the long-term approach for management of sustainable use of shared fish stocks in Southeast Asia.

Background

Many countries have embarked upon innovative programs and policies to ensure the development and management of sustainable fisheries in Southeast Asia. The need for relevant, reliable, and realistic statistics for formulating and evaluating fishery programs and policies has inevitably expanded manifold for development and management purposes. Fishery statistics and its systems, by the nature, serve national needs and depend upon national administrative structure. The development of a national fishery statistical system is a national subject, which may well satisfy both local and national requirements. Strengthening of fishery statistics then appears to limit only to national actions.

However, with the accelerating problems, which are common to regional countries such as resource depletion, conflicts over resources particularly shared fish stocks and so on, coupled with various international requirements such as those of UNCLOS relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the UN Fish Stocks Agreement), the Code of Conduct for Responsible Fisheries (CCRF), etc., the regional aspect of fishery statistical systems has therefore become increasingly important. In this connection, it is timely that countries in the region should move forward to take necessary actions

to promote common approaches in standardizing data collection, so that the region could use the data with greater value. Such perspectives and actions will ensure sustainable data collection and further strengthening of fishery statistical systems in the region.

The need of a sustainable data collection should not be limited to individual countries alone but the prospect of having an integrated fishery statistical system among countries in the region should also be looked upon. If the region can collect, collate and analyze fisheries data on a more detail basis, it is confident that such data and information can be of prime importance for the fisheries management and development on a regional basis. Data and information on shared fish stocks could be more fully understood so that such stocks could be exploited more responsibly for the benefit of countries in the region. Countries could make informed decisions on joint ventures reducing risks and failures. With such information, countries in the region could work closely to ensure that fisheries management, planning and development could be done on a broader basis to benefit all countries in the region. Having an integrated fishery statistical system and also common approaches in data collection would also ensure more effective results from joint fisheries research. This therefore implies that mobilization and coordination among regional countries in the integration of data, information and experience is highly essential.

2. RECENT SEAFDEC INVOLVEMENT IN THE STRENGTHENING OF FISHERY STATISTICS IN SOUTHEAST ASIA

It has been a number of occasions that SEAFDEC was requested by its member countries to pay greater efforts in developing fishery statistics in the region. At the last SEAFDEC Council Meeting in March 1999, the Council took note of the proposal on the improvement of fishery statistics in Southeast Asia in the view of relevant, accessible, reliable, realistic, comparable and timely information for formulating and evaluating fishery programs and policies. It was also suggested that the issue be placed under the SEAFDEC-ASEAN Fishery Consultative Group (FCG), a new collaborative mechanism of fisheries in the region, in order to gain greater political supports from the regional countries. Moreover, it was also emphasized at the last SEAFDEC Program Committee Meeting in November 1999 that SEAFDEC should further develop relevant programs and coordination to improve fishery statistics in the region.

Back in October 1998, an important milestone was marked when SEAFDEC convened the Consultation of Senior Administrators and Managers on the Strengthening of Fishery Statistical Systems in Southeast Asia. The Consultation adopted recommendations on appropriate actions for of the improvement of fishery statistical systems as well as long-term regional cooperation for fishery statistics in Southeast Asia. These include promotions of standardized classification of data as required at the minimal level for a national fishery statistical system, development of human resources at different levels, regionally comparable data systems, etc.

In addition, with the recent meeting of APFIC on the Ad-hoc Working Group of Experts in Capture Fishery Data Collection held in September 1999 where in SEAFDEC also participated, the regional countries have made a step forward in promoting common approaches and sustainable data collection systems. In addition, the meeting also reviewed the Guidelines for the Routine Collection of Capture Fishery Data, which could be used as one of the important references for fishery statistical development programs in the future.

3. STRATEGIES AND ACTIONS REQUIRED FOR IMPROVEMENT OF FISHERY STATISTICS

Based on recommendations made at various occasions, SEAFDEC has identified four main strategies for improvement of fishery statistics, namely, strengthening of national fishery statistical systems; promotion of data exchange and regionally comparable data systems, development of human resources at various levels; and coordination and collaboration among member countries and concerned agencies.

Strengthening of national fishery statistical systems

SEAFDEC is now developing a plan of actions for improvement of fishery statistics in Southeast Asia for submission to the next Council Meeting in coming March. This long-term strategy takes into consideration the Minimum Requirements of a National Fishery Statistical System with a step by step approach as the point of departure coupled with the promotion of a coordinating mechanism on fishery statistics at the national level to facilitate the strengthening. The improvement of quality of data as required for fishery development and management is also focused. It is also expected that through the SEAFDEC-ASEAN FCG mechanism after the approval of the Council of SEAFDEC, ASEAN would provide a strong support on the plan. The dissemination of the regional plan of actions will then be followed to create awareness on the issue.

SEAFDEC has also acknowledged different level/status of data collection and statistical systems in various countries. This has led to a new SEAFDEC pipeline project in collaboration with ASEAN on research in national fishery statistical systems. However, further elaboration and coordination with ASEAN is still on going.

Promotion of data exchange and regionally comparable data systems

SEAFDEC will continue the compilation of fishery statistics particularly catch and effort statistics to promote data exchange among countries in the region. It is planned that more meaningful/analyzed information based on statistical data will be developed in line with the requirements for management of fisheries.

With the assistance of internet technology, SEAFDEC is simultaneously developing its Digitized Atlas to accommodate databases of the compiled data to provide access to wider audience. Use of e-mail network through a dedicated e-mail of SEAFDEC; *statgroup@seafdec.org*, is a mechanism to facilitate exchange of data and information.

In addition, SEAFDEC recognizes that the Guidelines for Routine Capture Fishery Data Collection could be used as an important reference to promote regionally comparable data systems. Where appropriate, SEAFDEC will develop relevant programs for the purpose.

Development of human resources at various levels

SEAFDEC has planned to organize training for various target groups on collection and compilation of fishery statistics, routine capture fishery data collection, bio-statistics application for stock assessment, etc. in order to strengthen the national capabilities in data collection and information analysis. However, due to the insufficient resource persons, SEAFDEC would collaborate with international organizations such as FAO to develop appropriate programs. In addition, workshops/consultation when appropriate will be organized to exchange views and experience among national administrators and managers of fishery statistics.

Coordination and collaboration among member countries and concerned agencies

SEAFDEC plans to promote coordination and collaboration among SEAFDEC Departments and member countries as well as among other related organizations to avoid duplication of efforts but rather make it supplementary. The Regional Fisheries Policy Working Group (WGRFP) established at the Secretariat and the Technical Forum for Regional Fisheries Policy (TFRFP) would help facilitating such actions.

4. CONCLUSION

It should be recognized that improvement of fishery statistics in the Southeast Asia is substantially important for the development and management of sustainable fisheries in particular the shared fish stocks. Fishery statistics maintained at national levels should be regarded as the main source of information for the long-term and sustainable management of shared stocks. Along this line, strengthening of national fishery statistical systems and promotion of sustainable data collection systems for management of shared stocks should be given a first priority to fulfil the purpose.

Since the arrival of MV SEAFDEC in 1995, SEAFDEC has promoted the Collaborative Fishery Resource Surveys to obtain information and data for better insights of fishery resources. Due to the nature of the fishery resource surveys that much time is required for the interpretation of data and information, and the financial implication is substantial, the activities should be regarded as a supplementary source of information to the national fishery statistical systems providing a frame, which could be used for an interval of 10 or 15 years for further focused studies on ad-hoc or need bases.

The regional cooperation in the development and management of fisheries particularly on shared fish stocks is substantially important. The cooperation should take into consideration the sustainable data collection systems, human resources development for fishery statistics, exchange of data and information, etc.. In this connection, SEAFDEC will collaborate with the international organization like FAO for technical supports to facilitate the tasks. And lastly, the administrators and managers of fishery statistics should be encouraged to play a proactive role as they are providing a foundation for fishery scientists to assess the status of fishery resource and fisheries for management purposes.

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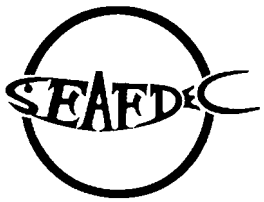
ANNEX 17

Annex 17



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

OPTIMIZING THE APPLICATIONS OF MARINE GEOGRAPHICAL INFORMATION SYSTEM (MARINE GIS), IN FISHERY RESEARCH AND RESOURCE MANAGEMENT IN SOUTHEAST ASIAN REGION

By:

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Optimizing The Applications of Marine Explorer, A Marine Geographical Information System (GIS), In Fishery Research and Resource Management In Southeast Asian Region

By

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ABSTRACT

This paper describes a project that has just been initiated by MFRDMD, to promote the application of Marine Explorer, a marine Geographical Information System (GIS), in fisheries research and resources management in the Southeast Asian region. Features and functions of Marine Explorer are briefly described. Two case studies are reviewed. Steps to materialize the application of the GIS in fishery research and resources management for this region are also listed and discussed.

Key word: Geographical Information System, Acoustic survey, Marine Explorer, Fisheries Research and Management

Introduction

Geographical Information System (GIS) is a powerful tool capable of organizing, analyzing and displaying spatial explicit data, with a better speed and accuracy compared to the conventional approaches. It comprises of a collection of integrated of computer hardware and software which together is used for inputting, storing, manipulating, analyzing and presenting a variety of geographical data, to assist in formulation of firm and precise decisions, immediately. Therefore, GIS has been widely applied in many areas such as in agriculture and land use planning, forestry and wildlife management, archeology and geology (Aronoff, 1995). However in the fisheries sciences especially the marine sector, applications of GIS have presently been very limited (Isaak and Hubbert, 1997; Meadan and Chi, 1996). Some reasons for GIS has been slowed to materialize have been listed by Meadan and Chi (1996), among which are lack of recognition of spatial aspects in fisheries management, the cooperation problems which need to overcome in data collection and lack of suitable data base in many areas of fisheries resources.

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However, continuous over exploitation and declining fish stocks indicating the needs for spatial and integrated strategies in fisheries management is imperative. GIS which is able to answer questions such as what is at....?, how big/long is...?, where is....?, what has change since...? what spatial patterns exist...? and what if...?, undoubtedly to be the most efficient of all available tools. Therefore, its application in marine fisheries has to be promoted.

The Features and Functions Of Marine Explorer

Marine Explorer is a new GIS that has been developed by the Environmental Simulation Laboratory, Inc., Japan, purposely for the utilization and analysis of oceanographic and fishery data (Itoh, 1999). This GIS has first been released in 1996 with instruction in Japanese language. However in early 1999, the version 3.0 with English language instruction has been released. This new version of Marine Explorer was demonstrated in the First International Symposium in Fishery Science at Seattle in March 1999, and has been noted as the best GIS to be promoted for marine fisheries application.

The Marine Explorer has designed to perform seven types of function: data base, horizontal distribution, vertical distribution, overlay map, creation of map, spatial analysis and 3D Viewer. However, for the Version 3.0, only data base, horizontal distribution and overlay map have been fully developed. The developments of the other four functions are in progress.

Marine Explorer accepts data from various applications such as Lotus, Excel and Access. The data need to be arranged in vector format, prior conversion and registration by Marine Explorer. Six types of distribution could be mapped i.e. symbol, contour, trace, image, vector and observation station. Various types of distribution could be overlaid to observe the correlation.

Case study 1 : Spatial Analysis Of The Acoustic Survey Data For Marine Fish Resources Within the Malaysian Economic Zones (EEZ)

The background of the study

Details of the study were described by Rosidi et al (1999[1]). The aim of this analysis was to understand the spatial distribution of fish in EEZ's of Malaysia. In 1998,

Department of Fisheries, Malaysia had carried out acoustic surveys covering almost all EEZ waters of Malaysia. The surveys off west coast of Peninsular Malaysia, east coast of Peninsular Malaysia and East Malaysia were conducted on March 24 to 30, May 24 to June 6 and July 8 to August 5 respectively. A training vessel belongs to the Department of Fisheries Malaysia, K.L. CERMIN, was used in the survey. The scientific echo-sounder, FQ-70M, was applied for the survey. Samplings of the oceanographic parameters were also conducted simultaneously with these acoustic surveys.

The Department of Fisheries, Malaysia had hired a consultant company from Japan, Sasa Labo. Co., to supervise and assist the local researchers in processing and analyzing the data.

Materials And Methods

The analysis was done in a ten days workshop from September 26 to October 7, 1998 at MFRDMD, as part of the contract between the Department of Fisheries Malaysia and Sasa Labo. Co. The hardware and software used in the analysis were provided the National Research Institute of Far Sea Fisheries, Japan, and the Environmental Simulation Laboratory, Japan.

Electrical based maps and bathymetry of the study areas were created in Marine Explorer. The estimated fish densities data compiled from Sasakura (1998), were transferred to the vector format, to enable them to be input into the Marine Explorer. Ranks of the densities were evaluated with basic statistics in order to standardize the symbols for all the areas. Based on this, the data were grouped into five classes of symbols at levels 20%, 40%, 60% and 80%. The distributions of fish densities were map using the Marine Explorer.

The same data of estimated fish densities were used to develop contour maps. Since the contour function in Marine Explorer has yet to be developed at that time, Surfer software was applied to estimate the contour values. The original density (point) data were transfer into the Surfer to get the contour value by pixel (5' x 5' basis). The data in the vector format were presented in continuos symbols so that the area based contour maps could be developed. The five levels of classes (similar to the once used in Marine Explorer) of different colors were chosen.

The maps of fish densities developed in Marine Explorer were the overlaid into the contour maps developed in Surfer to produce the final maps.

Results and Discussions

Map of the distribution and the contour of fish densities off west coast and east coast of Peninsular Malaysia is as shown in Figure 1. In the west coast of Peninsular Malaysia, it appears that the fish density is independent of water depth. The depth of water in this area is uniform and shallower than 50 m. High fish density area was observed in the northern part the areas, especially in the coastal waters. The fish density was relative low in the central part of the area. Raja Mohammad Noordin (personal comm.) reported that a convergence zone occurred in the offshore waters of the northern areas (off Penang) during the survey. Water from the north flowed southward but was prevented from flowing further by a strong underwater current, which flowed in a northward direction. The southern waters tapered off and flowed near shore in a northerly direction in north of Penang towards Kedah waters and then into waters between Perlis and Pulau Langkawi. The area of convergence indicated the down-welling of water and this would produce upwelling in adjacent areas. These phenomena would induce richness of water in areas and capable of aggregating higher density of fish.

In the east coast of Peninsular Malaysia (Figure 1), high fish density was concentrated in the deeper waters, offshore of the northern part. The survey was conducted in March, just after NE monsoon. Rosidi et al (1997) found out that during pre NE monsoon, pelagic fish concentrated at the upper part of the Gulf of Thailand. Mansor and Abdullah (1995) and Anon (1987) suggested that during post NE monsoon, these pelagic fish would move out to the offshore waters of the South China Sea.

In the East Malaysia high fish densities were observed in the coastal waters and in the continental shelf zone off Sarawak (Figure 2). Hadil Rajali (personal comm.) suggested that the appearance of coastal waters and the occurrence of upwelling seems to have close relationship to the distribution of fish in the areas.

Case Study 2 : The Affect Of Northeast Monsoon On The Distribution Of Fish Abundance Off East Coast Of Peninsular Malaysia

The Background of the study

Details of the study were described by Rosidi et al (1999[2]). The aim of the study is to observe the change in fish distribution due to Northeast monsoon. Analysis was based on three acoustic surveys were currently carried off east coast of Peninsular Malaysia. The first and the second surveys were carried out by M.V. SEAFDEC, a training vessel belong to the Training Department, SEAFDEC (Rosidi et al 1998). The former was conducted in September 1995, during the pre Northeast monsoon whilst the later was conducted in April to May 1996, during the post Northeast monsoon. The third surveys was carried out by K.L. CERMIN, a training vessel belong to the Fisheries Training Institute, Department of Fisheries, Malaysia, in May to June 1998, which was during off season of Northeast monsoon (Sasakura, 1999). The scientific echo-sounder used in the first two surveys were FQ-70 and in the third survey FQ-70M was used. Both equipment is similar in specification and is comparable. All the three surveys were aimed to estimate fish biomass in the area.

Materials and Methods

The average values of the back scattering area (SA) from the three acoustic surveys that had been carried out currently off east coast of Peninsular Malaysia were compiled (Note: SA values are index of fish availability). Only the SA values happened to be surveyed on the same transacts or stations for the three surveys were selected and used in the analysis. A total of 66 data of SA values were selected i.e. 22 data for each survey. All SA values were linked and analyzed for percentile rank using basic function in Excel to standardize the range at 0%, 20%, 40%, 60%, 80% and 100%. Based on these, five ranges of distributions were endorsed in Marine Explorer (i.e. 0% to 20%, 20% to 40%, 40% to 60%, 60% to 80%, 80% to 100%).

The SA data were arranged into the vector format, to enable them to be treated and analyzed by the Marine Explorer. The distributions of SA values for the three surveys were then mapped individually using the Marine Explorer and the maps were compared.

Results and Discussion

Distributions of SA value s off east coast of Peninsular Malaysia for the three surveys are shown in Fig. 3, Fig. 4 and Fig. 5 respectively. High concentrations of SA values were observed at the northern part of the study area in the first survey (Fig. 4) and in the third survey (Fig. 5). However, in the second survey (Fig. 4), the SA values were relatively low and scattered.

The SA values are index to indicate the availability of fish resource, and therefore the fish abundance within the survey area. Findings from this analysis, therefore indicated that the most potential fish ground off east coast of Peninsular Malaysia is probably in northern part of the waters.

The findings of this analysis also indicated that the fish abundance was concentrated during off season (starting in May) to pre season of Northeast monsoon. However after the monsoon, the fish were dispersed and move out to the offshore waters of the South China. The same conclusions were derived by Department of Fisheries Malaysia (1987) and Mansor and Abdullah (1985).

Programs Of SEAFDEC/MFRDMD To Promote And Optimize The Application Of Marine GIS In The Southeast Asian Region

The general objective of MFRDMD, the forth department of SEAFDEC, which has been established in 1992, is to provide assistance to the member countries of SEAFDEC for development and management of marine fisheries resources in waters of Southeast Asia. Since then, this department has played her role actively to achieve the above objective, such as coordinating and conducting researches, training, seminars, workshop and dissemination of information. In parallel with the above activities, the department has always looked forward for the possibilities to venture into new scopes or disciplines and also to be equipped by the most advanced and sophisticated tools. As the center for sustainable development and management of marine fisheries for the Southeast Asian region, MFRDMD has realized the necessity to promote and optimize the application of marine GIS in the region. In line with these, the department has taken the initiative to

introduce and promote the application of Marine Explorer, a marine GIS, in this region. Some of the activities that have been considered by the department are:

1. To be fully equipped and familiarized with GIS facilities.
2. To analysis on the correlation of marine fish distribution to the marine environment in the EEZ of the member countries.
3. To participate in the regional and international activities concerning the application of GIS in marine fisheries.
4. To introduce and train researchers from the member countries on the application of Marine Explorer.

A unit of marine GIS facilities comprises hardware (computer and printer) and software (Marine Explorer) has been established at MFRDMD in 1999. The activity at present is mainly to familiarize the application of the marine GIS. Two series of training had been conducted in 1999, coordinated by Environmental Simulation Laboratory Inc, Japan. Another training is planned to be in February 2000. At the same time, data of the resource surveys, oceanographic and biological studies within EEZ of the member countries will be compiled for further analysis. In 1999, MFRDMD participated in two international functions to present works on the application of Marine Explorer (Rosidi et al 1999[1], 1999[2]). Application of Marine Explorer has also been introduced into the regional training course on acoustic held at MFRDMD. Another activity that would to be considered is to establish regional team to work on Marine Explorer. GIS does not necessary to stand alone as a discipline. It is a tool to be fully applied in fisheries research and management. Those involve in this field should be exposed to this technology.

Acknowledgements

We wish to thank the Chief of MFRDMD, Mr. Ismail Taufid bin Md. Yusoff and the Deputy Chief of MFRDMD, Mr. Hitoshi Fujita for their support to establish GIS facilities at MFRDMD, which enable us then to perform this project. We also wish to thank the organizing committee of the 4th Regional Workshop On Shared Stock for giving us the opportunity to present our tiny work.

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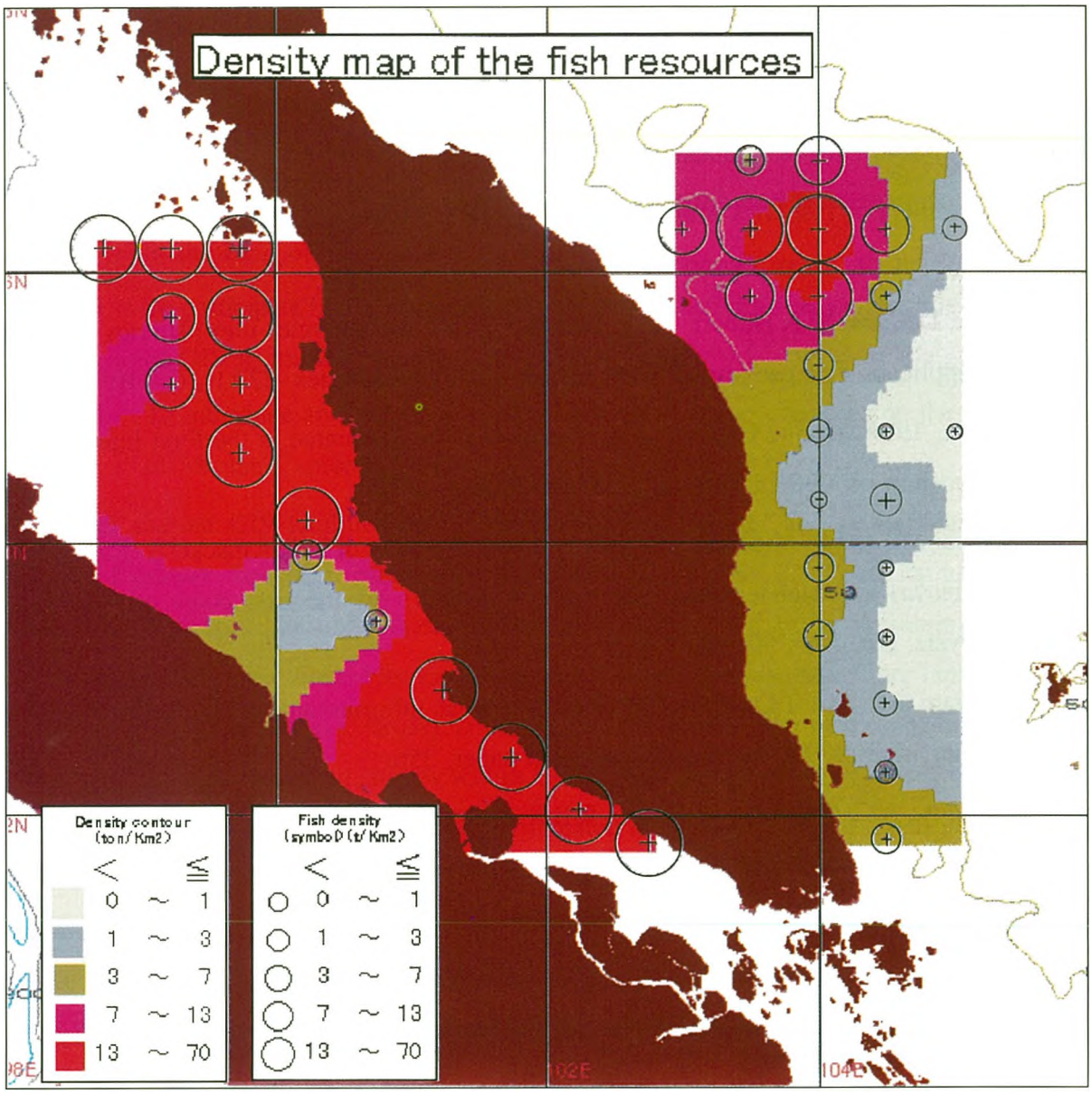

Figure 1: Distribution (by symbol and contour) of fish densities off west and east coast of Peninsular Malaysia

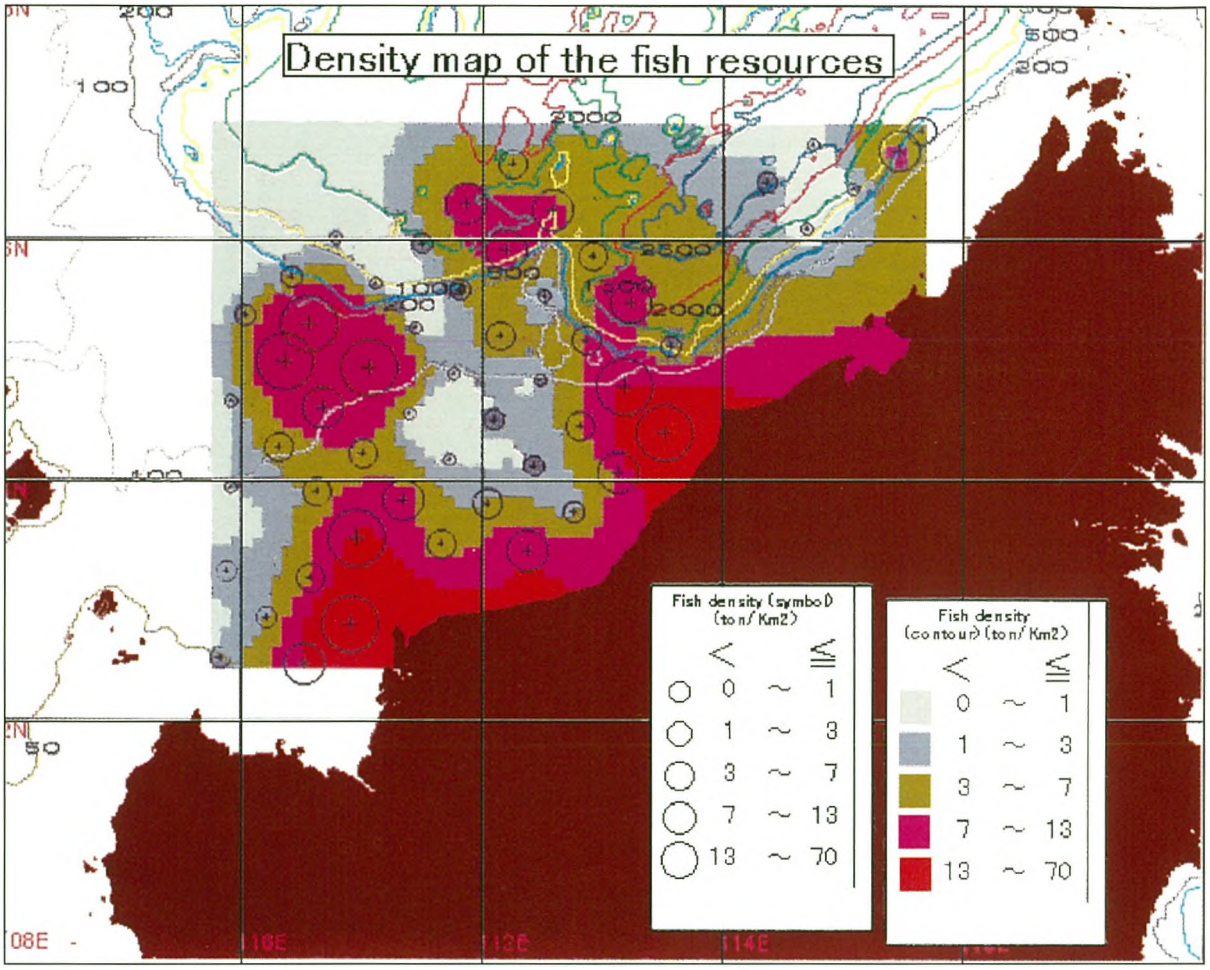

Figure 2: Distribution (by symbol and contour) of fish densities of East Malaysia (Sarawak and Sabah)

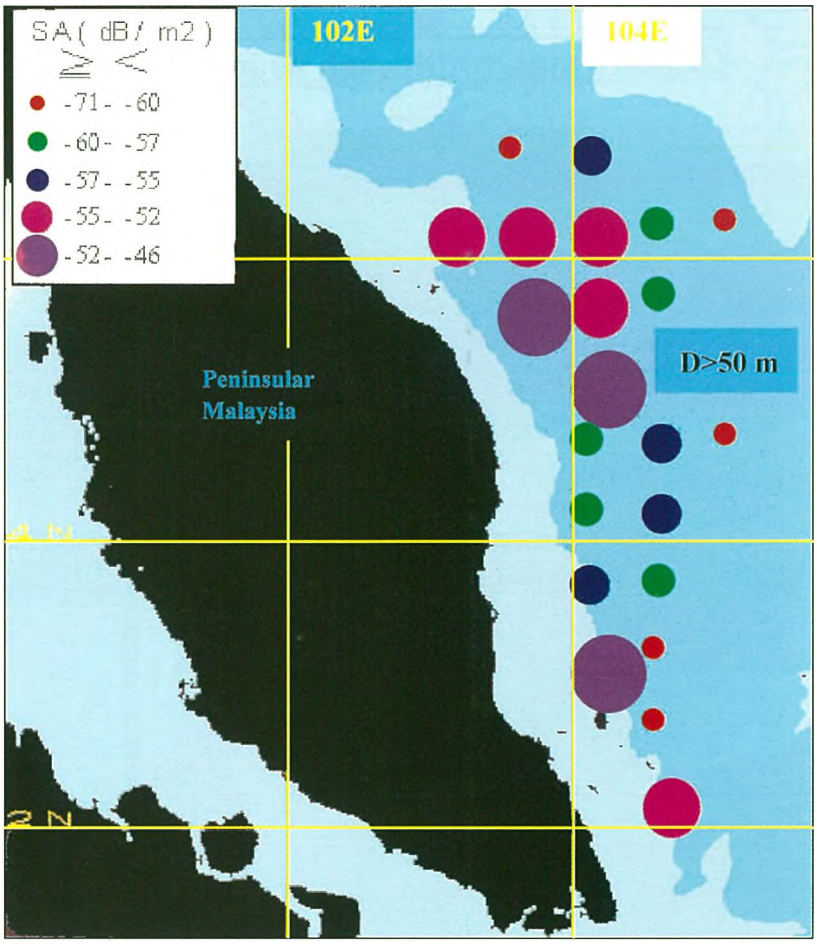

Fig. 3: Distribution of the average SA values (dB/m^2) off east coast of Peninsular Malaysia based on the acoustic survey by M.V. SEAFDEC carried out during the pre Northeast monsoon in September,1995.

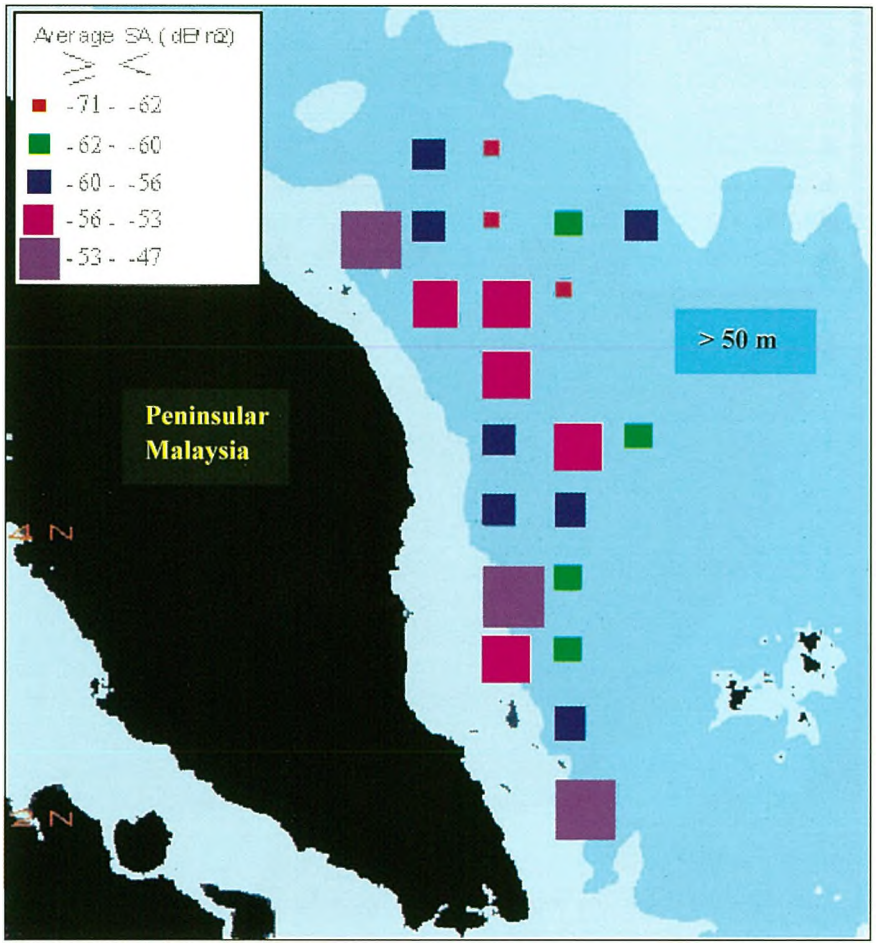

Figure 4: Distribution Of Average SA (dB/m^2) Off East Coast Of Peninsular Malaysia By Acoustic Survey Carried Onboard M.V. SEAFDEC During The Post Northeast Monsoon (NE) In April to May, 1996.

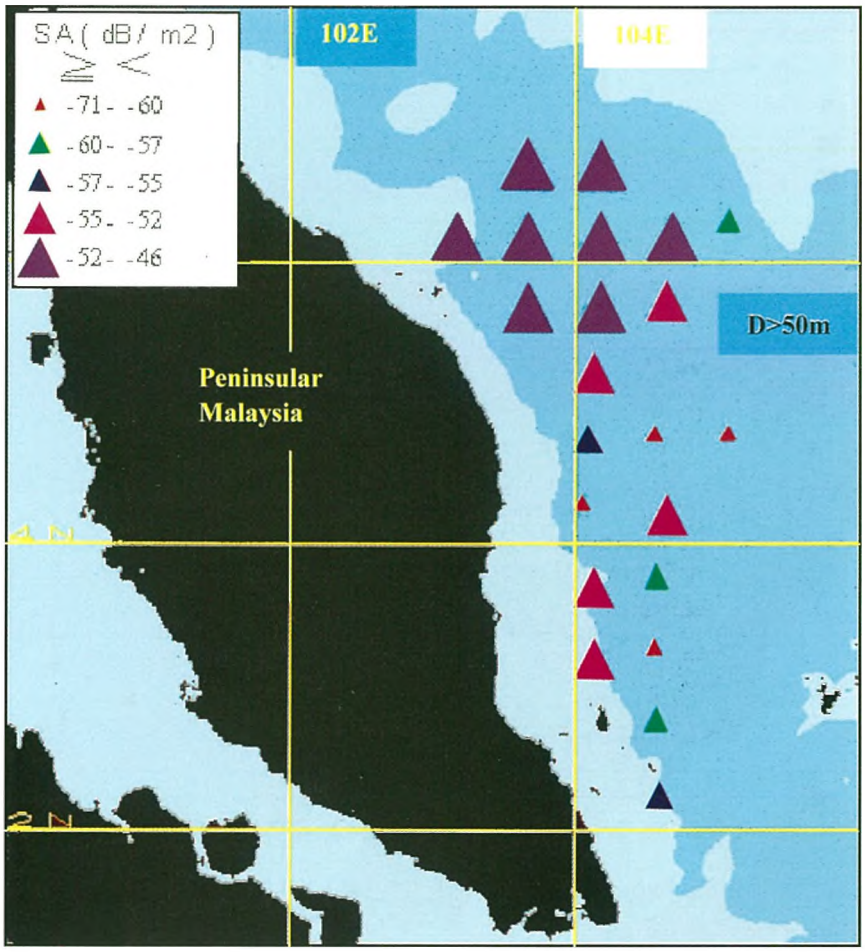

Fig. 5: Distribution of the average SA values (dB/m^2) off east coast of Peninsular Malaysia based on the acoustic survey by K.L. CERMIN carried out during off monsoon season in May to June, 1998.

ANNEX 18

THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

APPLICATION OF REMOTE SENSING IN FISHERIES

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APPLICATION OF REMOTE SENSING IN FISHERIES

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Abstract

The remote sensing techniques is used to study the distribution of fish in relation with the oceanic phenomena such as sea surface temperature (SST) and ocean color (phytoplankton). The pelagic fishing data were analysed from May 1997 to August 1998. The satellite data from NOAA AVHRR (SST) and SeaWiFS (phytoplankton) were also analysed. The results show that a lot of pelagic fish were caught in the warm water fronts as well as in the area of high density of phytoplankton. Further analyses should be made to come out with the firmer conclusion.

INTRODUCTION

With the development of the use of electromagnetic radiation (EMR) in studying of the earth, the remote sensing technology now becoming more essential. Remote sensing is defined as the acquisition of information about an object or event on the basis of measurements taken at some distance from it. The term is normally used to describe the collection and analysis of data made by instruments carried in or above the earth's atmosphere (Butler *et al.*, 1988). Since the EMR is distributed in a scale from γ-ray (0.1 nm) to radio wave (meters, kilometers) which is used by large scale of applications from quality control in laboratory to telecommunications, it can be applied to study of the earth surface. When someone talks about remote sensing, generally this means the visible band of the sepctrum to the infrared. These are the mostly used spectrum for remote sensing.

Until recently oceanographic observations were obtained by using vessels but this method was inaccurate, as the data obtained is not real time and when the data is processed the environment has already changed. This is true as the environment around us changes very rapidly and each observation point has very different rates of change. Remote Sensing using satellites has solved this problem for us. Satellites have been able to provide us with spatial observation as the acquisition of data from areas are at the same time with the time they are processed. More over oceanographic observation needs periodical data of sea surface temperature, salinity, current conditions etc. to solve the effects of sea conditions on biological production. Fish detection also depends on the relationship between fishery information and sea surface temperature.

One of the most obvious applications is the detection of pelagic fishes such as tuna and anchovy but this is the most difficult task to achieve. The use of satellite for direct detection has not been explored enough to fully understand its potential. Although this is not always feasible satellites are used for indirect detection.

Besides resource detection remote sensing can also be valuable in characterising the marine and coastal environment. This may involve such activities as revising navigatioal charts with

coastal and bathymetric data, identifying marine plants and sediment types and monitoring conditions of coastal reefs. Another important use of remote sensing is weather forecasting which could mean greater safety for fishermen. Pollution could also be monitored to avoid dissenting effects on fishing ground. With satellite data we may observe the sea surface phenomena associated with species distribution in real-time. This may simply involve projecting the distribution of fishing activities at a certain area. Satellite images could be used to describe different colours of the ocean to determine areas with huge amounts of planktons.

HOW REMOTE SENSING CAN BE USEFUL FOR FISHERY RESOURCES MANAGEMENT?

In order to manage the fisheries resources through remote sensing, we have to get correlation between oceanic phenomena with pelagic fish distribution. The seasonal current movement pattern should be understood, since the fish migrates following the current movement.

The optical remote sensing technology can be useful for pelagic fishing sector. The demersal fisheries may also use this technology, but the potential is limited. Limitation is only due to the ability of the EMR radiation. In clear water the blue light (short wavelength) can penetrate up to 60m of water depth. The penetration rate is lesser when the longer the wavelength (i.e. red and green light, as well as infrared).

The remote sensing technology is very useful to fisheries since the optical system of the technology is able to detect two most prominent oceanic phenomena, i.e. sea surface temperature and ocean color. The sea surface temperature from satellite view is also called 'skin temperature', that is the temperature of the few millimeters of ocean surface. SST is useful in studying the upwelling, fronts, as well as current. The current satellite system detects SST through the infrared region of the electromagnetic spectrum. To date there are a few satellites that are able to detect the SST such as NOAA-12, NOAA-14, NOAA-15 and ADEOS. Meanwhile the 'ocean color' refers to mostly the concentration of chlorophyll-a in the ocean. The color is detected by an optical system in visible region of electromagnetic spectrum. Chlorophyll is the basic means to measure the productivity of the sea. Generally, the fish abundance is related with the chlorophyll-a concentration in the water. At present there are various satellites detecting the ocean color such as SeaWiFS (CZCS), MOS and ADEOS.

The distribution of fish in the sea is very related to these two oceanic phenomena. The fish species might be found in certain optimum temperature. It also might be abundance in the front area, which indicated by sea surface temperature variation. According to local Malaysian fishermen, more fish can be found in warm water area. The fish is also tends to be more abundant in 'turbid' water. 'Turbid' here means the abundance of plankton in the water.

To exploit fish resources more effectively, fishermen must catch the most fish possible while at the same time minimizing cost and optimizing the schedule of their operations. The knowledge of the fishing ground locations helps fishermen in their fishing activities.

The NOAA/AVHRR data can be used to map the distribution of sea surface temperature (SST), daily. Study that had been made in Huanghai Sea and East China Sea proven that location of Japanese pilchard (*Sardinops melanosticta*) fishing ground could be predicted at accuracy up to 91.3%. SST around the area was 15-17°C (Japan Fisheries Information Service Center (JAFIC) produces satellite aided oceanographic condition charts with NOAA

AVHRR data and sends these charts to fishing vessel at sea because it was shown that NOAA AVHRR data were applicable for fishing ground forecasting. The study was also conducted in Indian Ocean (in tropical sea) to predict the distribution of yellowfin tuna due to SST. It was concluded that yellowfin tuna fishing ground could be found at SST of 27-29 °C.

Kawamura (1986) made a preliminary study on the NOAA APT signals on-board Kagoshima Maru vessel. The oceanographic features such as sea surface temperature and current could be obtained through the system. The images showed that there were two different types of water in Terengganu waters i.e. gulf waters coming down southwards from Gulf of Thailand and offshore waters going up northwards. The presence of the gulf water implies that the fishery in Terengganu waters would be affected by the movement of gulf water because most fishes tend to migrate or move with or within a water mass. Study made by Shattri, et al. (1999) in the east coast of Peninsular Malaysia has shown a high correlation between the warm water fronts and the catch of pelagic fish.

METHODS

MFRDMD is working hardly to study the fish distribution in relation with sea surface temperature and ocean colour. Data on daily fishing operation (1992-1999) by C2 Class purse seine boat (70 GRT and above) of the east coast of Peninsular Malaysia has been collected and compiled into a database. Data extracted from the boat's logbook. The data consists of date of fishing, period (days of fishing per one trip), locations (grid), kind of fish and approximate catch weight. The location of the center of the grid is appeared in Figure 1. The C2 Class purse seiner were chosen because, firstly, it was equipped with global positioning system (GPS) where the fishermen could fix their location. Secondly, the NOAA AVHRR satellite only records the top few milimeters of ocean surface. This is an inherent limitation of the satellites measurement of sea surface temperature.

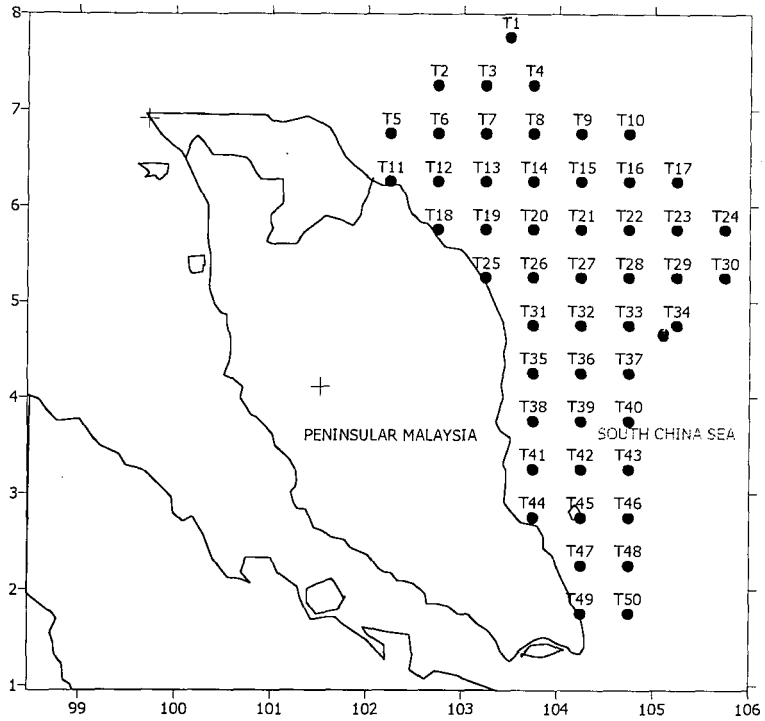

Figure 1 : Location of the center of the grid.

The fishing data then transferred into GIS (geographical information system) format and fishing location for weekly, monthly and seasonally would be plotted. At the same time, the SST data (weekly, monthly and seasonally) would be processed to determine the correlation between SST and fishing ground.

The sea surface temperature data was taken from NOAA AVHRR that were received by MFRDMD ground station. The SST was analysed using a split windows method and a tropical model. Meanwhile the SeaWiFS ocean color data was taken from Goddard DAAC, NASA. The data indicates the chlorophyll concentration in mg/m^3.

In this report only data from May 1997 to August 1998 were analyzed. The total commercial fish catch per trip data were analyzed for monthly average, while the temperature and ocean color were based on daily data. The data during clear sky are printed in the report. The SeWiFS ocean color data available in 1998.

RESULTS AND DISCUSSION

Figures 2 to 17 shows the monthly total catch per trip of commercial species of purse seiner and the daily SST and phytoplankton distributions.

In May 1997, the maximum catch per trip is up to 20 mt only at T28 and T32. Other locations show the less fish catch. In June 1997, the maximum catch per trip is up to 20 mt at T8 and T21. In July 1997, the maximum catch per trip is up to 30 mt at T10 and T15. In August 1997, the maximum catch per trip is up to 35 MT at T22, T23, T24 and T25. In September 1997, the maximum catch per trip is up to 100 mt at T22, T23, T24, T29 and T34. In October 1997, the maximum catch per trip is up to 150 mt at T37 and T40. In December 1997, the

maximum catch per trip is up to 20 mt at T8, T9, T19 and T29. In January 1998, the maximum catch per trip is up to 25 mt at T23. In February 1998, the maximum catch per trip is up to 40 mt at T20. In March 1998, the maximum catch per trip is up to 15 mt at T27. In April 1998, the maximum catch per trip is up to 25 mt at T14. In May 1998, the maximum catch per trip is up to 25 mt at T24. In January 1998, the maximum catch per trip is up to 25 mt at T23. In June 1998, the maximum catch per trip is up to 20 mt at T8 and T19. In July 1998, the maximum catch per trip is up to 20 mt at T2, T3 and T19. In August 1998, the maximum catch per trip is up to 25 mt at T2, T8 and T15.

Some of the SST images show a close relationship between SST and fish abundance (total catch). More fish are caught in the warm water fronts. Meanwhile some of the ocean color maps show the high catch in high phytoplankton pigment density areas. (please refer to the maps).

However in this report, we still cannot make any conclusion of the relationship unless we reanalyze the satellite data as well as the fishing data to get the daily or weekly or monthly averages, then we can come into conclusion.

Acknowledgement

The author would like to thank Mr Mohd Nasir Muhammad Kasni for satellite data analysis. The SeaWiFS ocean color data were provided by Data Active Archive Center of Goddard Space Flight Center (DAAC, GSFC) of NASA.

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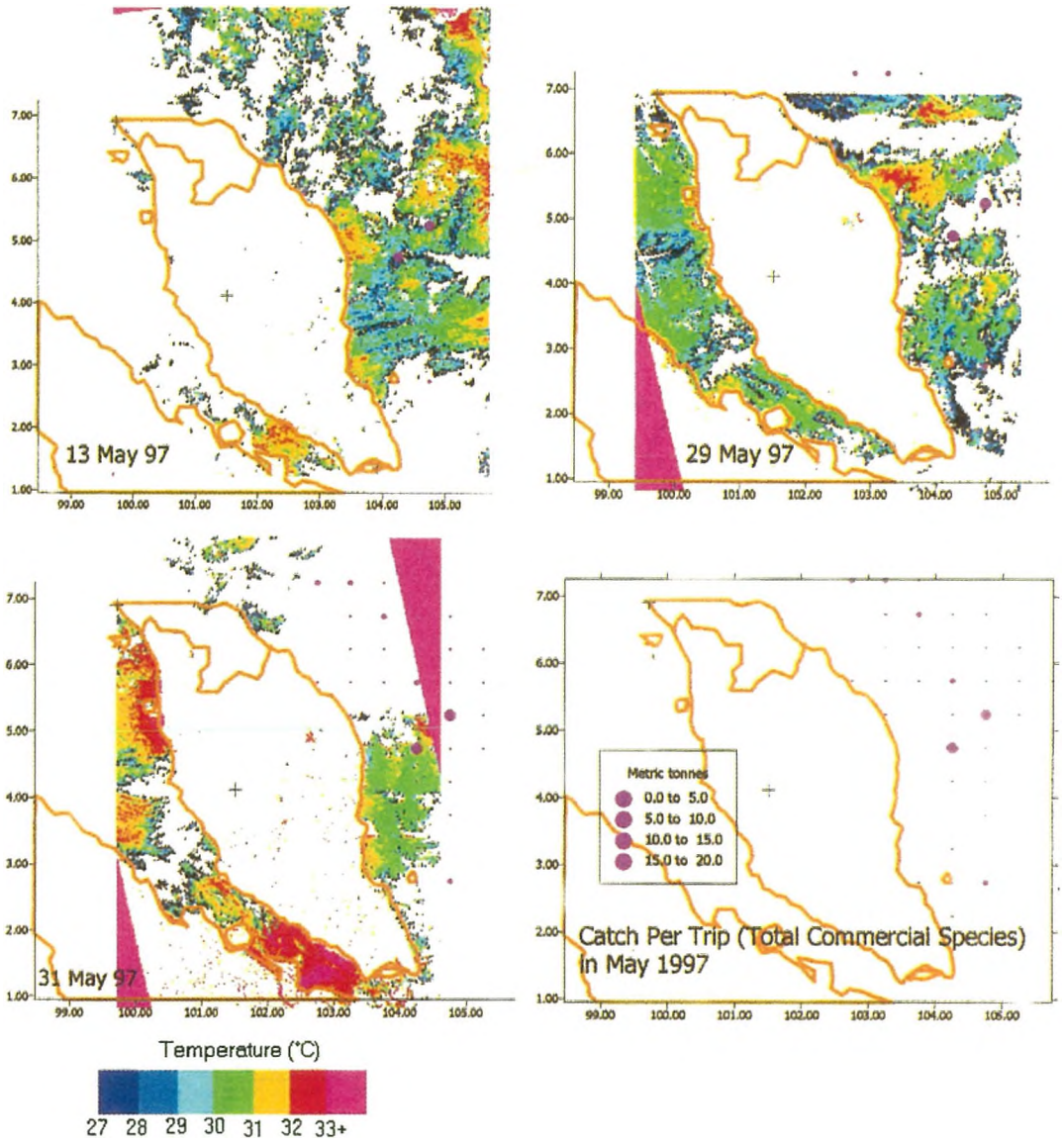

13 May 97
29 May 97
31 May 97
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
Catch Per Trip (Total Commercial Species) in May 1997
Temperature (°C)
27 28 29 30 31 32 33+

Figure 2

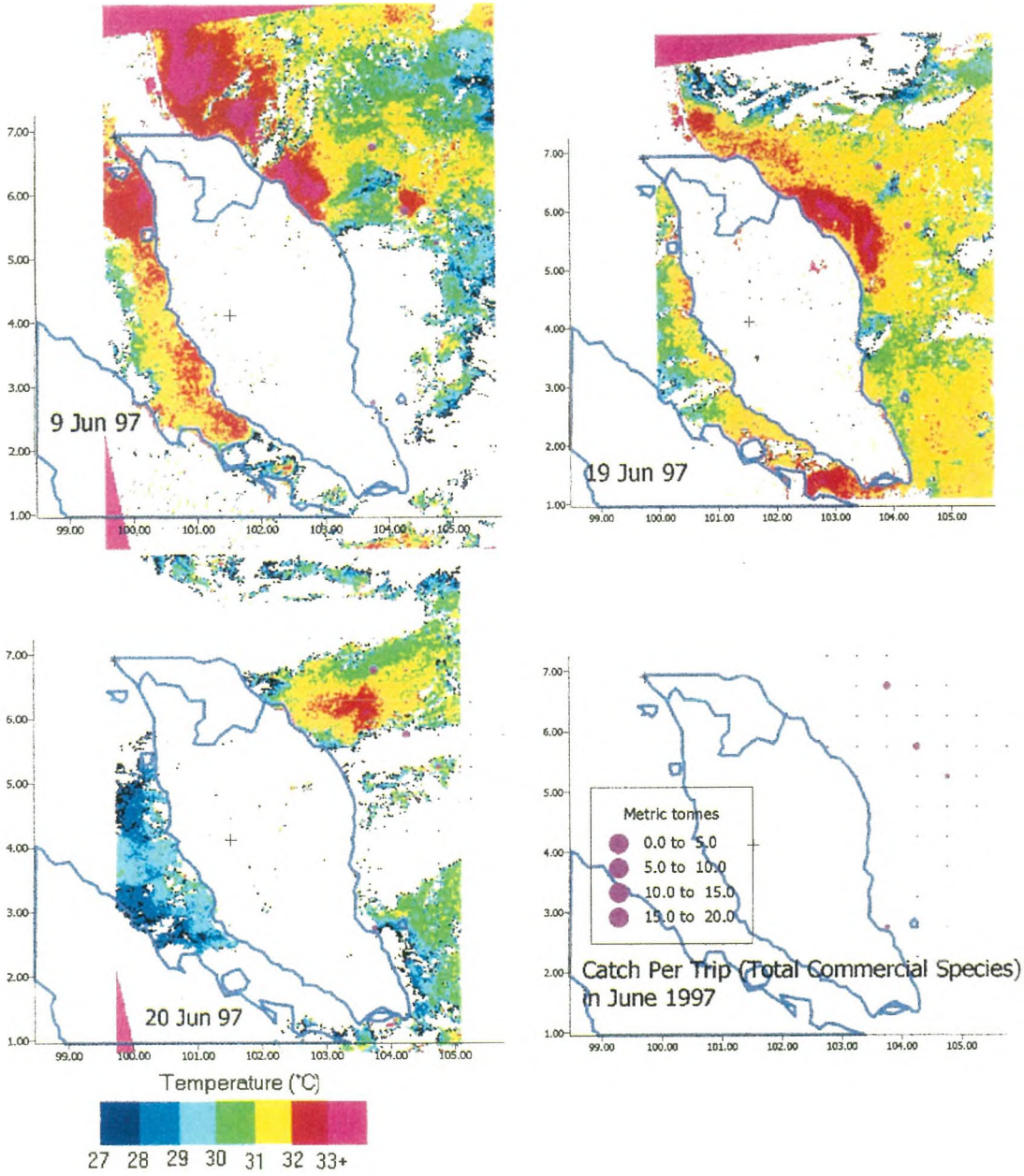

9 Jun 97
19 Jun 97
20 Jun 97
Temperature (°C)
27 28 29 30 31 32 33+
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
Catch Per Trip (Total Commercial Species)
in June 1997

Figure 3

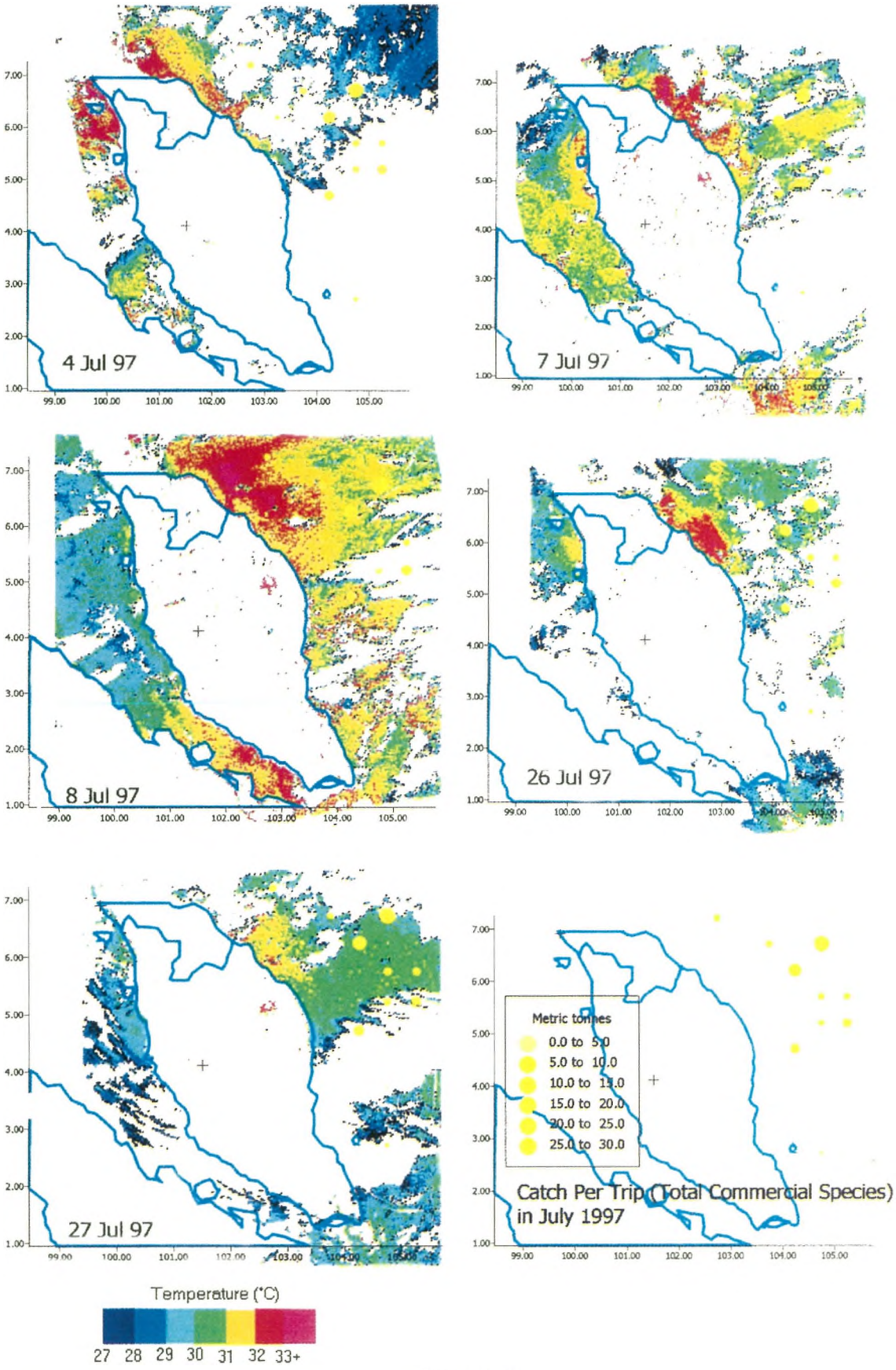

4 Jul 97
7 Jul 97
8 Jul 97
26 Jul 97
27 Jul 97
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
25.0 to 30.0
Catch Per Trip (Total Commercial Species) in July 1997
Temperature (°C)
27 28 29 30 31 32 33+

Figure 4

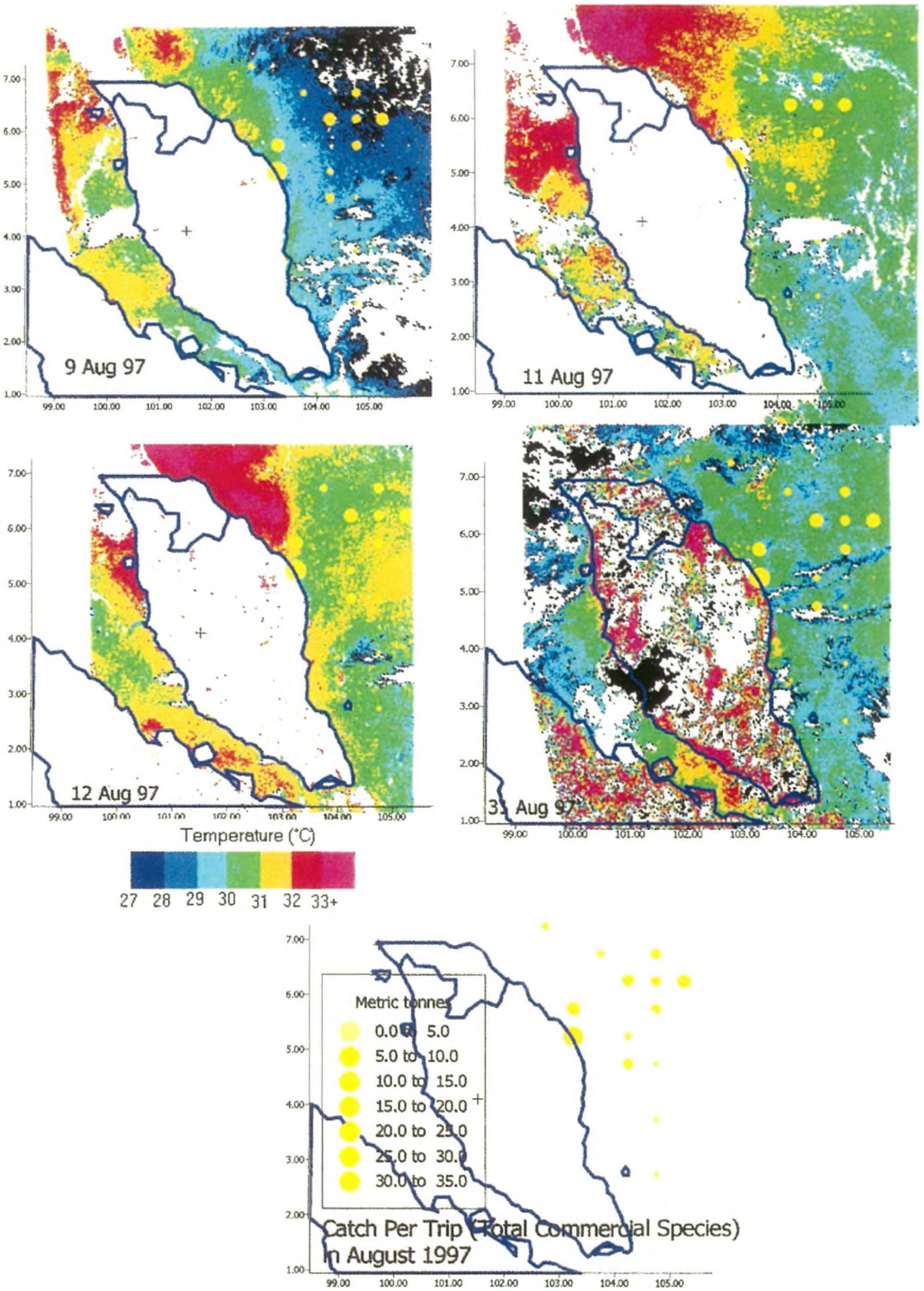

9 Aug 97
11 Aug 97
12 Aug 97
Temperature (°C)
27 28 29 30 31 32 33+
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
25.0 to 30.0
30.0 to 35.0
Catch Per Trip (Total Commercial Species)
In August 1997

Figure 5

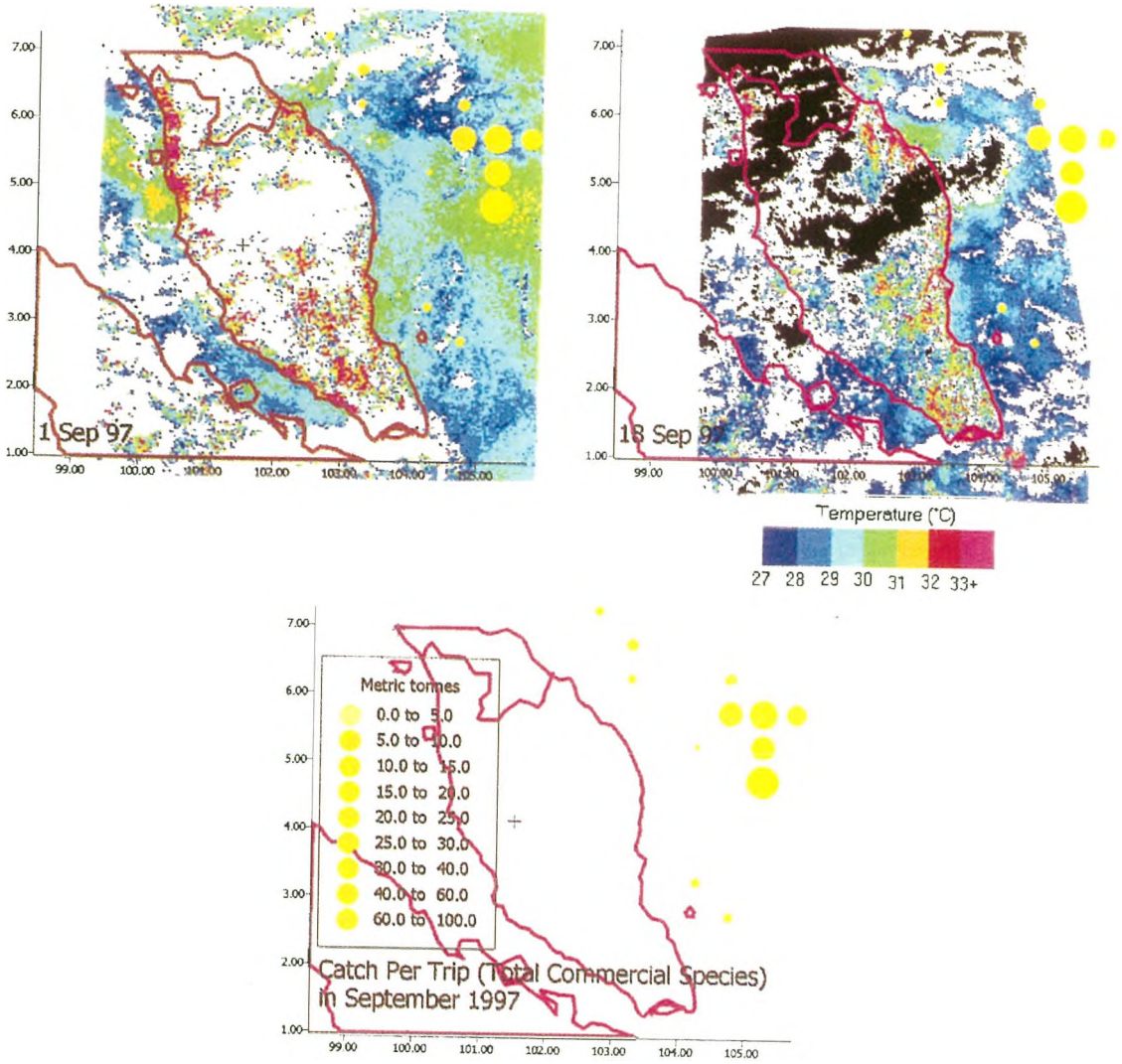

1 Sep 97
18 Sep 97
Temperature (°C)
27 28 29 30 31 32 33+
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
25.0 to 30.0
30.0 to 40.0
40.0 to 60.0
60.0 to 100.0
Catch Per Trip (Total Commercial Species)
in September 1997

Figure 6

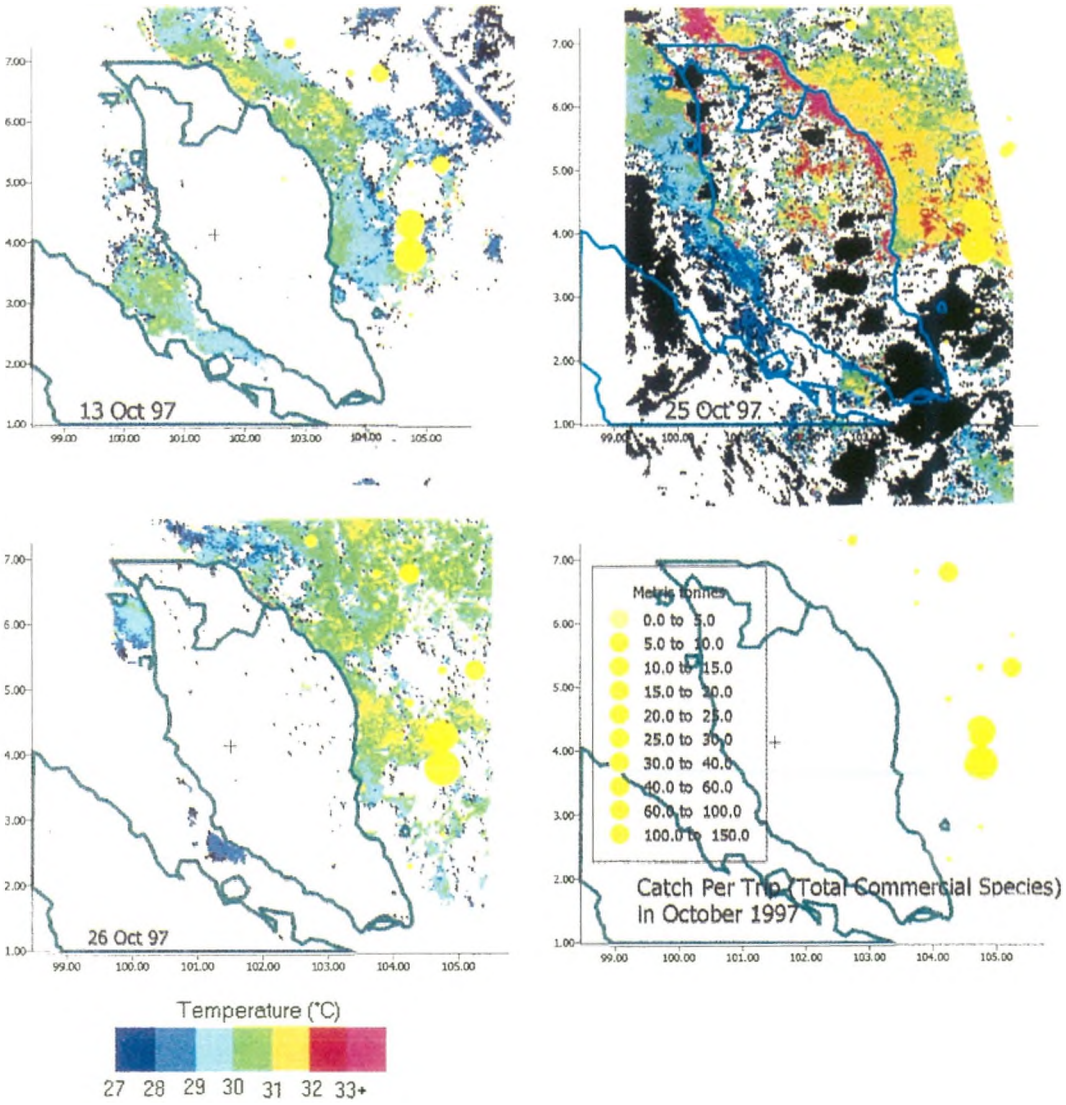

13 Oct 97
25 Oct 97
26 Oct 97
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
25.0 to 30.0
30.0 to 40.0
40.0 to 60.0
60.0 to 100.0
100.0 to 150.0
Catch Per Trip (Total Commercial Species)
In October 1997
Temperature (°C)
27 28 29 30 31 32 33+

Figure 7

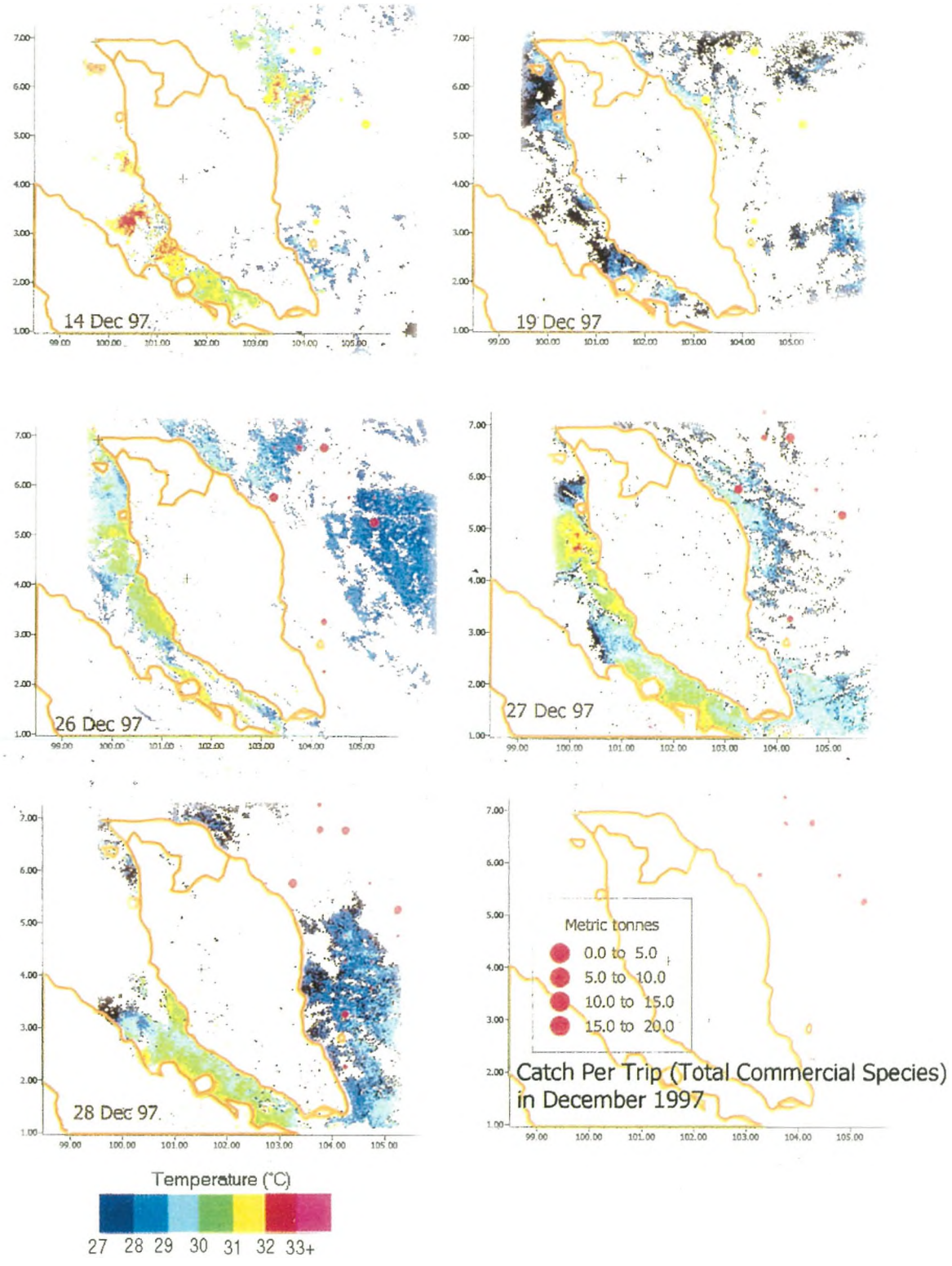

14 Dec 97
19 Dec 97
26 Dec 97
27 Dec 97
28 Dec 97
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
Catch Per Trip (Total Commercial Species)
in December 1997
Temperature (°C)
27 28 29 30 31 32 33+

Figure 8

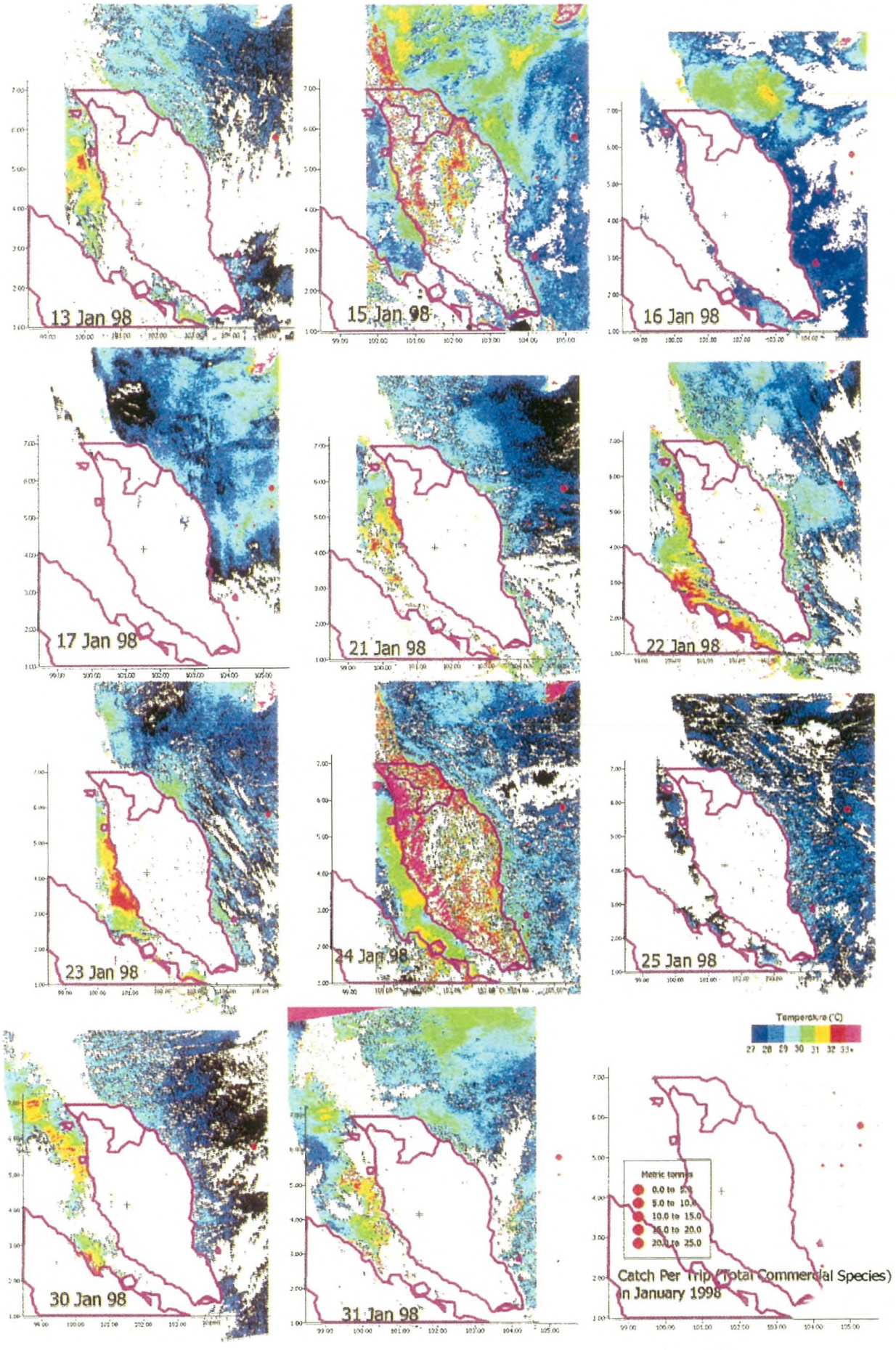

13 Jan 98
15 Jan 98
16 Jan 98
17 Jan 98
21 Jan 98
22 Jan 98
23 Jan 98
24 Jan 98
25 Jan 98
30 Jan 98
31 Jan 98
Temperature (°C)
27 28 29 30 31 32 33+
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
Catch Per Trip (Total Commercial Species)
in January 1998

Figure 9

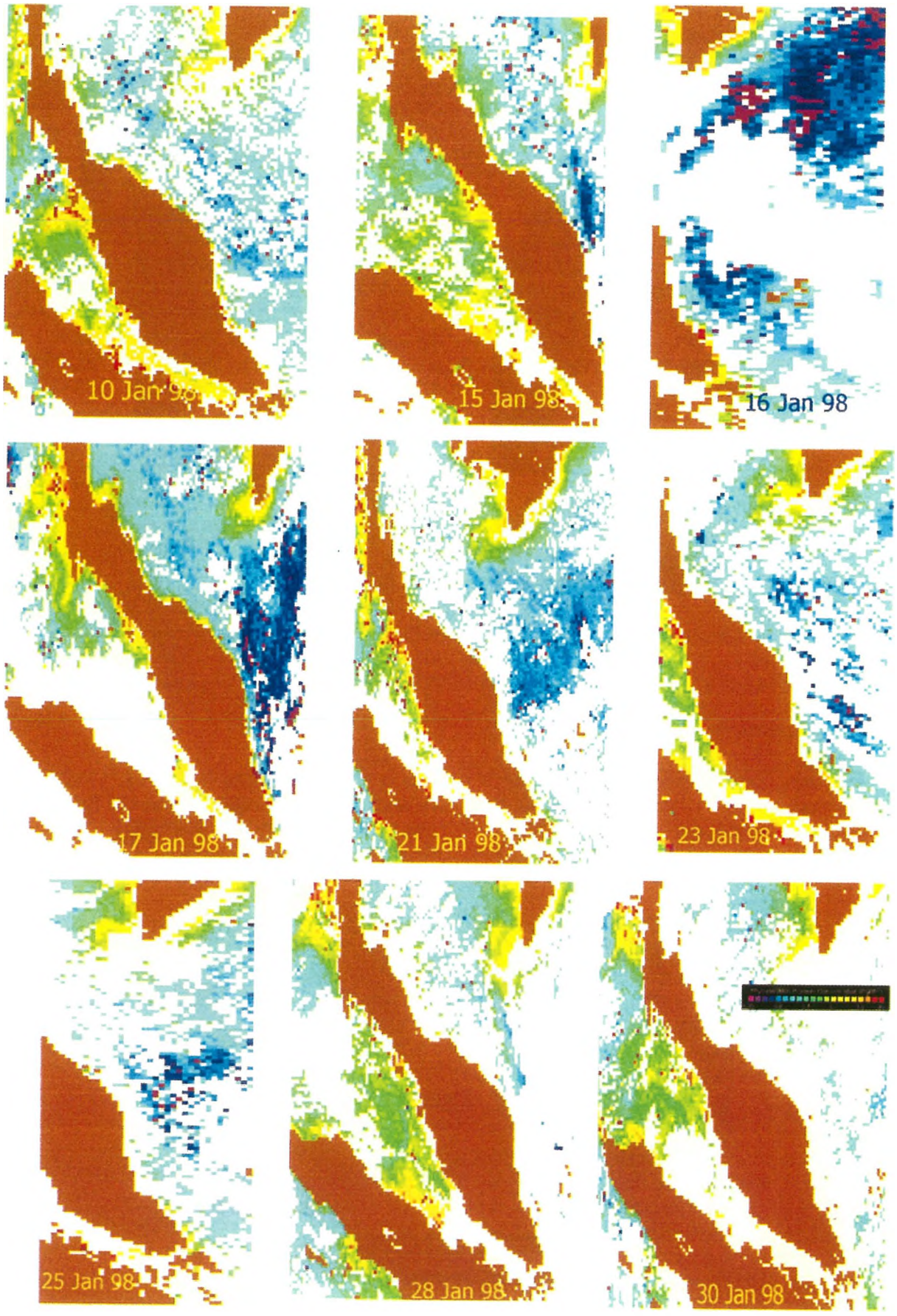

10 Jan 98
15 Jan 98
16 Jan 98
17 Jan 98
21 Jan 98
23 Jan 98
25 Jan 98
28 Jan 98
30 Jan 98

Figure 10

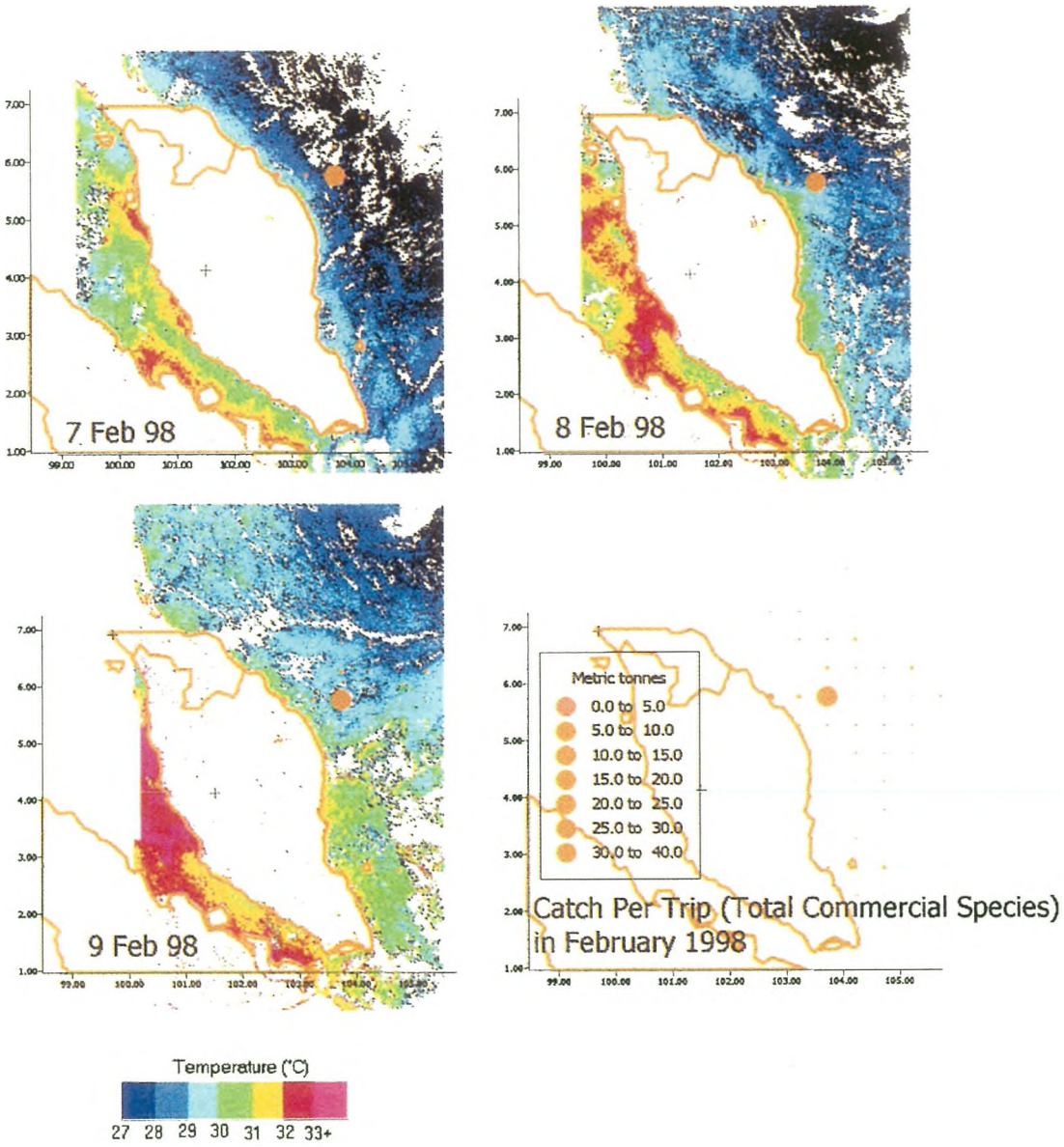
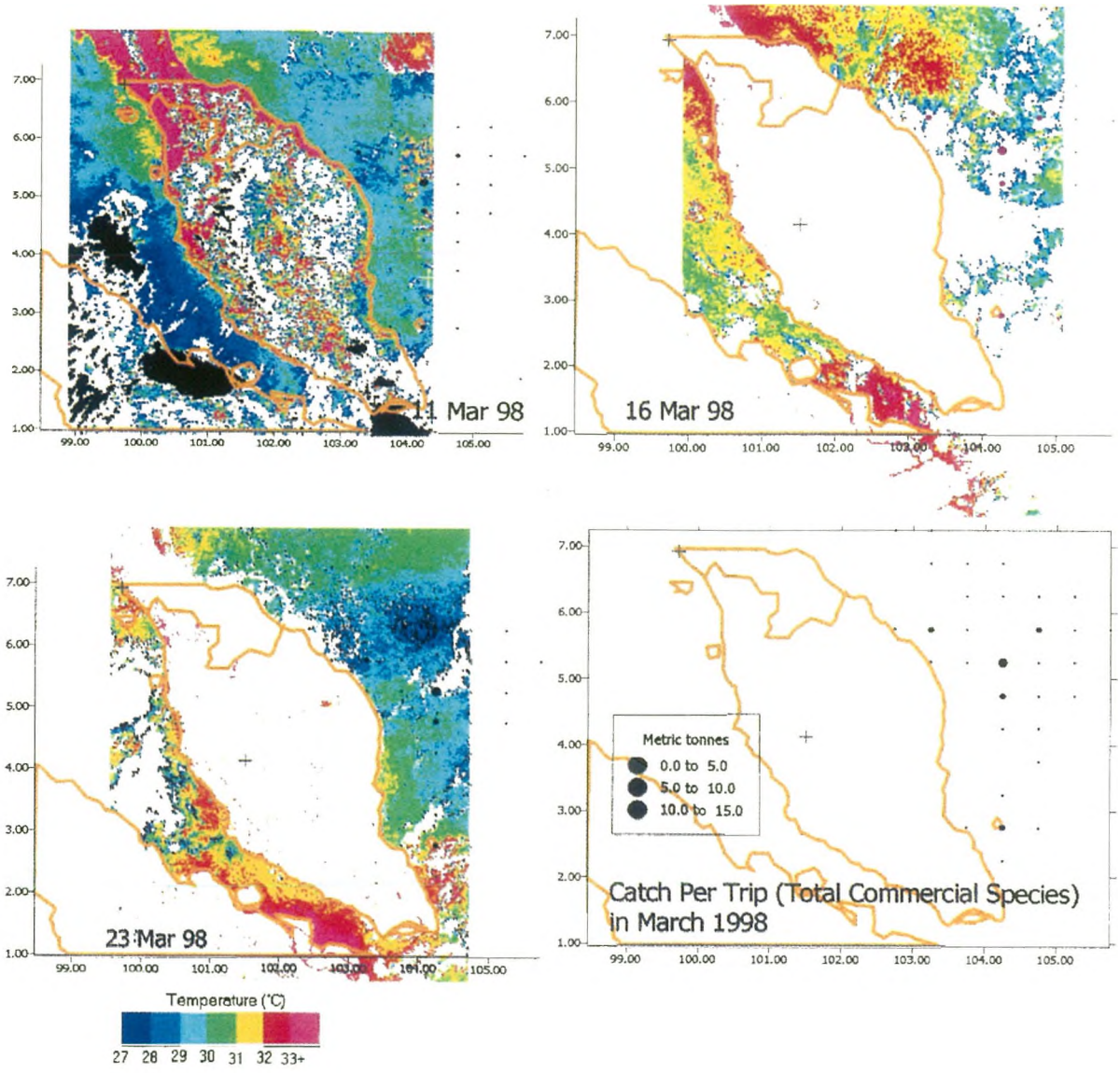

7 Feb 98
8 Feb 98
9 Feb 98
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
25.0 to 30.0
30.0 to 40.0
Catch Per Trip (Total Commercial Species) in February 1998
Temperature (°C)
27 28 29 30 31 32 33+

Figure 11


11 Mar 98
16 Mar 98
23 Mar 98
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
Catch Per Trip (Total Commercial Species)
in March 1998
Temperature (°C)
27 28 29 30 31 32 33+

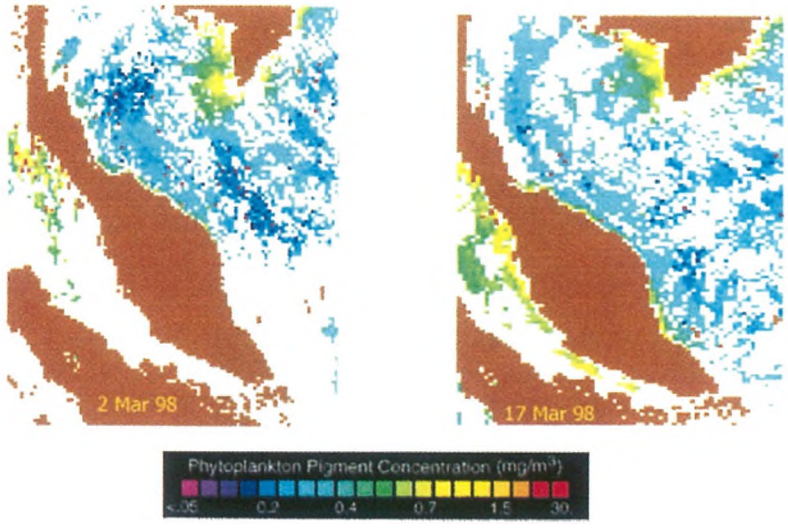

2 Mar 98
17 Mar 98
Phytoplankton Pigment Concentration (mg/m³)
0.2 0.4 0.7 1.5 30

Figure 12

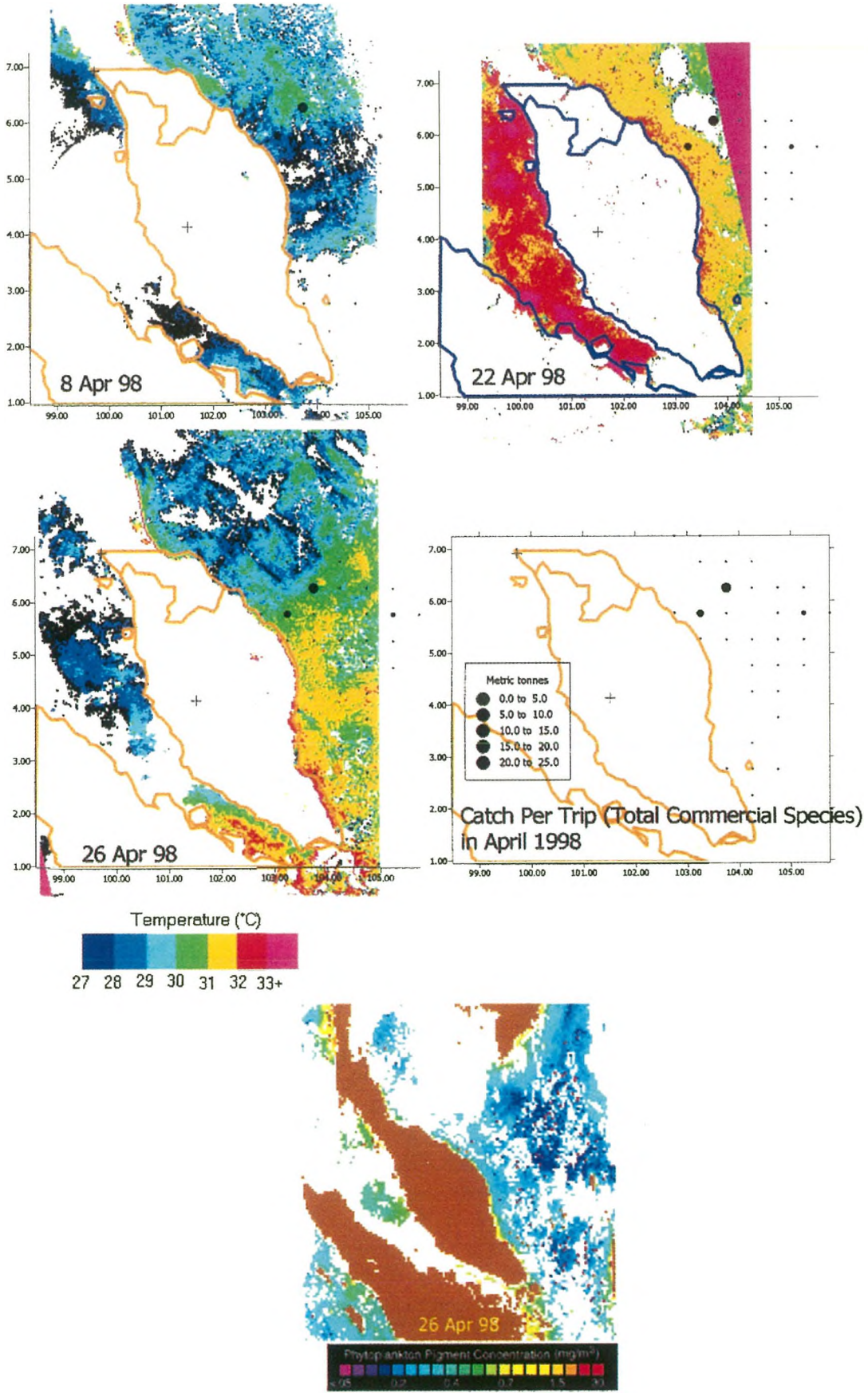
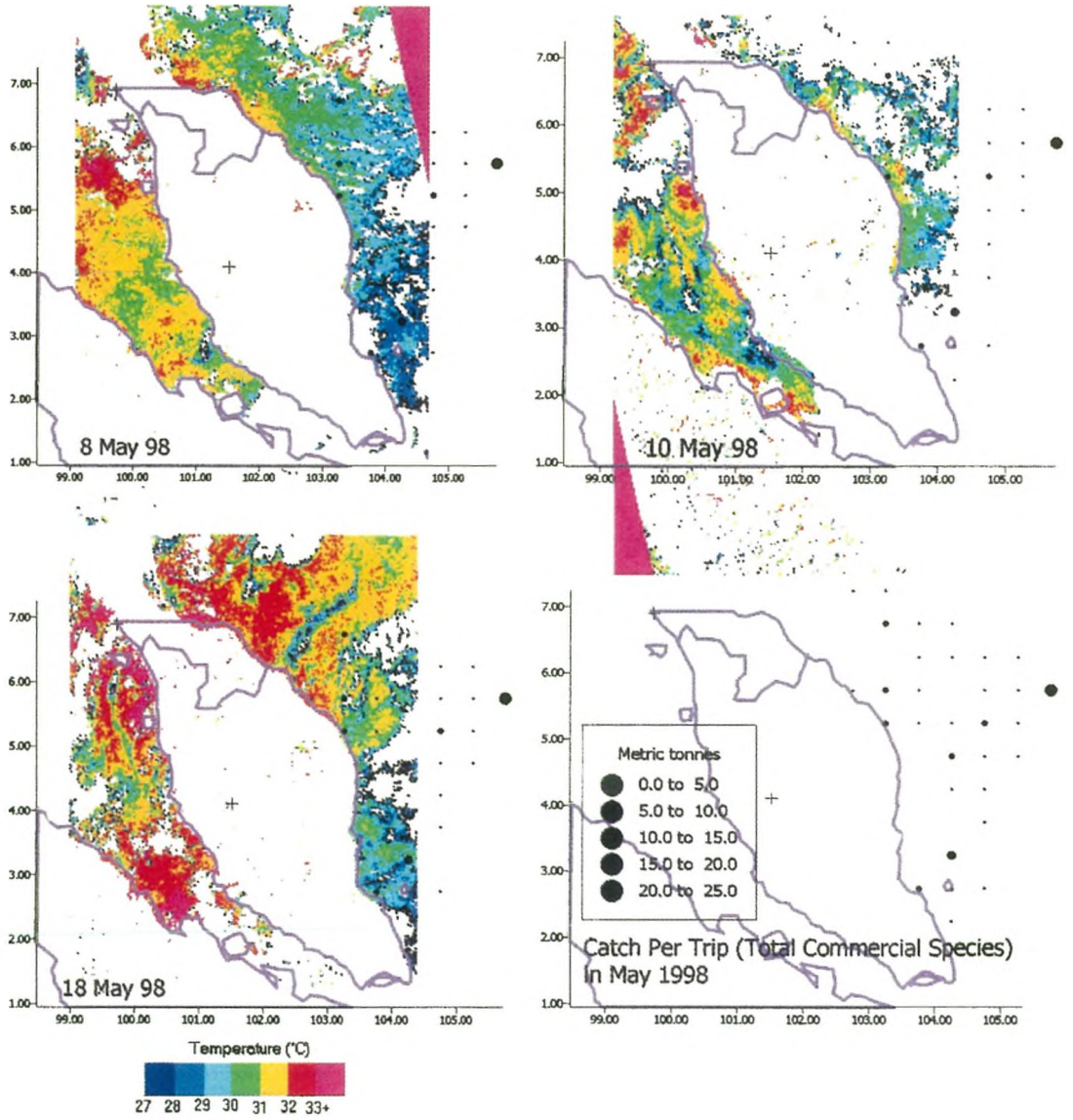

8 Apr 98
22 Apr 98
26 Apr 98
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
Catch Per Trip (Total Commercial Species)
in April 1998
Temperature (°C)
27 28 29 30 31 32 33+
26 Apr 98
Phytoplankton Pigment Concentration (mg/m³)

Figure 13


8 May 98
10 May 98
18 May 98
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
Catch Per Trip (Total Commercial Species)
In May 1998
Temperature (°C)
27 28 29 30 31 32 33+

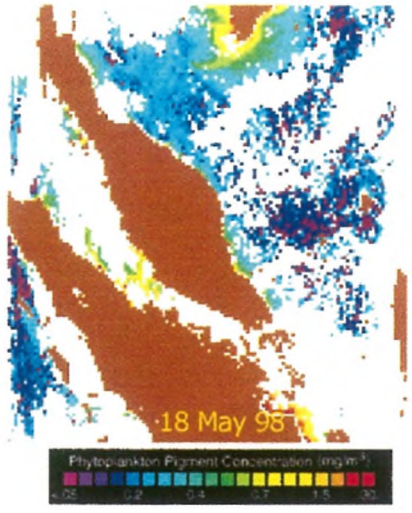

18 May 98

Figure 14

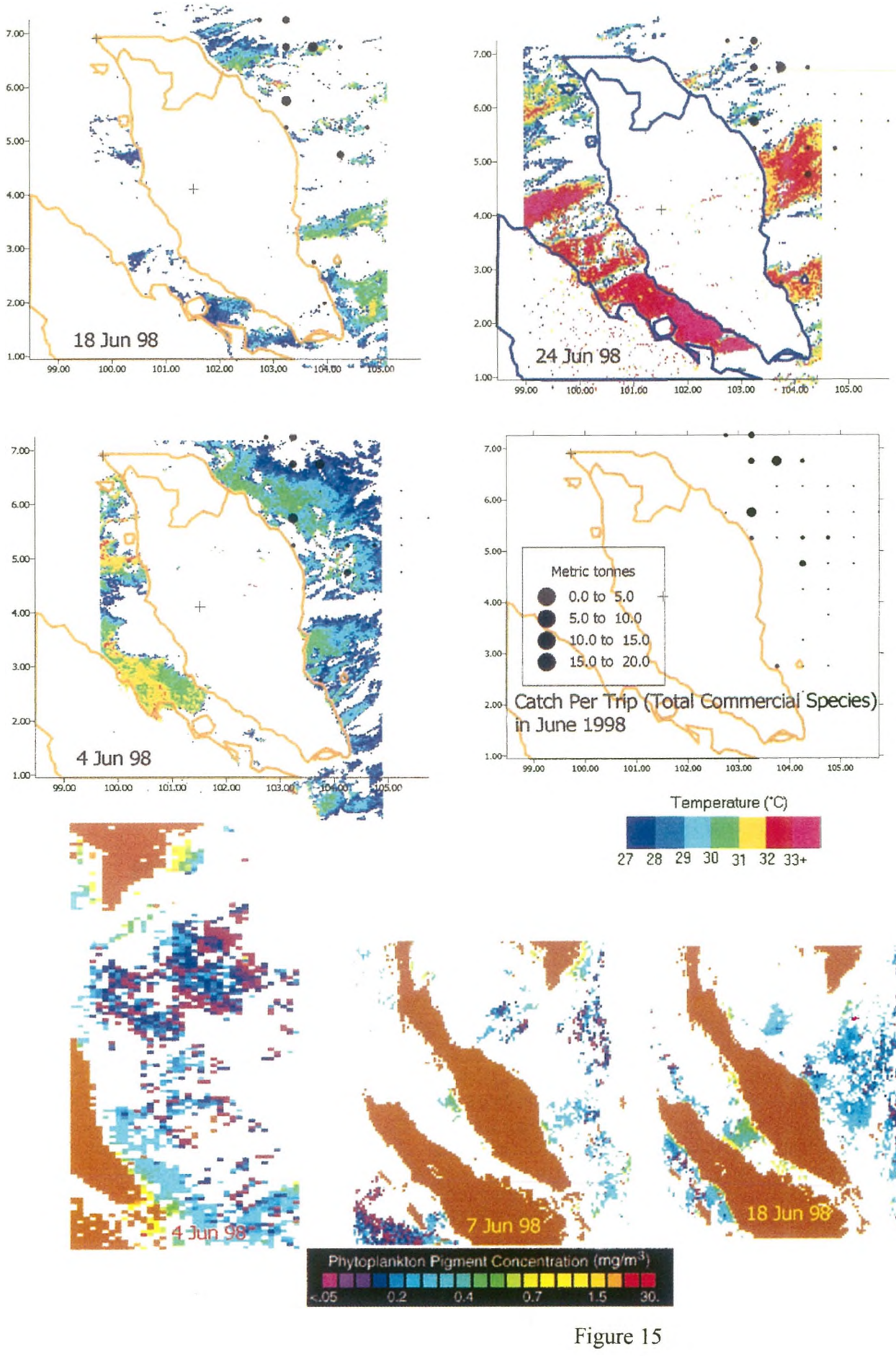
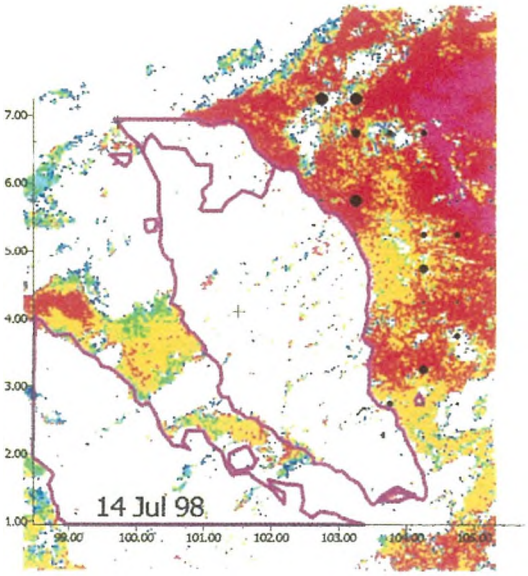
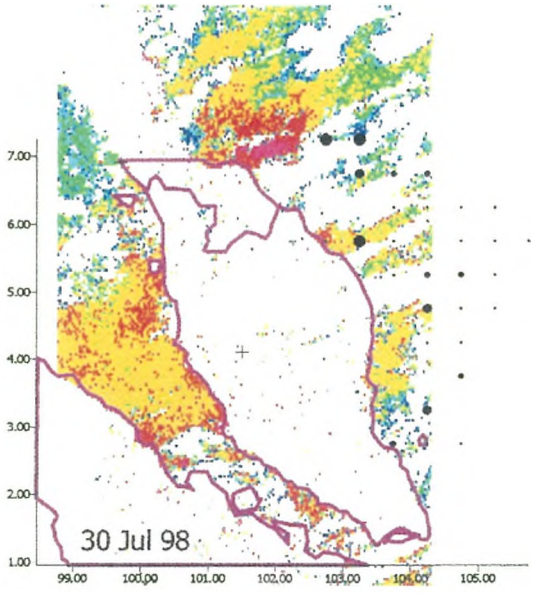
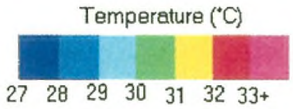
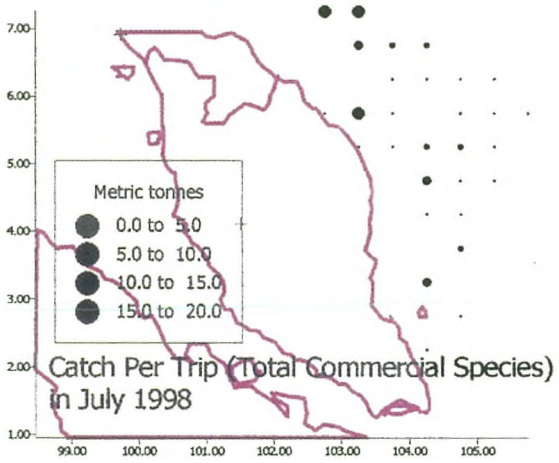

18 Jun 98
24 Jun 98
4 Jun 98
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
Catch Per Trip (Total Commercial Species) in June 1998
Temperature (°C)
27 28 29 30 31 32 33+
4 Jun 98
7 Jun 98
18 Jun 98
Phytoplankton Pigment Concentration (mg/m3)
<.05 0.2 0.4 0.7 1.5 30.

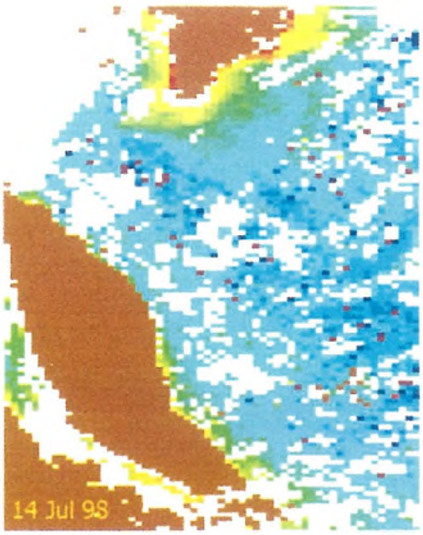
Figure 15


14 Jul 98


30 Jul 98


Temperature (°C)
27 28 29 30 31 32 33+


Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
Catch Per Trip (Total Commercial Species)
in July 1998


14 Jul 98


30 Jul 98


Phytoplankton Pigment Concentration (mg/m3)
<.05 0.2 0.4 0.7 1.5 30.

Figure 16

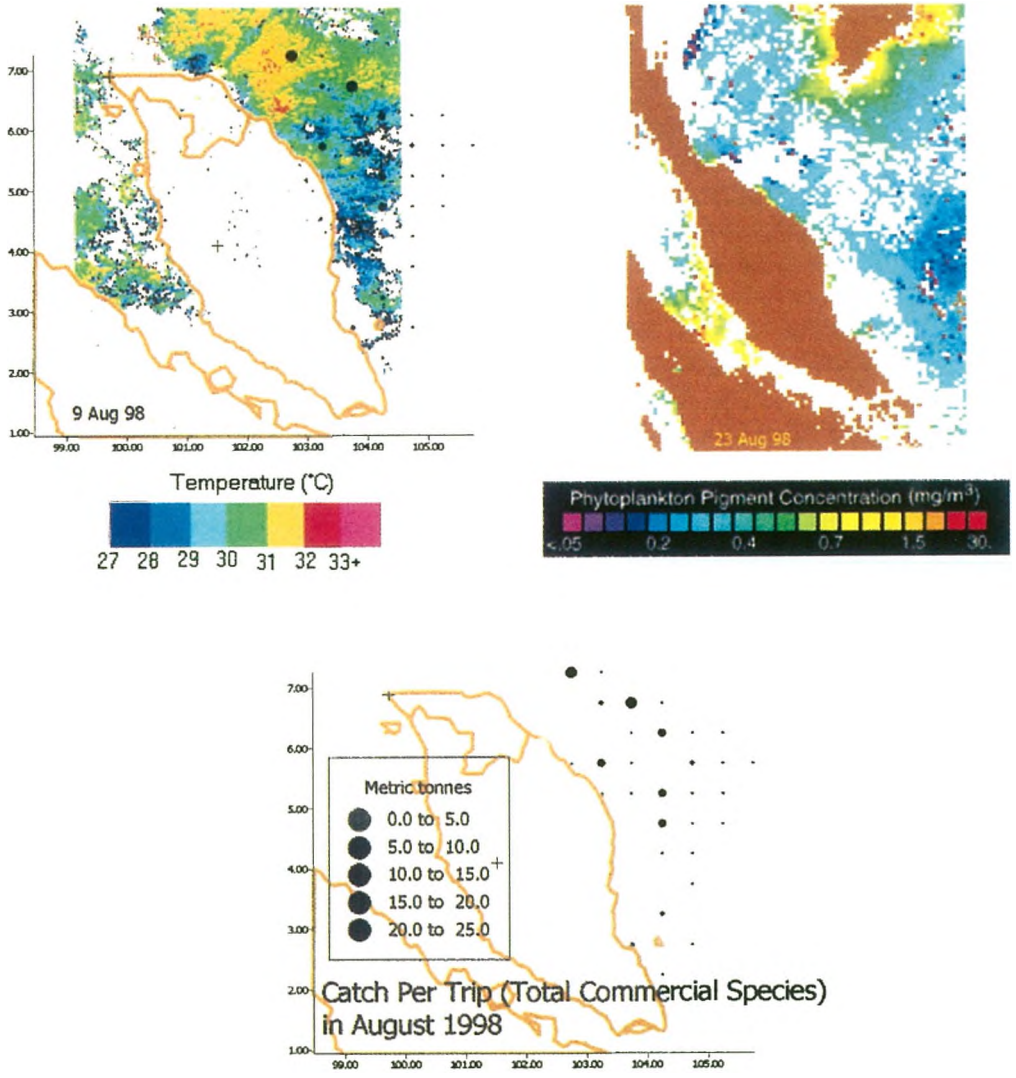
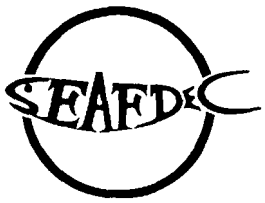

9 Aug 98
Temperature (°C)
27 28 29 30 31 32 33+
23 Aug 98
Phytoplankton Pigment Concentration (mg/m³)
<.05 0.2 0.4 0.7 1.5 30.
Metric tonnes
0.0 to 5.0
5.0 to 10.0
10.0 to 15.0
15.0 to 20.0
20.0 to 25.0
Catch Per Trip (Total Commercial Species)
in August 1998

Figure 17

ANNEX 19

Annex 19



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

REGIONALISATION OF THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES PHASE III : FISHERIES MANAGEMENT

By:

MOHD TAUPEK MOHD NASIR

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Chendering,
21080 Kuala Terengganu,
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REGIONALISATION OF THE CODE OF CONDUCT FOR RESPONSIBLE FISHERIES
Phase III : Fisheries Management

Mohd Taupek Mohd Nasir
SEAFDEC MFRDMD,
Chendering,
21080 Kuala Terengganu,
Malaysia

INTRODUCTION

The gradual depletion of commercially important fish stocks due to excessive use of fishing effort has been one of the major problems faced by many countries around the world. This is especially a major concern among fisheries managers whose duties are to ensure that fish stocks are exploited on a profitable but sustainable basis and among fisheries scientists involved in their assessment and enhancement.

It was due to this recognition of the importance of the commercial fish stocks and their respective fisheries on the global scale that the FAO Governing Bodies recommended the formulation of a global **Code of Conduct for Responsible Fisheries** (CCRF), which could help set the *principles* and *international standards behaviour* for responsible practices, taking into account the relevant biological, technological, economic, social, environmental and commercial aspects. The Code, unanimously adopted on **31 October 1995** by the FAO Conference, provides the necessary framework for national and international efforts to ensure the objectives of ensuring the effective conservation, management and development of all living aquatic resources can hopefully be achieved.

Four years of exhaustive efforts by interested countries of the world have resulted in a consensus on the current comprehensive text of the CCRF. During the negotiation process, however, specific regional issues were diluted, or perhaps even avoided, with a view towards finding acceptable global compromises and consensus on controversial issues. There was also a strong political will by the countries concerned to avoid from interfering on sensitive issues within EEZs which are the prerogatives of national sovereignty, especially in its Articles on Fisheries Management and Fishing Operations.

Eventually the regional or global issues, including those on the high seas and related fisheries, have, in general, been focused upon. Throughout the deliberations of the CCRF, members from the developed fishing nations were comparatively more active, resulting in the CCRF being formulated based mainly on situations more relevant to the developed countries. Now the member countries, SEAFDEC and relevant international Organization and other stakeholders of fisheries are requested to implement the CCRF.

REGIONALIZATION OF CCRF TO SOUTHEAST ASIA

SEAFDEC supports the formulation and implementation of the CCRF and upholds the general principles and standards provided therein. The Organization realizes that the global consensus on the CCRF is an enormous achievement by the international society to rectify the current practices of fisheries worldwide even though the contained issues have not managed to fully cover all areas of concern for sustainable fisheries in all regions of the world. The region of Southeast Asia, for example, contributes a major proportion of global fisheries production, and is now seriously considering implementing the CCRF for the achievement of sustainable fisheries in its area.

However, before this can be achieved, the Region needs to identify specific fisheries situation in the region prior to the implementation of the Code. The different fishing scenarios and issues that exist within the Southeast Asian region, especially those relating to the multi-species coastal and small-scale fisheries which are rather dominant here but unfortunately only superficially covered by the global Code, need to be firmly addressed.

The following issues are among those identified as relevant to the Southeast Asian region that need further deliberations but considered missing or only partially covered in the CCRF:

(i) Operation practices of small scale fishing boats, that comprise a major proportion of the fishing vessels of the region, are not proportionally highlighted.
(ii) Fisheries management for small scale and coastal fisheries are only barely covered in the Article on Fisheries Management.
(iii) Freshwater, small-scale fisheries and aquaculture, which are extremely important and major sub-sectors contributing to the food security of the region, are also not appropriately covered.
(iv) Food security aspects of the fisheries have likewise not been fully considered. This has led to the organization of the "Kyoto Conference on the Sustainable Contribution of Fisheries to Food Security" by the Japanese Government and FAO in 1996, in order to supplement these important aspects of fisheries, that are a critical base of the fisheries in the region.

SEAFDEC thus supports that *further consideration and elaboration be taken to specifically address these issues*. To fulfill this obligation to the region, the Organization has initiated a rather comprehensive project of what is now known as the ***Regionalization of the Code of Conduct for Responsible Fisheries for Southeast Asia***. Phase I of the Project, which is mainly related to Responsible Fishing Operation, was successfully organized by SEAFDEC TD/Secretariat in June 1998 with a meeting of the regional Core Experts on the subject. This meeting paved the way for the more dignified Expert Consultation on the Regionalization of the Code of Conduct for Responsible Fisheries : Article 8 (Responsible Fishing Operations) held in Chiang Mai, in November 1998. One of the main outputs from this meeting is the set of Regional Guidelines for Responsible Fisheries in Southeast Asia: Responsible Fishing Operations.

Phase II of the Project is devoted to Article 9 (Aquaculture Development) for the region, a task currently undertaken by SEAFDEC AQD of the Philippines.

To undertake the third phase of this project, which is related to Fisheries Management in the Southeast Asia region, the technically competent SEAFDEC Marine Fishery Resources Development and Management Department will act as the focal point for regional efforts involving fisheries management experts of the region.

OBJECTIVES

The objectives of the Project on the "Regionalization of the Code of Conduct for Responsible Fisheries: Phase III Fisheries Management" are:

1. To consider inappropriate and missing components with respect to Fisheries Management in the Code of Conduct for Responsible Fisheries.
2. To produce the Regional Technical Guidelines for Responsible Fisheries Management, and
3. To disseminate and promote the Regional Technical Guidelines for Responsible Fisheries Management among the countries of the region.

Duration : 3 years (1999 – 2001) (tentative)

PROJECT STAFF

Mr Ismail Taufid Md Yusoff (MFRDMD)	Project Director
Dr Yasuhisa Kato (Secretariat)	Project Advisor
Mr Ibrahim Saleh (MFRDMD)	Project Advisor
Dr Mansor Mat Isa (MFRDMD)	Project Advisor
Dr Mohd Taupek Mohd Nasir (MFRDMD)	Project Manager
Mr Rosidi Ali (MFRDMD)	Project Coordinator

REGIONAL CORE EXPERTS

The following core experts have been identified and endorsed by the respective governments to effect the success of the Project.

Dr. Vu Van Trieu
Vice Director General of International Cooperation Department,
Ministry of Fisheries Socialist Republic of Vietnam,
10 Nguyen Cong Hoan Street, Hanoi,
VIETNAM

Ms. Jessica C. Munoz
Fisheries Resources Research Division,
Bureau of Fisheries and Aquatic Resources,
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Mr. Suharyadi Salim
Chief, Fishing Technology Development Center, Semarang,
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Mr. Sakul Supongpan
Director of Bangkok Marine Fisheries Development Center
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ADVISOR

Mr. Kiyoshi Katsuyama
Deputy Director,
International Affairs Division,
Fisheries Agency,
Ministry of Agriculture, Forestry and Fisheries,
1-2-1, Kasumigaseki, Chiyoda-ku, Tokyo, 100-8907, JAPAN.

Activities & Time Schedule: To fulfill the objectives of the Project, two series of activities will be undertaken within the time schedule as follows:

I. The Regional Technical Guidelines for Responsible Fisheries Management.

ACTIVITIES	TIME SCHEDULE
1. Identification of Regional Core Experts	1999
2. Government endorsement of Core Experts	1999
3. Organisation of Pre-Workshop among the Core Experts and Advisors.	27-30 January, 2000
4. Contracts with the Regional Core Experts.	30 January, 2000
5. Preparation of Regional Technical Guidelines for Responsible Fisheries Management (Article 7) by the Regional Core Experts.	****
6. Submission of Regional Technical Guidelines for Responsible Fisheries Management (Article 7) by the Regional Core Experts.	****
7. Organisation of Workshop among the Regional Experts and the Advisors.	****
8. Governments nominate three representatives excluding the core experts.	****
9. Expert Consultation Meeting	****

II. The Regionalisation of the Code of Conduct (Article 7) for Responsible Fisheries Management.

ACTIVITIES	TIME SCHEDULE
10. Preparation on the Draft Regional Technical Guidelines for Responsible Fisheries Management (Article 7)	****
11. Regional Government Consultation on the Regional Technical Guidelines for Responsible Fisheries Management (Article 7)	****
12. Adoption of the Regional Technical Guidelines for Responsible Fisheries Management (Article 7) at SEAFDEC Council Meeting.	****

FUTURE OUTLOOK

MFRDMD is hopeful that a set of similar guidelines covering responsible Fisheries Management can be produced at the completion of this exercise for the benefit of member countries in the region.

ANNEX 20

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THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

REVIEW OF SEAFDEC COLLABORATIVE RESOURCE SURVEYS IN THE SOUTH CHINA SEA

By:

DR. Y. KATO
SEAFDEC/Secretariat

REVIEW OF SEAFDEC COLLABORATIVE RESOURCE SURVEYS IN THE SOUTH CHINA SEA

Dr Y. Kato
SEAFDEC/Secretariat

Introduction

SEAFDEC's Interdepartmental Collaborative Research Program on Fishery Resource Survey in the South China Sea was initiated in 1995 after acquisition of M.V. SEAFDEC from Japan. The first cruise was conducted for Area I Gulf of Thailand and East Coast of Peninsular Malaysia from September to October 1995. The studies in Area II(Waters of Sabah and Sarawak in Malaysia and Brunei Darrussalam), Area III (West Coast of Luzon island in the Philippines) and Area IV have also been conducted consecutive way until 1999.

Since the documents (Proceedings of the First Technical Seminar on Marine Fishery Resource Survey in the South China Sea Area I, Proceedings of the Second Technical Seminar on Marine Fishery Resource Survey in the South China Sea Area II and Highlight of SEAFDEC Interdepartmental Collaborative Research Program on the Fishery Resources on the South China Sea Area I) which had been available and enabled to make a review were limited during the reviewing period, the only preliminary review was conducted based on the outcomes from the resource survey for the Area I.

Preliminary Review

The above Survey (for Area I) conducted the following research in order to assess the fishery resource in the proposed area.

Oceanography

1. Simulated temperature distribution contours at different depths in the Gulf of Thailand during pre-and post monsoon seasons.
2. Simulated salinity distribution contours at different depths during pre-and post monsoon seasons indicating possible occurrence of upwelling and downwelling process in the region, brought by the effects of the monsoons.
3. Dissolved oxygen distribution at different depths during pre-and post monsoon season, together with other measurement such as dissolved carbon dioxide indicating the movement of deeper water mass from and to the South China Sea.
4. Bottom characteristics.
5. Low levels of organic contents indicating low productivity in general with some exception such as near Samui Island where high productivity is envisaged.
6. Different levels of sulfide distribution, high in coastal and low in deeper areas.
7. Distribution of petroleum residues indicating the effects of human activities.
8. Distribution of metals contents are not fully analyzed.

Marine Biology

1. Primary production relating to chlorophyll-a profile and light penetration in different depths. High in surface water decreasing with depth.
2. Biological study on the phytoplankton.
3. Biological study on the zoo plankton
4. Biological study on benthic fauna indicating rich in the coastal areas, indicating low productivity in the offshore due to the scarcity of macrobenthos.

Fisheries Resources

1. Collection of fish larvae indicating the abundance of *Sardinella* but indicating substantial reduction of species and amount compared with previous similar surveys.
2. Some sampling survey using trawl was conducted but not systematically analyzed.

Fisheries Acoustic Survey

The following observation can be derived from the out come of the research,

1. Even though the title of the surveys were called as marine fishery resource survey, very few information on the fisheries resources are collected. It apparently based on the reason that the program was not prepared to collect these informations. This situation can partly be attributed to the vessel used which are not appropriately equipped with the fishing gears for sampling of fish. Therefore the vessel was used for her capacity on the oceanographical survey, seaworthiness and large capacity of her accommodation.
2. Although the supplemental efforts to solve such constraints were conducted including using additional vessel in collaboration with the countries where the survey conducted to collect fish sample, these data to date are not systematically analyzed to assess the resource survey, but mainly used for taxonomical information (In case of Area I).
3. The most of the information collected on oceanography, marine biology including fish larvae have great value for the reference points in each subject, since such comprehensive information and data were not available in the region.
4. SEAFDEC in some senses, failed to manage the overall program due to the mainly the fact that the main research topics above are outside of SEAFDEC competence. The reporting of the survey was greatly delayed. The first documents are made available three years after the survey. If the information contained has values on the specific time, the outcomes of the research are become outdated.

Based on the above observation, the following suggestion can be made in order to further develop the information base on the fisheries resources.

The major achievement of the survey was to collect the oceanographic and marine biology information in the South China Sea Areas. These information could not be obtained in other survey. However, since these factors in the South China Sea are rather static nature and may not drastically be changed year by year, unless major environmental changes in the areas are occurred. In addition, as far as the clear

linkages of such oceanographical factors with marine fisheries resource are our main concerns, the minor change of such factors may be less prioritized from the SEAFDEC's mandate.

In this connection, it is suggested that the similar survey in the other areas of South China Sea where these have not been conducted including Cambodia coast, water between Peninsula Malaysia and Sarawak and northern and middle parts of South China Sea including Spratly Islands will not be conducted from the view point of the prioritization requirement of the SEAFDEC programs.

Although with respect to the acoustic survey, it can be concluded that the current survey on this subject could provide some information on the stock abundance in the South China Sea. However, it should be noted that the current acoustic survey alone would not provide any information on the stock size. In this connection, following steps have to be taken in order to collect more useful information which will be useful for stock assessment.

1. Considering the multi-species composition, acoustic survey may not be useful tool to assess the resource of the demersal stocks which may require many assumptions to obtain its size by species.
2. Since the methodology and equipment have been developed for single species, the acoustic survey should use for pelagic species which are normally more single species composition.
3. However, the stock assessment of the pelagic survey involve another difficulty including fecundity and recruitment mechanisms of these species. It is therefore important to make survey more frequently systematically in the certain period and for wider areas. In this connection, the data collected from the fishermen is usually more useful. The development of data collection mechanism from the industry should simultaneously be developed.
4. In order to obtain the data at species level, the species specific target strength (TS) have to be measured.
5. In addition, during the survey, it is also important that species identification has to be conducted by the simultaneous sampling.

Considering the above constraints, the survey using acoustic equipment should be more carefully programmed.

Conclusion

The participants are invited to provide their views on the outcomes of the series of resource survey. It should be concluded that the series of surveys could provide great value of data and information especially in the field of oceanographical and marine biology. It is envisaged that the collected data and information will be greatly used in many ways as reference points for the future research works for South China Sea. However, it was also noted that the main purpose of the survey for fisheries resource survey may need some reconsideration to improve the outcomes.

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THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

FUTURE REGIONAL FISHERIES RESOURCE SURVEY PROGRAM OF SEAFDEC

By:

DR. Y. KATO
SEAFDEC/Secretariat

Future Regional Fisheries Resource Survey Program Of SEAFDEC

Y. Kato
SEAFDEC/Secretariat

Background

SEAFDEC launched the Interdepartmental Collaborative Research Program in 1995 to fully utilize the new training/research vessel; M.V.SEAFDEC with the provision of additional project fund from Japan. The Interdepartmental Collaborative Research Program was conducted in the South China Seas in four geographical areas (Gulf of Thailand, Waters off Sabah and Sarawak, West Coast of the Philippines and Waters off Vietnam) during 1995-1999. The most of the reports, especially consolidated ones are under preparation.

At the Thirty-First Meeting of the Council of SEAFDEC held in Japan in March 1999,it was informed that current difficult budgetary circumstances are likely to continue at least for a few more years. Therefore, it can not be expected that the contribution by Japan will increase every year. The Government of Japan also hoped that SEAFDEC would make further efforts towards more efficient and effective implementation of its Program. From this standpoint, the Government of Japan suggested that SEAFDEC should explore the possibility to institutionalize a strong evaluation system in order to show more concrete results of its projects and cost effectiveness.

On 6 th April 1999, the meeting to discuss about the Collaborative Research Program was held in MFRDMD with the representatives of the Secretariat, TD and MFRDMD. The following points were agreed with respect to the future Collaborative Research Program together with other technical issues on the collaboration among the Participated Departments.

(a) The collaborative survey in Vietnam will be the last of its kind in the South China Sea and the proposed survey for Vietnam will proceed as scheduled from 21st April 1999
(b) Future collaborative surveys should be reviewed and properly planned and organized to meet specific needs of fisheries and its development, with more committed participation by researchers from the Departments of SEAFDEC
(c) The acoustic component for future surveys should be reviewed to include species identification and its outcome beneficial for the management and development of fisheries
(d) Future project proposals may need to prepare for the scrutiny of the Program Committee
(e) The Secretariat, TD and MFRDMD need to collaborate and put up the above proposals
(f) Future proposals may take into consideration the transboundary fish stock including oceanic squids.

Proposal

It is therefore understood that the research program should be prepared with more focus on the regional needs and best possible use of physical equipment including vessel. The criteria of the research topics should be carefully elaborated. The followings are the proposals for the future collaborative surveys to be conducted by SEAFDEC.

1. Objectives of the Program

Under the SEAFDEC Strategic Plan, regional objectives were more clearly defined. All SEAFDEC programs and activities will have more regional directive when the prioritized Program are formulated. In this connection, it is proposed that future Collaborative Research Program will change its name to "Regional Fisheries Resource Survey Program".

The Regional Fisheries Resource Program should have more clear fisheries objectives in order to first meet with the mandate of SEAFDEC and fully mobilize the technical competence in the SEAFDEC framework. In addition, it can be considered that survey target should be focused on the items which agreed at the meeting in MFRDMD in April 1999 as the "Future proposals may take into consideration the trans-boundary fish stock including oceanic squids".

2. Scope of the Program

From the view of the above policy consideration and financial constraints, the present collaborative research program in the South China Sea will be discontinued. M.V. SEAFDEC which has been designed for a training vessel for tuna purse seine will in the future, mainly be used for training and exploratory work in Indian Ocean where tuna is comparatively abundant . Therefore, if the research program in South China Sea area is greatly needed, it will have to be elaborated with the condition that more appropriate research vessel will have to be identified.

In addition, if SEAFDEC continue to provide resource survey program to the coastal water in its member countries as conducted in the past program, this SEAFDEC's support may undermine the research initiatives by these member countries. SEAFDEC's initiative, under the Strategic Plan will therefore give more regional focus such as off shore areas, and complemented with the efforts by the national authorities in the coastal areas. If the target species are set for trans-boundary ones, these complementary efforts by SEAFDEC and the member countries will provide more comprehensive views on these fisheries stocks.

Program A.

It is therefore suggested that the regional researchers should meet and discuss areas where SEAFDEC should conduct its survey in accordance with the regional needs. Since there is very few high sea areas in the South China Sea, the target areas might be high seas and overlapping areas with neighboring countries in the South China Sea.

It is also suggested that the more clear fisheries objectives should be given. Based on the above suggestion, the target species can be trans-boundary fish stock. In addition, research focus should also given to the assessment of these stocks, and not only for the biological research. Off course, the oceanographic and environmental parameters which are proved to have linkage with the dynamics of the fisheries resources should also surveyed

together with other biological parameters such as plankton and larvae. By setting the target species of the survey, the required research component can be streamlined and interlinked in more meaningful way.

However, as SEAFDEC will not conduct the above survey under the current budgetary provision, extra budgetary funding source will first be sought. With some positive indication of the financial provision, the researcher from the concerned Departments of SEAFDEC and relevant member countries will elaborate the "Regional Fisheries Resource Survey Program" based on the agreed policy direction and scopes.

Program B.

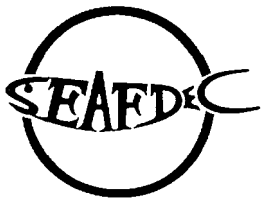
Based on the immediate regional needs and the formal request by the member country (s), SEAFDEC can extend the support for the resource survey program. Due to the above policy, the objectives of the research proposal should be focused on the shared stock. The research program will be jointly elaborated by the requesting country(s) in collaboration with the relevant Departments of SEAFDEC. By the nature of shared stocks, few countries can be involved in the implementation of the program. Since the program is joint program with the member countries, the required financial and research responsibilities can be shared among the concerned countries and the SEAFDEC.

The Conclusion

The Participants of the meeting are invited to provide comments on the regional fisheries resource survey program, especially for the immediate needs and the priorities. It is also requested to provide the areas where SEAFDEC can support in this field. If the information on what resources survey have been conducted in the last year by the government initiative and the major constraints to assess the important fish stocks are provided, they are very useful base for SEAFDEC to further elaborate and reprioritize the program on the Regional Fisheries Resource Survey Program.

ANNEX 22

Annex 22



THE FOURTH REGIONAL WORKSHOP ON SHARED STOCKS:
RESEARCH AND MANAGEMENT
IN THE SOUTH CHINA SEA

Kuala Terengganu, Malaysia 24th - 26th January 2000

MINUTES OF THE MEETING OF THE WORKING GROUP ON SHARED STOCKS IN THE SOUTHEAST ASIAN REGION

Date: 26th January 2000
Park Royale Hotel Kuala Terengganu

MINUTES OF THE MEETING OF THE WORKING GROUP ON SHARED STOCKS IN THE SOUTHEAST ASIAN REGION

Date: 26th January 2000
Park Royale Hotel Kuala Terengganu

ATTENDANCE:

Mr. Ismail Taufid Md. Yusoff (CHIEF OF SEAFDEC MFRDMD) (CHAIRMAN)
Mr. Sabri Haji Mohd Taha (BRUNEI DARUSSALAM)
Ms. Praulai Chantawong (THAILAND)
Dr. Chu Tien Vinh (VIETNAM)
Ms. Chee Phaik Ean (MALAYSIA)
Mr. Albert Chuan Gambang (MALAYSIA)
Mr. Irman Isnain (MALAYSIA)
Mr. Noel C. Barut (PHILIPPINES)
Mr. Mudjekeewis D. Santos (PHILIPPINES)
Mr. Suriyan Vichitlekarn (SEAFDEC SECRETARIAT)
Mr. Rafael V. Ramiscal (SEAFDEC SECRETARIAT)
Dr. Mohd Taupek Mohd Nasir (SEAFDEC MFRDMD) - Technical Rapporteur

MINUTES OF DISCUSSION:

1. The meeting agreed that the name of this Working Group be called "*The Working Group on Shared Stocks in Southeast Asian Region*".

2. The meeting agreed for the following representatives to be the coordinators for selected species groups of the shared stocks:
   a) *Malaysia* will be the coordinator for *mackerels*.
   b) *Thailand* will be the coordinator for *coastal tunas*;
   c) *The Philippines* will be the coordinator for *round scads*;
   d) *Brunei Darussalam* will be the coordinator for *sardines*; and
   e) *Vietnam* will be the coordinator for *oceanic tunas*.

3. Regarding the funding constraints, the Chief of MFRDMD expressed his believe that the Department would seek opportunities to obtain funding from various sources. He further expressed that if the Working Group could come up with a good regional program, there would be a greater possibility of implementing these future programs.

4. The meeting discussed on the representation of members in this Working Group. Based on a proposal to have the similar group of participants from the Fourth Regional Workshop on Shared Stocks directly involved in the Working Group, the meeting took note of the following advantages and disadvantages:
   a) Advantages: these participants have been involved in the discussion and have gained better understanding of the current issues on the shared stocks. In addition, the

participants have also been well acquainted with each other, and this would facilitate future communication.

b) Disadvantages: Without the government endorsement, these participants might not be given sufficient support to perform their tasks. They might also not be the direct responsible officers for shared stocks in their own countries.

5. The meeting however agreed to propose the names of the participants at this Workshop to be members of the Working Group. It would be up to the SEAFDEC Council Directors to make their final decisions.

6. It was tentatively agreed that each member of this Working Group would serve as a permanent member to further coordinate with other researchers/experts in the region. His or her tasks would be to compile information on the assigned species group and synthesize the needs for further research. Should the need arise, a meeting of the Working Group may be organized, possibly within the year.

7. The Regional Coordinator of this Working Group, SEAFDEC MFRDMD, is expected to prepare the Terms of Reference (TOR), working mechanisms, guidelines for compilation of information and data, etc., after the Workshop, and to circulate this information to all members for agreement. Upon agreement from the members, the Regional Coordinator would then prepare the program proposals on shared stocks and submit to the next SEAFDEC Program Committee Meeting and SEAFDEC Council Meeting for final approval.

8. The Chairman postponed the meeting.

Dicetak oleh:
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