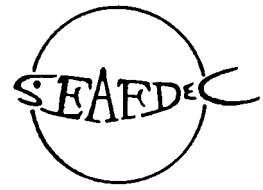

THE SECOND REGIONAL WORKSHOP ON SHARED STOCK IN THE SOUTH CHINA SEA AREA

Kuala Terengganu, Malaysia, 18 — 20 July 1995

SEAFDEC / MFRDMD / WS / 95 / CR. 9

COUNTRY STATUS REPORT
VIETNAM

SOME BIOLOGICAL PARAMETERS AND FISHERIES STATUS OF SHARED STOCK *Decapterus, Rastrelliger* AND TUNAS IN COASTAL SEAWATERS OF VIETNAM

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I. INTRODUCTION

Vietnam has a coast line of 3,260 km. spreading over 13 latitudes and an exclusive economic zone of about one million square kilometres.

The fisheries sector plays an important role in the national economy of Vietnam. In order to develop the fisheries sector successfully, it is necessary to master all characters of natural conditions and resources.

Both the pelagic and demersal fish resources have become very important for commercial fisheries in Vietnam. The shared stock like round scad (Decapterus), mackerel (Rastrelliger) and tunas belonging to the most important commercial fish of the country.

Fisheries research in seawaters of Vietnam was carried out since foundation in 1923 of the Indo – China Oceanographic Institute based in Nha Trang. Series of research cruises on board of the R/V De LANESSAN, Trawler, 1000 Hp were conducted continuously until the World War II taken place.

Due to the war situation the research works were interupted during 1940 – 1955 period. After 1955, the research works on fisheries resources and oceanography were being carried out by the Research Institute of Marine Products (RIMP) and other institutions independent or in cooperation with research institutions of other countries.

The major fisheries research activities in seawaters of Vietnam are summarized in **Table 1.**

Table 1: Fisheries Research Activities

Period	*Research Institutions*	*Research Vessels*	*Research Areas*
1959 – 1961	Station of Marine Research (now RIMP) (Vietnam – China Cooperation.	Trawler of 250 Hp	Tonkin Gulf
1960 – 1961	Station of Fisheries Research, (now RIMP) (Vietnam – USSR Cooperation)	Trawler PELAMIDA (1000 Hp) Purse Seiner ONDA Trawler, Long Line ORLIK	South China Sea and adjacent areas
1962 – 1977	Station Fisheries Research (now RIMP)	6 Trawler of 90–200 Hp	Coastal areas of the Tonkin Gulf

Period	*Research Institutions*	*Research Vessels*	*Research Areas*
1969 – 1971	Fisheries Research Institute Saigon (UNDP/FAO)	Trawler KYOSHIN MARU No. 52, (1000 Hp) HUU NGHI, Purse seiner (380 Hp)	Central and South Vietnam, Gulf of Thailand
1977 – 1980	Research Institute of Marine Products (RIMP)	R/V BIEN DONG Fishery Multipurpose (1500 Hp)	Coastal areas of Vietnam
1979 – 1988	RIMP (Vietnam – USSR)	21 Research Vessels of 800–3800 Hp 33 cruises	EEZ of Vietnam
1991 – 1993	RIMP	4 pair trawlers 500 Hp	Coastal areas of Tonkin Gulf

Data on biology and fishery of round scads, mackerels and neritic tunas were collected from above-mentioned research activities and from commercial fishery.

The data have been collected and analyzed in accordance with the FAO Manuels for fishery research purposes and others methods.

II. BIOLOGICAL PARAMETERS

A. Round Scads *Decapterus Maruadsi*

Round scads belonging to genus Decapterus in the Vietnamese seawaters are represented by 4 species namely: *Decapterus maruadsi* (White tip scad), *D. lajang* (Slender mackerel scad), *D. kurroides* (Redtail scad) and *D. russelli* (Russell's mackerel scad). Among these species *D. maruadsi* is the most common species. The biological features of *D. maruadsi* are given as follows:

DISTRIBUTION

D. maruadsi is distributed widely in seawaters of Vietnam, it was found through the coastal areas from the Tonkin Gulf to the Thailand Gulf, mainly at the depth range of 30 – 60 m.

LENGTH FREQUENCY DISTRIBUTIONS

D. maruadsi caught by traditional pelagic fishery have body length ranging from 60 to 239 mm, mainly from 120 – 189 mm. There are some differences in length frequency distributions of fishes caught during North–East Monsoon time and South–West Monsoon time. **(Figure 1)** Length frequency distributions of *D. maruadsi* caught by bottom trawl and pelagic trawl on board of R/V BIEN DONG during 1978 – 1980 in Central and South Vietnam seawaters areas are shown in **Figure 2.**

The length frequency distributions of *D. maruadsi* caught by trawl fishing and other fishing methods are relatively similar. It could be understood through the day night vertical migration of this species. The phenomen is described in this paper.

GROWTH

Length – Weight Relationship

Values of a and b in Length – Weight relationship equation $W = a L^{b}$ are shown in **Table 2.**

Figure 1 – Length Frequency Distribution D. Maruadsi in 1974 – 1975

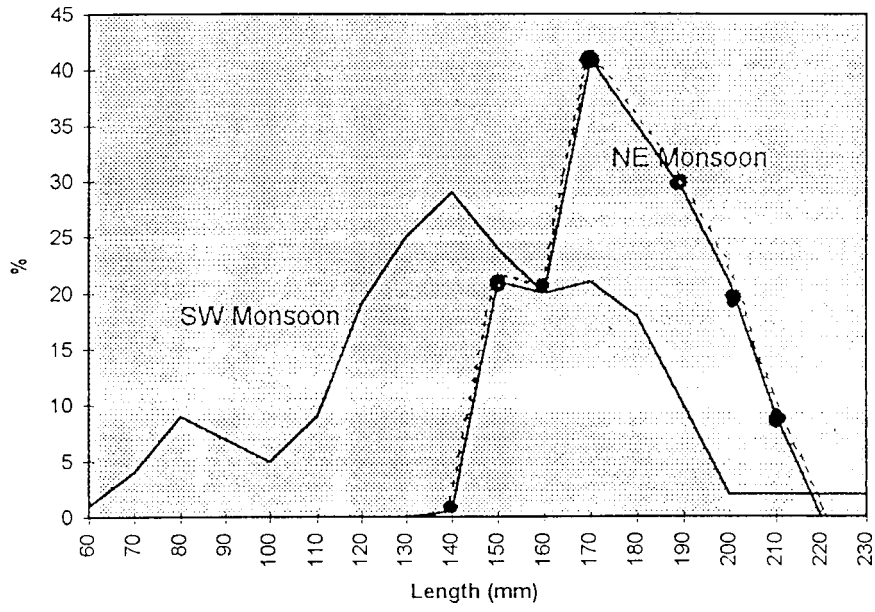


Fig.2 : Length frequency distributions of D.maruadsi caught by R/V BIENDONG during 1978-1980

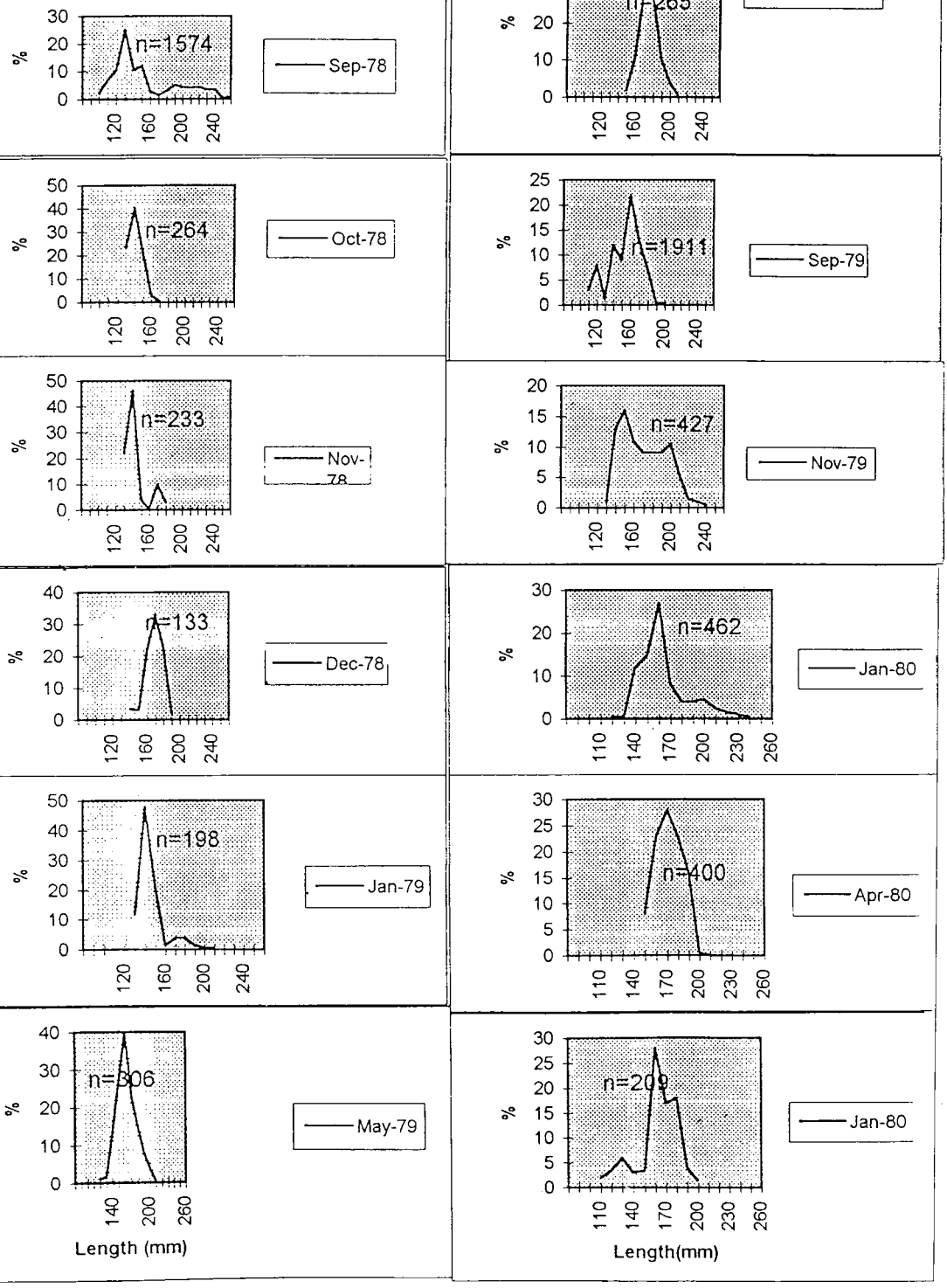


Table 2: Length – Weight Relationship of *D. maruadsi*

Areas	*a*	*b*
Central part of the Tonkin Gulf	0.00001340	2.5330
South–Eastern part of the Tonkin Gulf	0.00006839	2.6507
Southern part of Central Vietnam	0.0001005	2.6020

Von Bertalanffy Equation

The growth parameters of *D. maruadsi* are shown in **Table 3**.

Table 3: Growth Parameters of *D. maruadsi*

Areas	*Lo*	*K*	*to*
Central part of the Tonkin Gulf	243	0.32	0.89
South–Eastern part of the Tonkin Gulf	286	0.21	1.17
Southern part of Central Vietnam	258	0.22	0.79

The growth curves of *D. maruadsi* are shown in **Figures 3, 4** and **5**.

Growth Rate

D. maruadsi grew very fast in the first year. Growth in length–at–age is shown in **Table 4**.

Table 4: Growth Rate of *D. maruadsi*

Age (Year)	*Length (mm)*	
	Range	*Mean*
1	70 – 159	100 – 110
2	100 – 199	137 – 148
3	140 – 209	164 – 176
4	160 – 219	184 – 202

Fig 3 : Growth curve of D.maruadsi in central part of the Tonkin Gulf

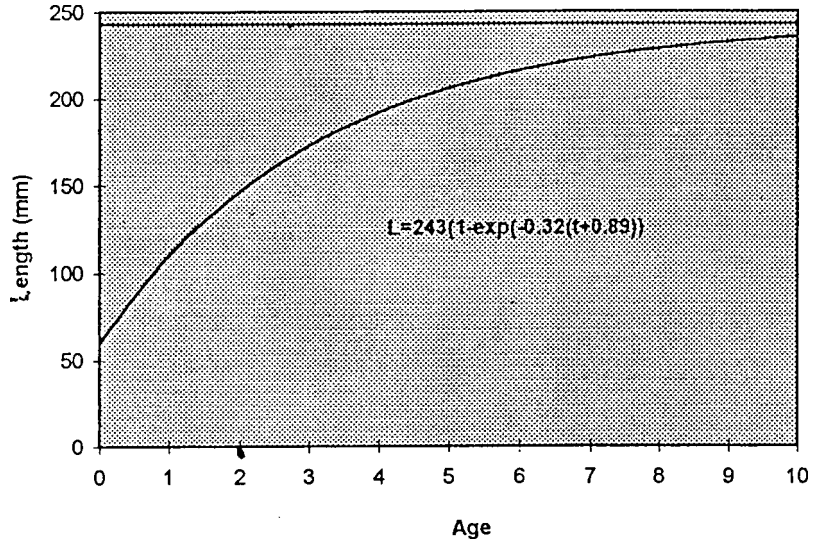
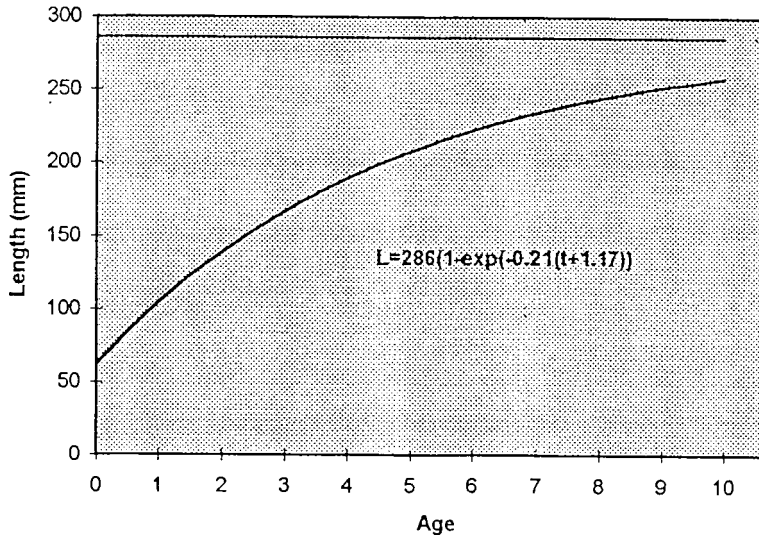
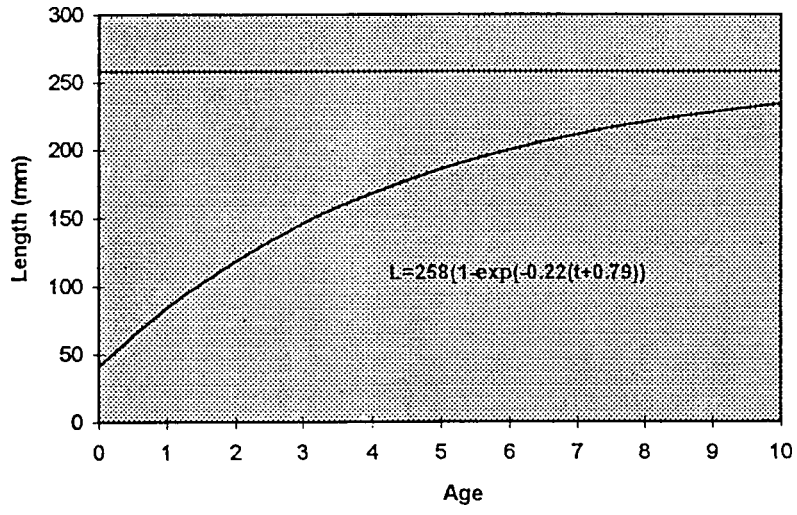


Fig 4 : Growth curve of D.maruadsi in South - Eastern part of the Tonkin Gulf



Fig,5: Growth curve of D.maruadsi in Southen part of the Central Vietnam



MORTALITY

The total mortality (Z) was estimated to be 1. 19, natural mortality (M) 0.87 and fishing mortality (F) 0.32.

SPAWNING

Spawning season of *D. maruadsi* lasts from January to August – September. In the Tonkin Gulf *D. maruadsi* spawns earlier (in January) than in other areas. *D. maruadsi* spawns 2 – 3 times during the spawning season. The size at first maturity of *D. maruadsi* is estimated at the smallest body length of 145 mm.

The spawning population consists mainly of fishes of length group 160 – 199 mm. (2 – 3 years old group).

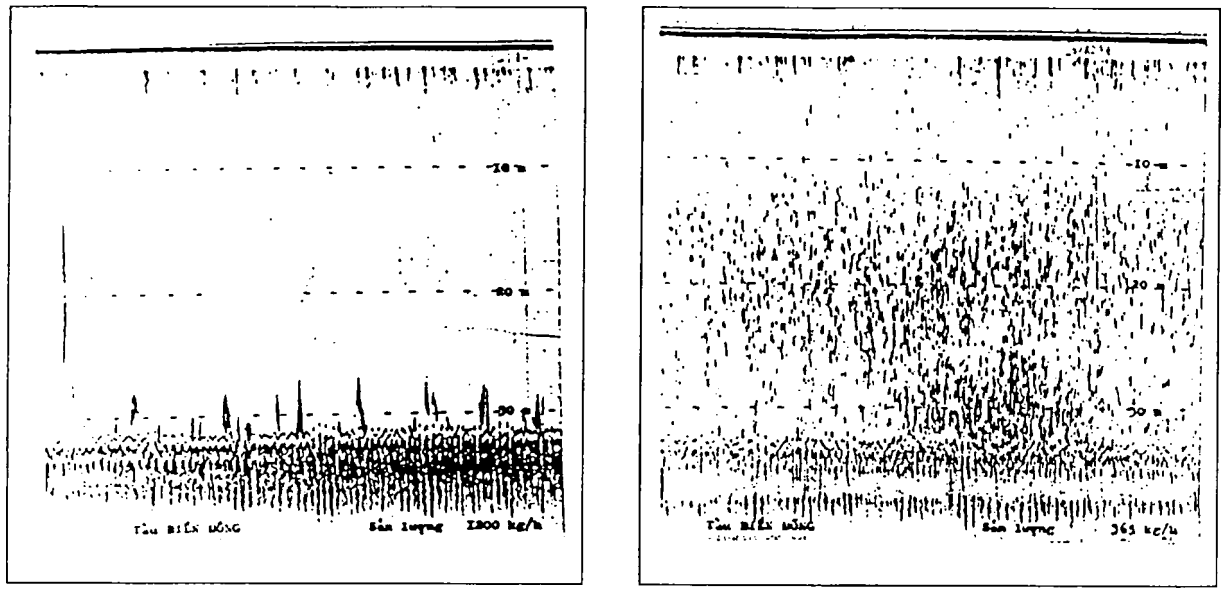
The fecundity of *D. maruadsi* ranges from 36.700 – 139.500 eggs. The relationship between fecundity and length and age are shown in **Table 5**.

Table 5: Fecundity of *D. maruadsi*

Length and Weight (mm) (g)		*Fecundity Range*	*Average*
Weight	60 – 69	49,800 – 57,500	53,200
	70 – 79	39,500 – 112,400	73,100
	80 – 89	58,700 – 115,900	78,200
	90 – 99	110,400 – 139,500	124,900
	100 – 109	51,900	51,900
	110 – 119	49,300	49,300
Length	160 – 169	46,000 – 46,900	46,500
	170 – 179	36,700 – 112,400	66,300
	180 – 189	49,800 – 115,900	68,900
	190 – 199	39,500 – 139,500	79,300
	200 – 209	51,900	51,900
	210 – 219	49,300	

MIGRATION

By Echodiagram recordings and catch composition of sample of test fishing by bottom and pelagic trawls, the day – night vertical migration of the *D. maruadsi* have been seen very clearly. It was found from the bottom during day time and to the upper layers at night time. **(Figure 6).**



Day time Night time

Figure 6: Day and Night Vertical Migration of *D. maruadsi* in South Vietnam (near CONSON Island)

From December to March, *D. maruadsi* migrates from central to the northern areas of the Tonkin Gulf for spawning and from April to August they approaches the coastal in the West. (**Figure 7**).

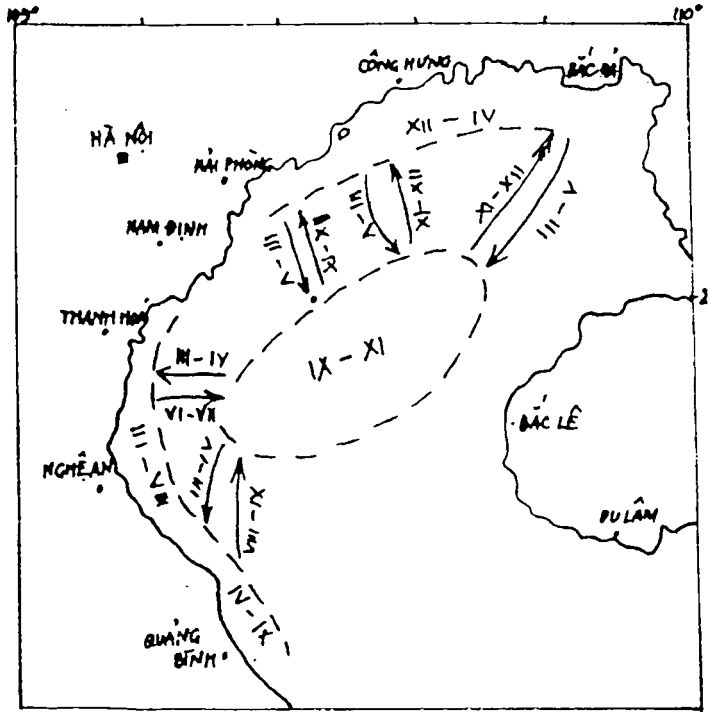


Figure 7: Migration of *D. maruadsi* in the Tonkin Gulf

In Phan thiet and Vung tau areas, South Vietnam *D. maruadsi* migrates from the northern to the southern areas and from off-shore areas to coastal ones.

STOCK ASSESSMENT

By Acoustic and Swept Area Methods, the total biomass and total allowable catch (TAC) of *D. maruadsi* were estimated for the Tonkin Gulf, Central Vietnam (12 – 16°N) and South Vietnam (8 – 12°N), the results of estimation are shown in **Table 6**.

Table 6: Biomass and Total Allowable Catch of *D. maruadsi*

Areas	*Biomass (MT)*	*TAC (MT)*
The Tonkin Gulf	59,000 – 75,000	26,000 – 33,000
Central Vietnam (12 – 16°N)	30,000 – 40,000	15,000 – 20,000
South Vietnam (8 – 12°N)	70,000 – 108,000	30,000 – 47,000
TOTAL	158,000 – 223,000	71,000 – 100,000

Comparing with the fishery it was only a priliminary rough estimation of biomass and total allowable catch of *D. maruadsi.* The more detail stock assessment of *D. maruadsi* is needed in the future.

B. Mackerels *Rastrelliger Kanagurta*

Mackerels (*Rastrelliger* spp.) are widely distributed in the Indian and Western Pacific Oceans. Two species of mackerels commonly found in the Vietnamese seawaters are:

Rastrelliger kanagurta (Indian Mackerel) and *R. brachysoma* (Short body mackerel). *R. kanagurta* are found through the whole seawaters of Vietnam while *R. brachysoma* are found only in the Gulf of Thailand.

Extensive studies on biology and ecology of mackerels have been carried out for *R. kanagurta* and *R. brachysoma* in many waters. In Vietnam, some studies on *R. kanagurta* have been done only.

The biological features of *Rastrelliger kanagurta* are given as follows:

DISTRIBUTION

R. kanagurta is distributed along the coast of Vietnam in water depth ranging from 15 to 10 m, but concentrated mainly in stratum of 25 – 70 m.

LENGTH DISTRIBUTION

R. kanagurta caught has length ranging from 72 to 280 mm with an average length of 209 mm. The length varies accordingly to areas, for example in Vungtau areas the length of *R. kanagurta* caught varies from 72 – 280 mm, in Conson Island areas from 62 – 260 mm and in Phanrang – Phanthiet areas from 135 to 295 mm.

LENGTH – WEIGHT RELATIONSHIP

The length – weight relationship equation of *R. kanagurta* is estimated to be:

$$W = 0.084\ L^{2.33}$$

AGE COMPOSITION

Indian mackerels caught in the Vietnamese water belonging to 4 age groups of which two years old fish group is predominant and accounting for average of 64.4%, one year old group accounting for 19.7%, three years old group – 12.0% and four years old group only 3.8%.

GROWTH

R. kanagurta grew very fast in the first year, at the end of the first year the length of newly hatched *R. kanagurta* reached in average of 113 mm. From second year, growth gradually decreased. The growth in length by age group of *R. kanagurta* is shown in **Table 7**.

Table 7: Growth in Length by Age Group

Age	*Length (cm)*	*Growth increments (cm)*
1	113	113
2	176	63
3	217	41
4	250	33

SPAWNING

Spawning season of R. kanagurta lasts from the end of dry season. (March) to the end of rainy season (October) with two peaks in March – June and September – October. The size at first maturity varies from 140 to 200 mm. The favourable temperature of seawater surface for spawning is 26 – 27.5°C and salinity 30 – 34%.

FOOD AND FEEDING HABIT

R. kanagurta feed mainly on zooplankton and partly on phytoplankton. Oncaea is dominant in food composition and accounting for 39.8%, Copepoda – 11.4%, Megapoda larva – 9.4%, Microtella – 5.6%, Temora discaudata – 4.6%, etc.

Food compositions of male, female and juveniles of *R. kanagurta* are relatively similar.

MIGRATION

Day and night migration by the vertical direction of *R. kanagurta* has been seen very clearly, especially by the echo diagram recordings received from the Echosounder SIMRAD – 38, 50 and 120 KHz. The results of trawling showed that, *R. kanagurta* being caught by bottom trawls only in the time from 2 am. to 6 pm.. With the pelagic trawl the highest catch was gained from 10 –12 pm.

C. Tunas

Tunas are widely distributed in Coastal and seawaters and off-shore areas of Vietnam. Among 14 species belonged to 8 genera distributing in the South China Sea and adjacent waters, 8 species belonged to 5 genera have been identified in seawaters of Vietnam, namely: *Auxis thazard* (Frigate tuna), *A. rochei* (Bullet tuna), *Euthynnus affinis* (Eastern little tuna), *Sarda orientalis* (Oriental bonito), *Katsuwonus pelamis* (Skipjack tuna), *Thunnus tonggol* (Longtail tuna), *T. albacares* (Yellowfin tuna) and *T. obesus* (Bigeye tuna).

The first 6 species are considered as neritic tunas, they are objects of traditional tunas fishing in Vietnam, and the last two species are objects of longline fishing which was introduced into Vietnam only for some years ago:

The data and information on the important biological features of neritic tunas in seawaters of Vietnam are given as follows:

LENGTH COMPOSITION

Among the neritic tunas caught in seawaters of Vietnam, *Auxis rochei* (Bullet tuna) has the smallest body size, the size of Bullet tuna ranges from 24 – 29 cm. The size compositions of tunas are shown in **Table 8**.

Table 8: Length Composition of Tunas

Species	*Body Size (Lf) Captured (cm)*	*Dominant Size Group*
Auxis rochei	24 – 29	26 – 27
A. thazard	20 – 59	29 – 33
Euthynnus affinis	20 – 64	36 – 60
Sarda orientalis	41 – 71	44 – 57
Thunnus tonggol	26 – 68	48 – 56
Katsuwonus pelamis	41 – 65	50 – 56

Length frequency distribution are shown in **Figures 8 – 12**.

LENGTH – WEIGHT RELATIONSHIP

Length – Weight relationship of tunas caught in seawaters of Vietnam are shown in **Table 9**.

Fig. 8 : Length frequency distribution of Auxis rochei

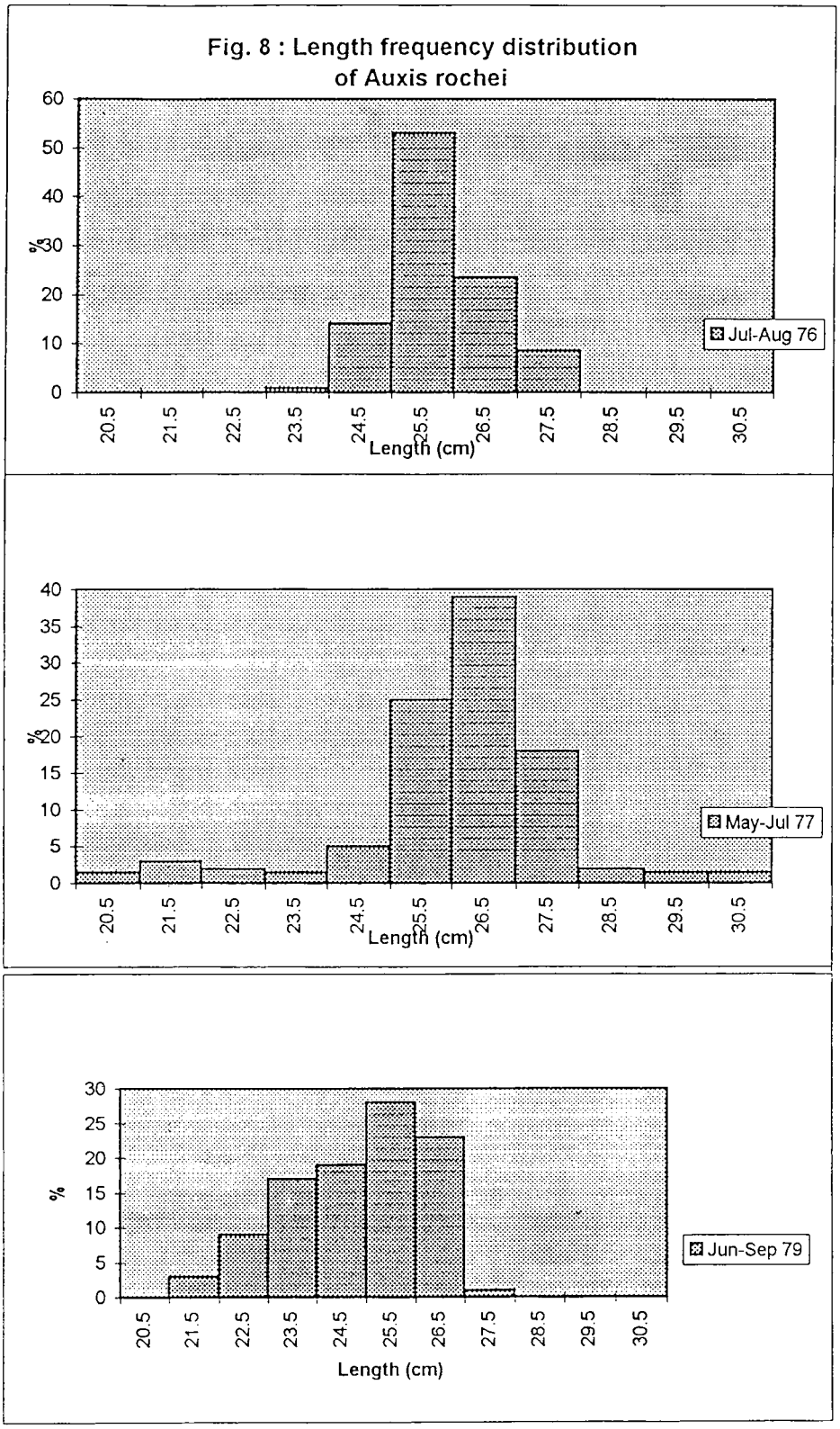
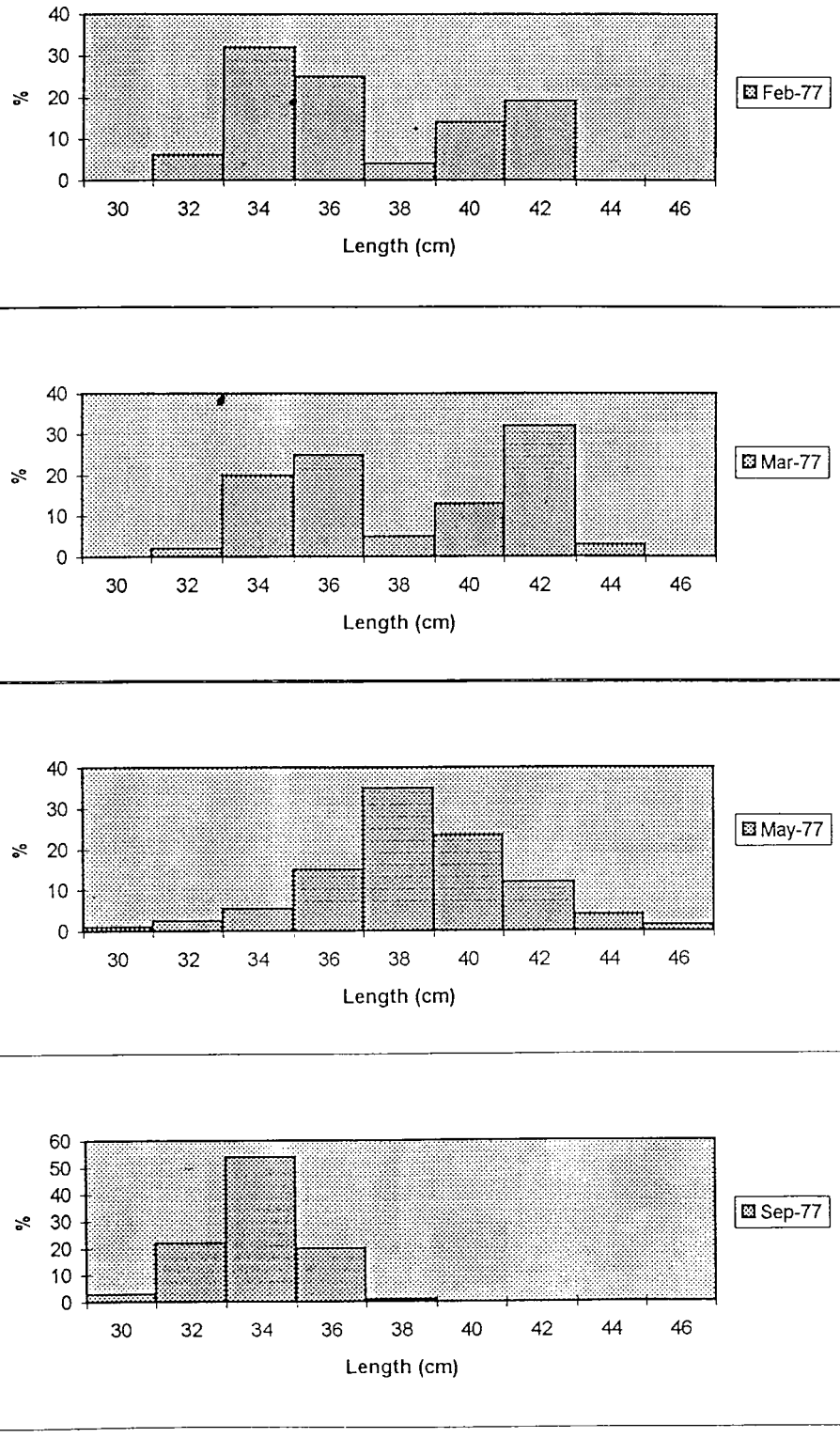
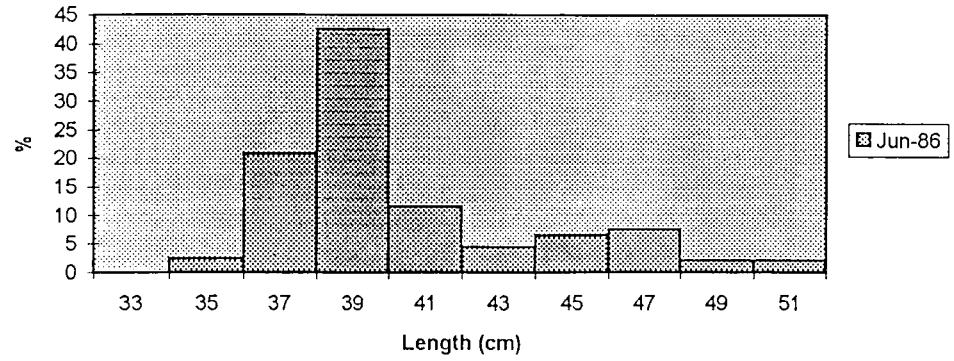
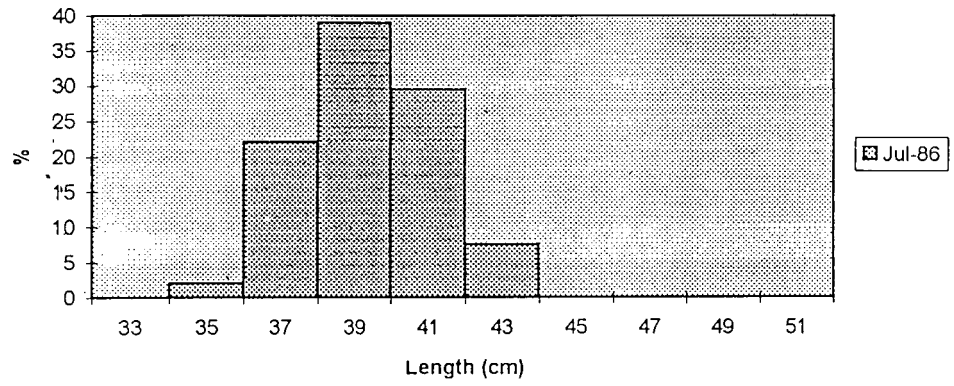


Fig. 9 : Length frequency distribution of Auxis thazard in Central Vietnam



Length frequency distribution of Auxis thazard in South-Eastern seawaters and the Tonkin Gulf





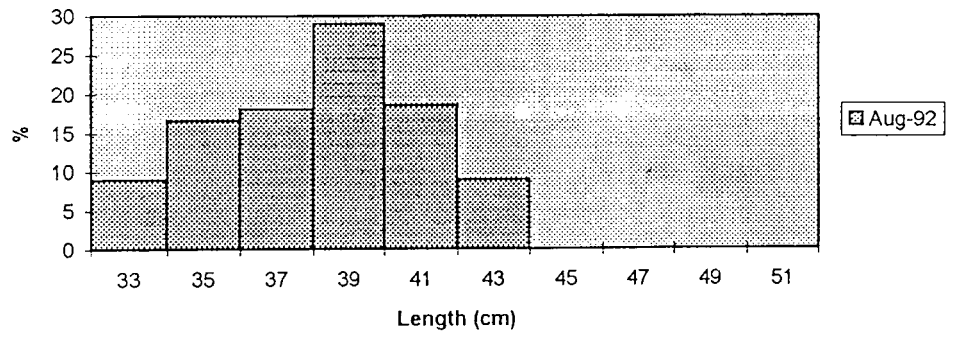
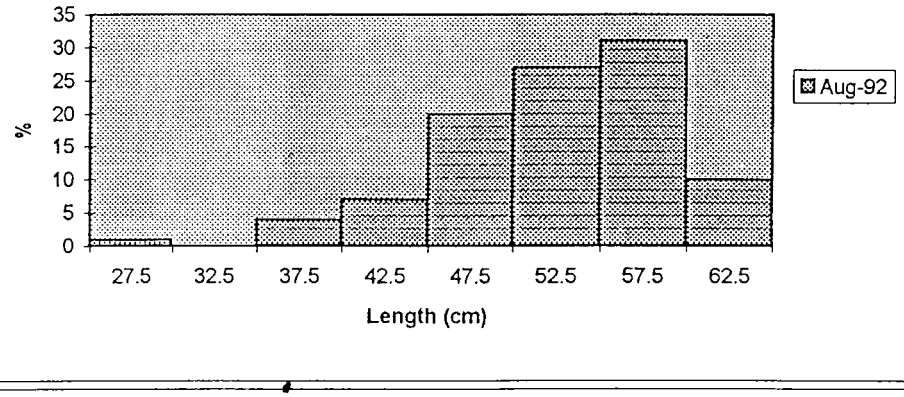
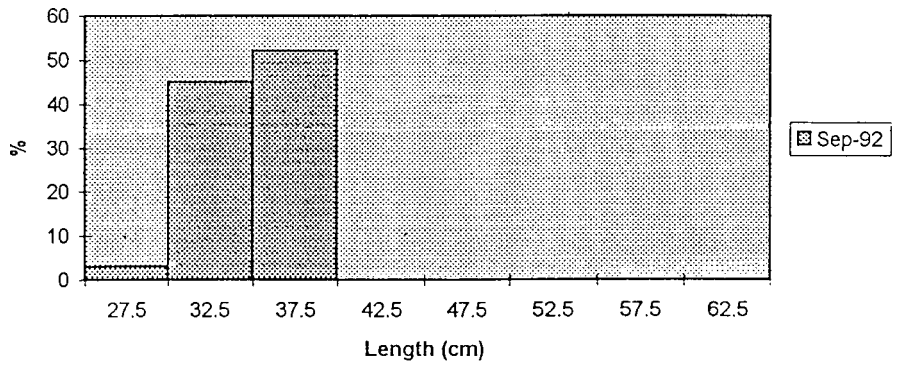
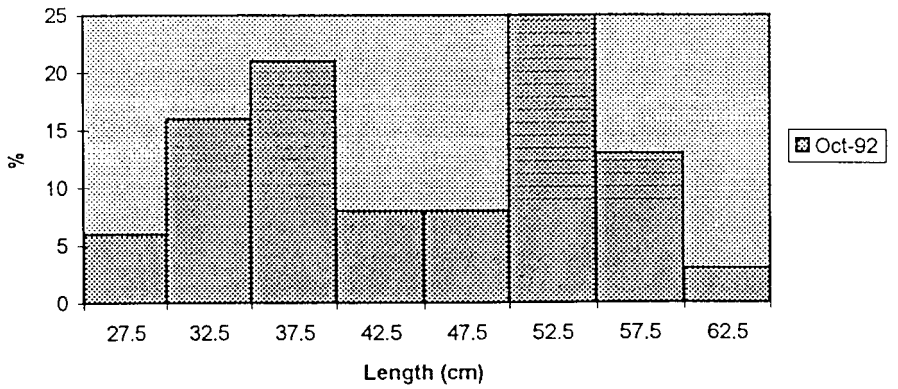
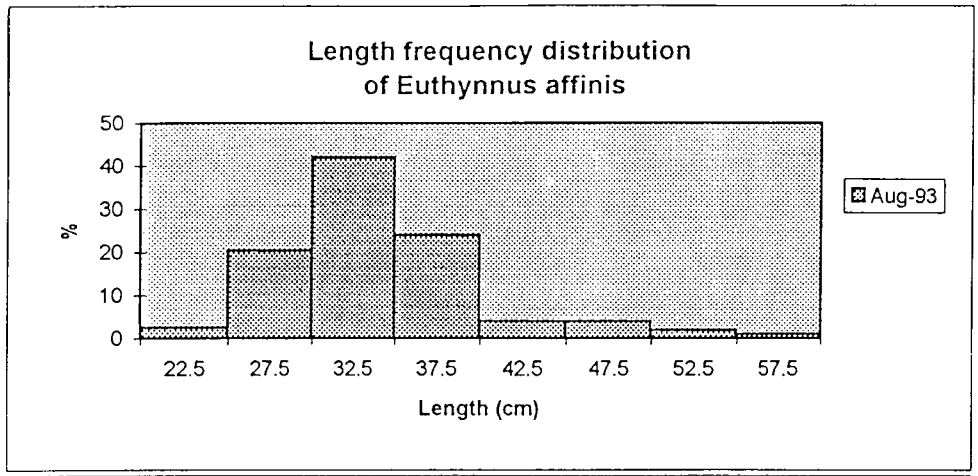


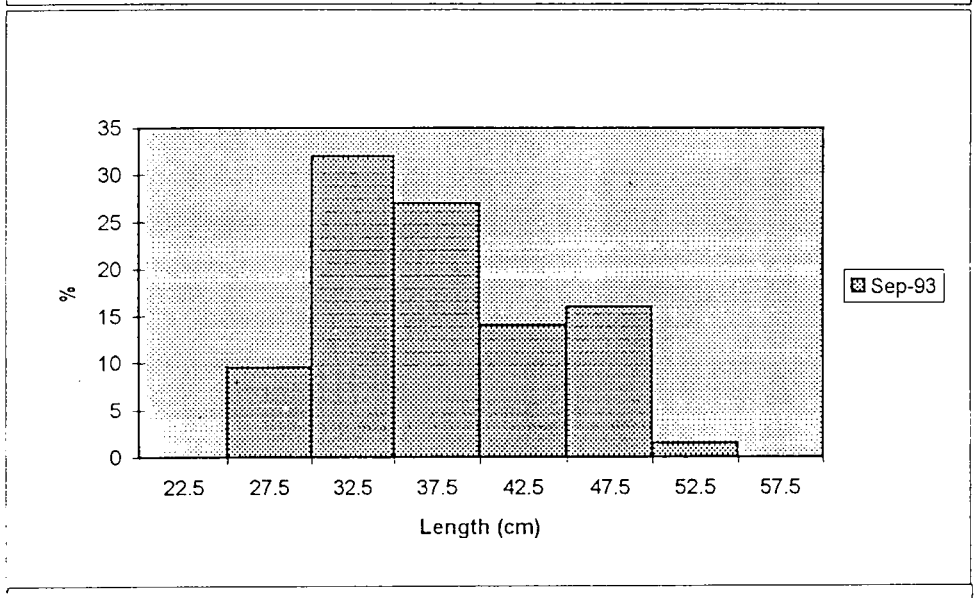
Fig. 10 : Length frequency distribution of Euthynnus affinis








Length frequency distribution
of Euthynnus affinis
50
40
30
20
10
0
%
22.5
27.5
32.5
37.5
42.5
47.5
52.5
57.5
Length (cm)
Aug-93


35
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32.5
37.5
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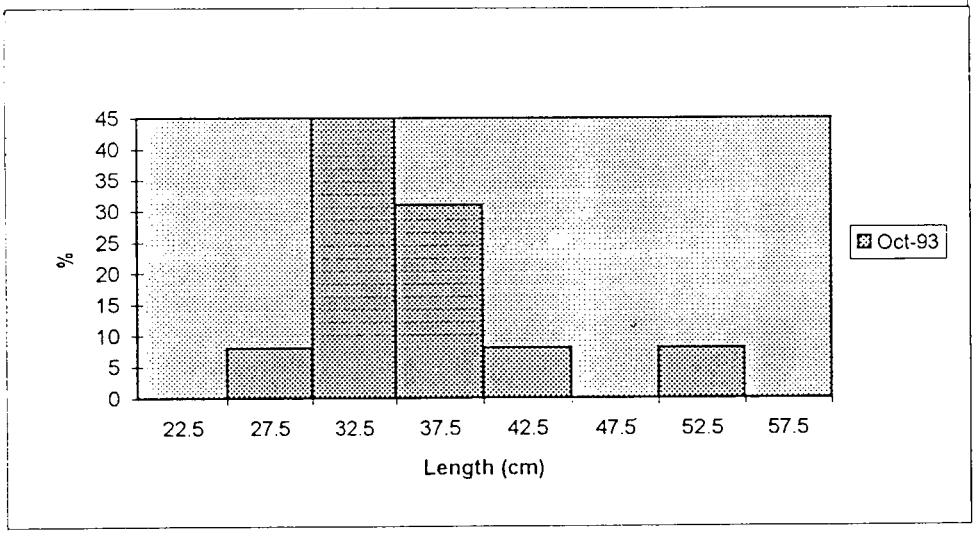
52.5
57.5
Length (cm)
Sep-93


45
40
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0
%
22.5
27.5
32.5
37.5
42.5
47.5
52.5
57.5
Length (cm)
Oct-93

Fig. 11 : Length frequency distribution of Thunnus tonggol

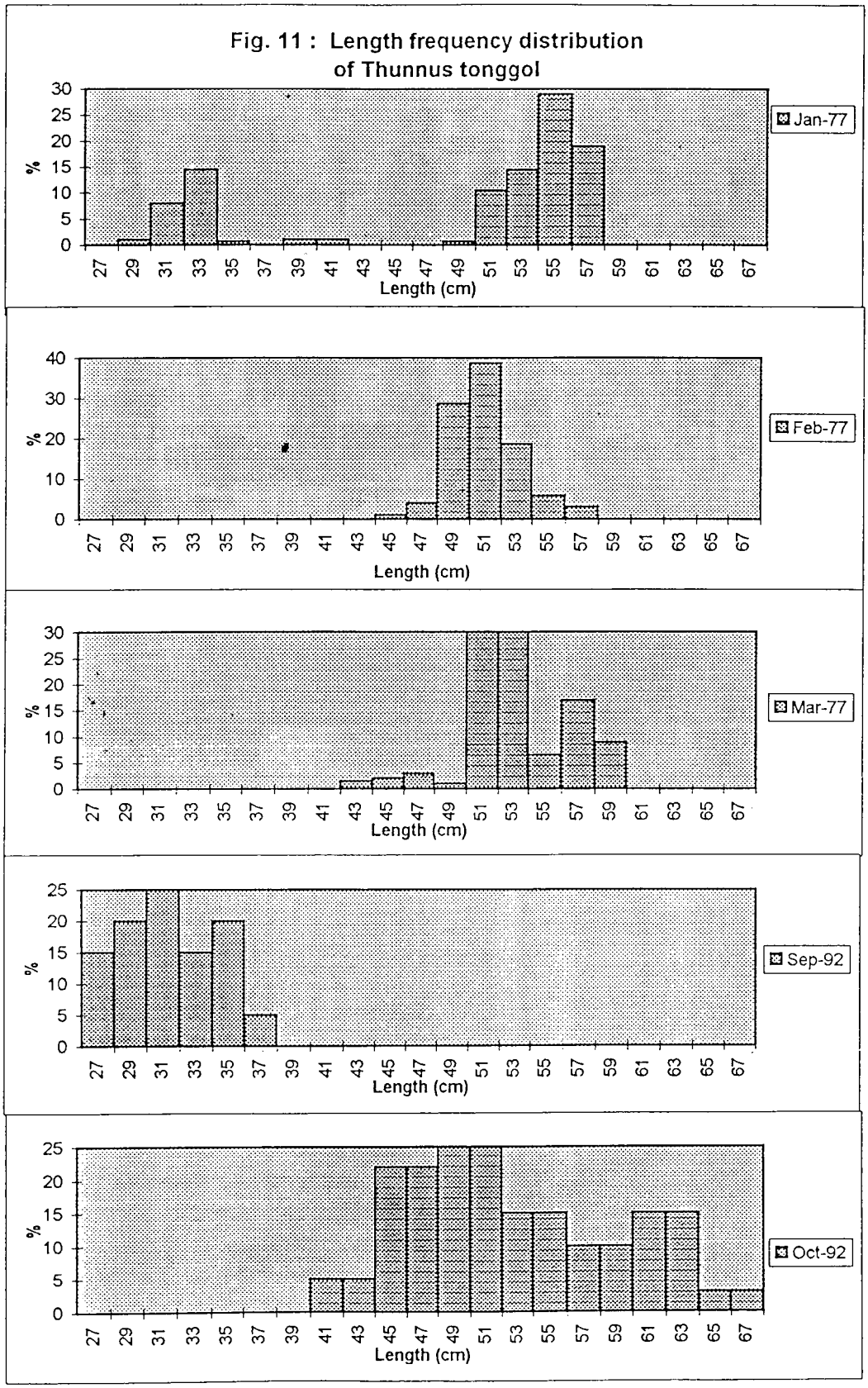
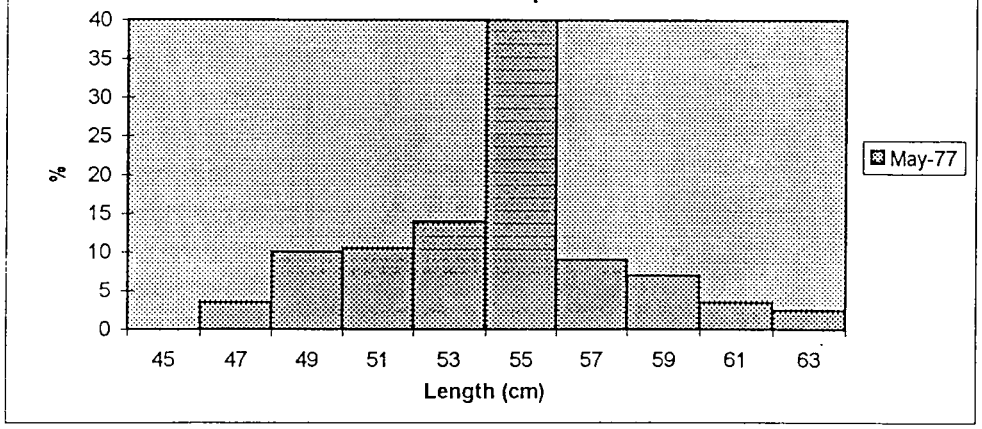
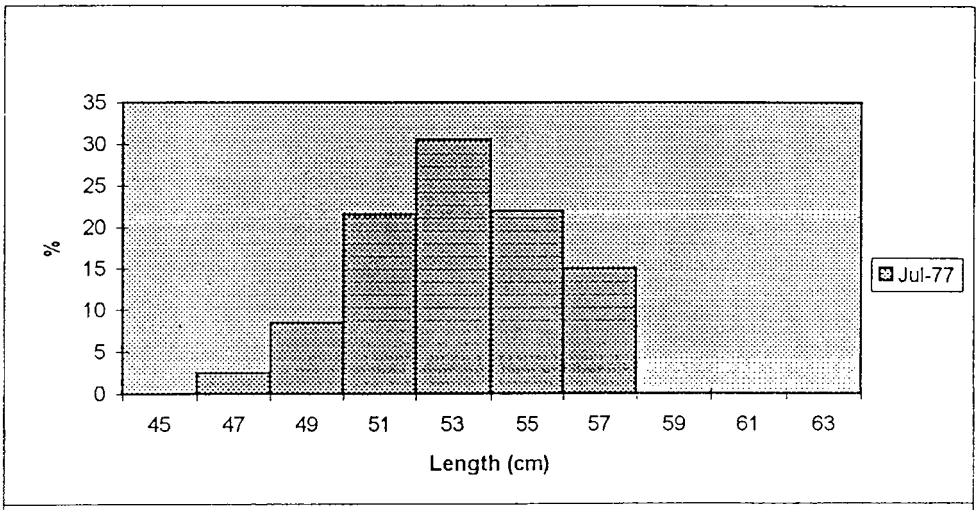


Fig. 12 : Length frequency distribution of Katsuwonus pelamis





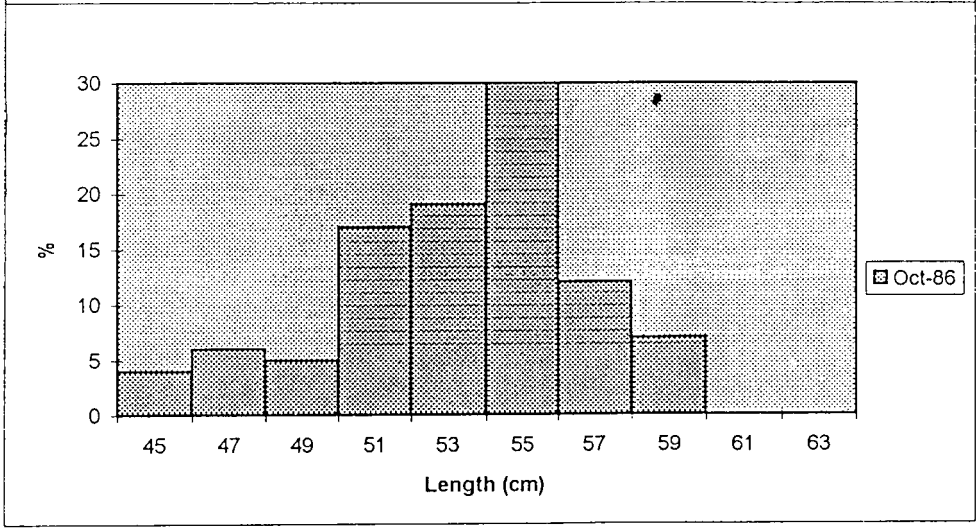


Table 9: Length – Weight Relationship ($W = aL^b$)

Species	*a*	*b*
Auxis thazard	0.00164	2.210
Euthynnus affinis	0.00058	2.698
Thunnus tonggol	0.000731	2.644
Katsuwonus pelamis	0.000114	2.710

VON BERTALANFFY EQUATION

Growth parameters were estimated by Bhattacharya method (used program FiSAT – FAO/ICLARM. Stock assessment Tools). The results of estimation are shown in **Table 10**.

Table 10: Growth Parameters

Species	*Loo*	*K*	*to*
Auxis thazard	60.58	0.982	0.111
Katsuwonus pelamis	72.08	1.099	0.08
Thunus tonggol	72.22	0.899	0.128

The Growth curves of some species are shown in **Figures 13, 13a, 14, 14a**.

MORTALITY

Mortality rate was estimated by using program FiSAT. The total mortality (F), Fishing mortality (F) and natural mortality (M) Coefficents are shown in **Table 11**.

Table 11: Z, F and M Coefficents

Species	*Z*	*M*	*F*
Auxis thazard	1.94	0.38	1.56
Euthynnus affinis	1.0	0.52	0.48
Thunnus tonggol	1.3	0.27	1.03
Katsuwonus pelamis	0.54	0.28	0.26

Figure 13 : Growth curve of Thunnus tonggol

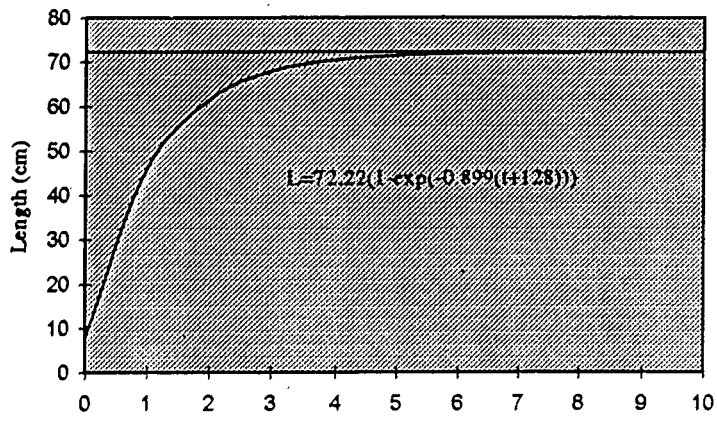


Figure 14 : Growth curve of Katsuowonus pelamis

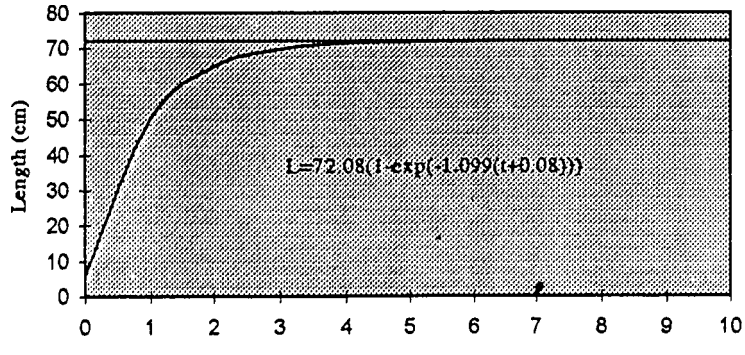


Figure 13a . Growth curve of Auxis thazard

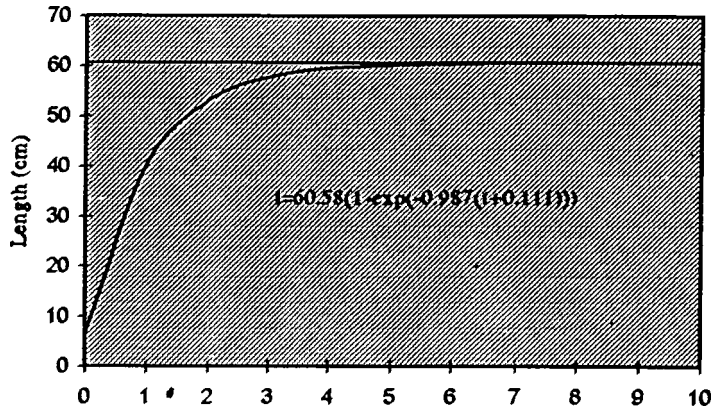
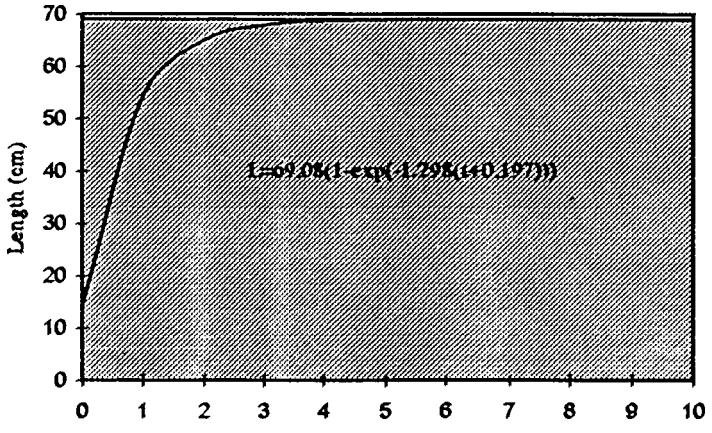


Figure 14a . Growth curve of Euthynnus affinis



FOOD AND FEEDING HABIT

All species of neritic tunas feed essentially on Carangids (Decapterus spp.), Squid (Loligo spp.), Sardines (Sardinella spp.) and Anchovies (Stolephorus spp.) as well as Zooplankton such as Amphipoda, Copepoda, Cephalopoda, Crustacean and Squilla larvae.

SPAWNING

Spawning seasons, fecundity of two neritic tunas as shown in **Table 12.**

Table 12: Spawning Season and Fecundity

Species	*Spawning Season (month)*	*Fecundity (x 1000)*	*Spawning Areas*
Auxis thazard	5 – 8 4 – 8 2 – 7	200 – 1060	Tonkin Gulf Central Vietnam Gulf of Thailand
Euthynnus affinis	4 – 8 3 – 9	1400	Tonkin Gulf Gulf of Thailand
Thunnus tonggol	3 – 9	1400	Gulf of Thailand
Katsuwonus pelamis	5 – 8 4 – 8		Tonkin Gulf Central Vietnam

MIGRATION

According to the results of drift gillnet catch of tunas, it was assumed that neritic tunas are migrating from off-shore areas of the South China Sea to seawaters of Central areas of Vietnam in January – February. They accure for sometime there and one part of stock migrates northward to the Tonkin Gulf in March – April and stays there until August – September. Other part of stock migrates southward to the Eastern seawaters. The major part of the stock stays in the Central seawaters areas.

Another stock migrates from southern off-shore areas to the Thailand Gulf.

III. STATUS OF FISHERIES

D. maruadsi in Vietnamese seawaters are caught mainly by bottom trawls, liftnet and purse seiners. The catch distributions of *D. maruadsi, D. kurroides* and *D. lajang* (kg./h of vessel of 2300 Hp, bottom trawl) in general and in dry (November – April) and rainy seasons (May – October) are shown in Figures of *D. kuroides* 15 – 17 of *D. maruadsi* in **Figures 18 – 20** of *D. lajang* in **Figures 21 – 23.**

The total catch production of *D. Maruadsi* was estimated at about 30,000 MT/year.

Mackerels (*R. kanagurta*) are objects of bottom trawl, liftnet, purse seiners and drift gillnet fishing.

No statistical data on catch and production are available from commercial fisheries. The catch distributions of *R. kanagurta* from research data are shown in **Figures 24 – 26.**

Fishing on neritic tunas is becoming one of the important commercial fisheries in Vietnam. Although the tunas resources are believed to be abundant over the entire areas, fishing on tunas has not been developed accordingly to resources potential yet.

The traditional methods of fishing for neritic tunas are chinese purse seiners and drift gillnet. Due to the lack of fisheries statistical system in Vietnam, the data on catch and production by species of tunas are not available. Roughly, the total production of all species of tunas in seawaters of Vietnam was estimated to be about 30,000 MT/year. The main fishing season for tunas in Vietnam is from April to August.

The catch dinamics of 3 species of *Decapturus* and *R. kanagurta* are given in **Table 13.** The results showed that, catch productivity of *D. maruadsi* in some years reached very high values (in 1977, 1979, 1980). It's tendency is to decrease in recent years.

In coastal areas of the Gulf of Thailand, date collected are limited, the similar tendency has been seen for *D. maruadsi* and *R. kanagurta* (**Table 14**).

Catch rate dinamics of shared stock in the Tonkin Gulf, Central sea waters and Eastern sea waters of South are shown in **Tables 15 – 17.**

FIG. 15 : CATCH DISTRIBUTION OF *DECAPTERUS MARUADSI*
During rainy season (May - October) 1977 - 1988
Converted Hp : 2300

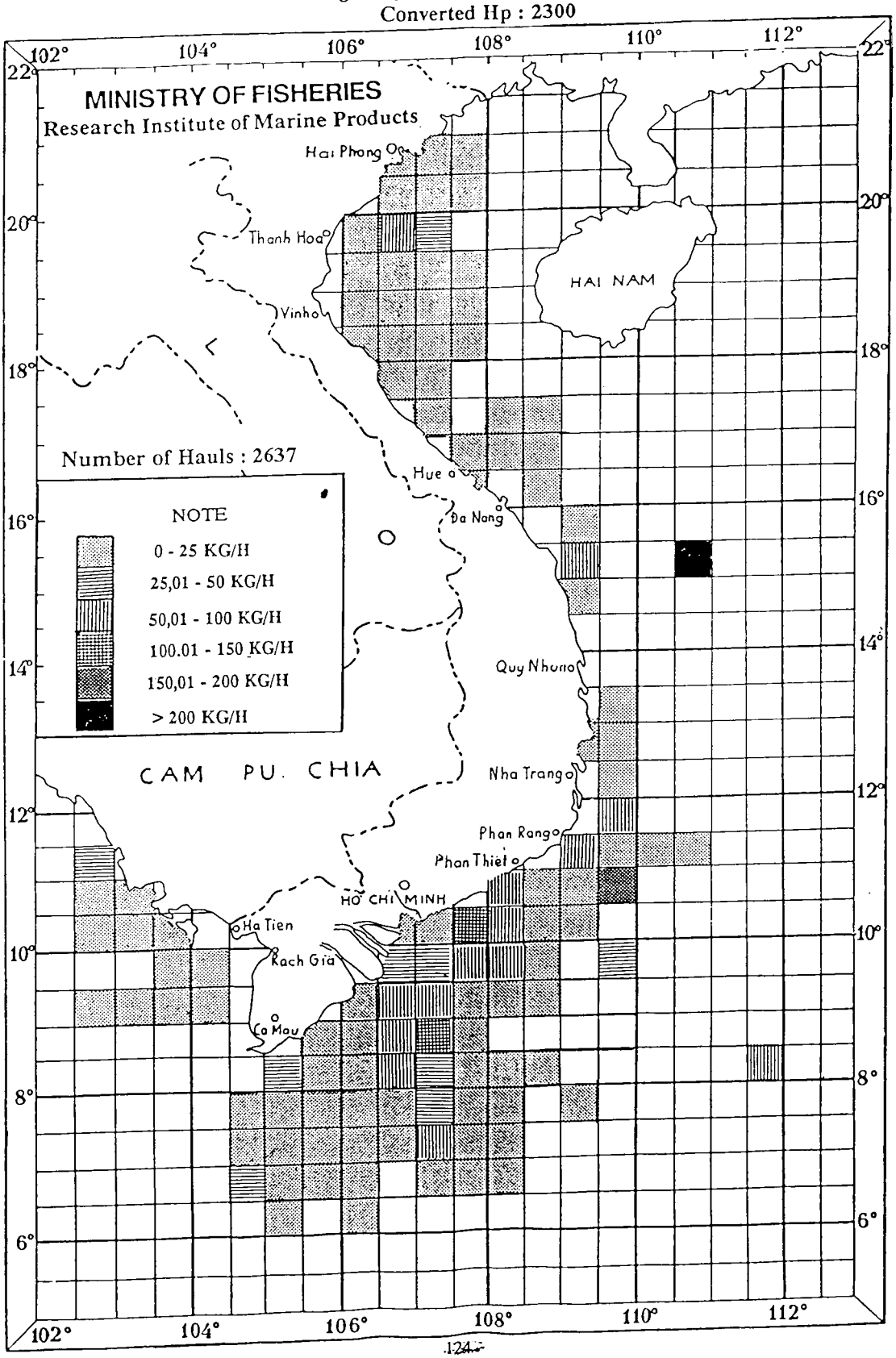


Table 13: Catch Productivity (Kg/h) of Shared Stock in Vietnamese Seawaters During 1977 – 1988

Year	*1977**	*1978**	*1979**	*1980**	*1981**	*1983*	*1985*	*1986*	*1987*	*1988*
N° of Hauls	*64*	*80*	*564*	*410*	*314*	*26*	*63*	*84*	*64*	*173*
Hp	*1.500*	*1.500*	*1.000*	*1.000*	*1.000*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*
Converted Hp	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*	*2.300*
1	2	3	4	5	6	7	8	9	10	11
Decapterus maruadsi	42.41	14.92	30.52	40.59	—	4.69	1.57	—	6.14	2.44
D. lajang	—	—	—	0.14	—	—	1.19	—	2.08	0.70
Decapterus kurroides	—	—	—	—	0.35	—	—	1.98	—	—
Rastrelliger kanagurta	2.89	—	—	1.78	—	0.14	—	—	0.97	0.38

Table 14: Catch Rate (%) of Shared Stock in the Gulf of Thailand During 1977 – 1978

Year	*1977*	*1979*	*1980*	*1981*	*1985*	*1986*	*1988*
N° of Hauls	*2*	*6*	*133*	*64*	*23*	*15*	*7*
Hp	*1500*	*1000*	*1000*	*1000*	*2300*	*2300*	*2300*
D. maruadsi	—	—	0.03	—	0.80	—	—
R. kanagurta	0.23	5.19	0.69	5.18	3.36	3.17	0.54

Table 15: Catch Rate (%) of Shared Stock in Central Seawaters During 1977 – 1988

Year	*1977*	*1978*	*1979*	*1980*	*1981*	*1983*	*1985*	*1987*	*1988*
N° of Hauls	*5*	*9*	*88*	*6*	*23*	*14*	*9*	*36*	*66*
Hp	*1500*	*1500*	*1000*	*1350*	*1000*	*2300*	*2300*	*2300*	*2300*
Decapterus	3.59	0.08	0.07	—	—	0.33	—	2.22	0.26
D. lajang	—	—	—	—	—	—	—	1.31	0.34
Rastrelliger kanagurta	—	—	—	0.65	0.08	0.56	—	6.67	1.57

Table 16: Catch Rate (%) of Shared Stock in the Gulf of Thailand During 1977 – 1978

Year	*1977*	*1978*	*1983*	*1985*	*1987*	*1988*
N° of Hauls	*44*	*62*	*12*	*7*	*22*	*35*
Hp	*1.500*	*1.500*	*2.300*	*2.300*	*2.300*	*2.300*
Decapterus maruadsi	5.21	10.95	16.24	1.43	7.38	2.31
D. lajang	—	—	—	0.9	1.71	—
Rastrelliger kanagurta	1.49	—	0.51	1.65	1.52	

Table 17: Catch Rate (%) of Shared Stock in Eastern Seawaters of South Vietnam During 1977 – 1988

Year	*1977*	*1978*	*1979*	*1980*	*1981*	*1985*	*1986*	*1987*	*1988*
N° of Hauls	*13*	*19*	*470*	*275*	*227*	*24*	*69*	*6*	*65*
Hp	*1500*	*1500*	*1000*	*1000*	*1000*	*2300*	*2300*	*2300*	*2300*
Decapterus maruadsi	34.67	4.40	9.48	19.37	—	0.43	—	1.05	3.12
D. lajang	—	—	1.38	0.06	—	1.10	—	0.10	0.96
Decapterus kurroides	—	—	3.76	—	0.13	4.72	0.33	0.60	19.79
Rastreliger kanagurta	3.09	—	0.26	0.31	—	—	—	0.58	0.08

IV. CONCLUSIONS AND RECOMMENDATIONS

1. Resources of shared stock in seawaters of Vietnam have been studied mostly in coastal areas, while in off-shore areas there were still few studies have been done.

2. In Vietnamese coastal areas, studies on *D. maruadsi* have been done relatively regularly and detaily, while on others round scads species, *R. kanagurta* and others mackerels and tunas, especially oceanic tunas very few studies have been conducted. Studies focused mainly on biological features of these species rather than on behaviour, migration or stock assessment.

3. Statistical systems on catch and effort for all species in general and for above shared stock should be established and made accurate as soon as possible.

4. Fishing technology for shared stock must be improved in order to reach higher productivity, catch and at the same time to conserve the resources.

5. Cooperative research works on shared stock of Round Scads, Mackerels and Tuna (stock assessment, biology, behaviour, migration, exchange of date, etc. ...) should be organized and conducted among the countries bordering the South China Sea.

6. Species compositions and catch dynamics of shared stock in the Vietnamese Waters as well as in some countries in the region showed that: It is time to strietly enforce measures to protect and converse above shared stock.

Only with common will and unified management of all countries bordering the South China Sea – these measures could be come in to forces.

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