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PART 1: INFORMATION ON FISHERIES, RESEARCH AND STATISTICS

Introduction

Fisheries are playing a very important role in the economic development of Vietnam and it is also a rapid and dynamic development sector. In recent years, number of fishing vessels and total capacity has been rapidly increased. During the period from 1994 - 2009, total capacity of fishing vessels has been sharply increased from 1,443,950 HP to 6,120,000 HP with an increase rate of 4.24 times. Consequently, total catches of capture fisheries was also increased from 878,474 tons to 2,013,000 ton (2.29 times).

Tunas and tuna-like species (true tunas, billfishes, and other tuna-like species) are an important food source, used mostly for canning and sashimi, and, due to their high economic value and extensive international trade, are an important global commodity. However, tuna fisheries have been only introduced to Vietnam in the early 1990s by fishing technologies introduced from abroad countries. Since then the tuna fisheries have been developing rapidly and becoming one of the biggest fisheries in Vietnam in term of food security and economic benefits.

By March 2010, the number of tuna fishing vessels has been added more with 19,629 units with the capacity of higher than 90 HP and thus they significantly contributed to the total catches of offshore fishing fleets. Moreover, tuna fisheries brought job for approximately 70,000 employees who are living on fishing.

Vietnamese waters especially in the center areas in the offshore sea areas are also one of the areas in the distribution of tuna species is high and significant of the Pacific Ocean where is very high. Thus in recent years, tuna fisheries in Vietnam have developed rapidly and are the very important fisheries to contribute for export values of Vietnam.

However, fisheries data collection system in general and for tuna fisheries in particular of Vietnam is lacked and insufficient, and thus data of exact annual catch

estimation of the tuna fisheries is not available so far. It is very important to produce estimates of annual tuna catch by gear types, species and regions in order to provide relevant and essential advises for fisheries management purposes of highly migratory species. Unfortunately, there was insufficient information currently available to produce reliable estimates, but an attempt to produce estimates was nonetheless undertaken by Dr. Antony Lewis during his visit to Vietnam in March 2010 (VTFDC-1) with total catches of tuna species of about 50,000 tones.

This report is to provide some existing information on Vietnamese tuna fisheries to support ongoing tasks in monitoring and management of tuna fisheries resources in Vietnam as well as to contribute for management strategies in the West and Center Pacific Oceanic.

1. Overview of previous research programmes on tuna resources in Vietnam

From 1977-1978, Research Institute for Marine Fisheries, Vietnam (RIMF) collaborated with Institute of Marine Research, Norway to conduct 9 survey trips to investigate and assess pelagic fish resources in the Tonkin Gulf using acoustic survey. Research results pointed out the overall trends about biomass, distribution and resource status of some pelagic species belonging to *Scombridae* family in the studied areas. However, these studies did not consider much on tuna species.

In 1992 to 1995, a national project to assess tuna species resources in the Vietnamese waters was also carried out. The results of the project indicated species composition of tuna species distributing in the Vietnamese waters, distribution, main fishing grounds and biomass of tuna resources in the offshore areas of Vietnam.

A national project namely “Investigate living marine resources and their habitats at Truong Sa islands” was conducted from 1993 to 1997. The main objectives of this study are to assess the status of large pelagic fish resources using gill net fishery and to collect environmental parameters in the surveyed area. The results of this study provided important and significant information on biology of tuna and mackerel species in the offshore areas of Vietnam.

At the same time, another project called “assessment of resources of large pelagic fish species in Vietnamese waters” funded by Japan International Cooperation Agency (JICA) in the period from 1995 to 1997 was also carried out using R/V Bieng Dong. The scope of this study was from $8^{o}00$ N - $18^{o}00$ N and the gill net was also chosen as main fishing gear. Main outputs of this study were some biological characteristics of some important and commercial species including tuna and mackerel species.

Moreover, results also provided very important information on temporal and spatial distribution of tuna species.

In addition, to solve the situation on the previously slow growth in the offshore fishery The Government establishes and drives a new programme to develop offshore fisheries targeting on tuna species exploitation in 1997 - the National Target Program on Offshore Fishing Development. This programme was designed to provide possible loans for fishers to upgrade and build their fleets, with the goal of creating fishing fleets at the high and deep sea areas and these fishing fleets would exploit on Vietnam's exclusive economic zone (EEZ). This was also intended to reduce pressure on inshore areas where were over-exploited. The Program would also improve fisheries logistics and support facilities for postharvest preservation. Investment in facilities that would process tuna products for export was also encouraged. The tuna fishery has grown gradually since then and the most developed areas were in the south central provinces of Vietnam for instance, Binh Dinh, Phu Yen, Khanh Hoa and Da Nang. Furthermore, it was also expanded in Binh Thuan and Ba ria Vung Tau. Throughout the programme, the fishers had chances to be trained in fishing skills in order to catch more effectively and thus cost of fishing was also reduced as a result.

Since then many research programmes have been conducted to assess tuna fisheries resources and one of them is a project funded by Danish Government called Assessment of Living Marine Resources in Vietnam (ALMRV). Sampling/resource assessment activity at provincial level by the project has been carried out in some provinces since 1996, and to be continued in others since 2000. This has also involved sampling of various fleets and gears, through interviews, then deriving catch (and CPUE) estimates through raising the available data by vessel numbers. Production estimates developed in this way do not yet enjoy official sanction, and there may also have been problems with the estimates of vessel numbers used, such that raising factors have been deemed uncertain.

The most considerable project was the national project namely “Investigate biomass and maximum sustainable yield of the pelagic fishes (skipjack, yellow fin and big eye tuna) and assess fishing fleet status in the Central and Southeastern areas. This programme was carried out from 2002 to 2004 and conducted 5 survey trips with total of 514 hauls (gill net: 330 hauls and longline: 184 hauls). The studied area is indicated in the Figure 1.

Collected data included fisheries independent and dependent data (data from logsheet, surveys, landings, port sampling, and observer). However this programme is not continued and comprehensive and thus its applicable ability was not very high.

Recently, a small programme implemented by WWF with funding of NOAA have been conducted but the programme only considered on bycatch of tuna fisheries without taking into account other types of tuna fisheries data.

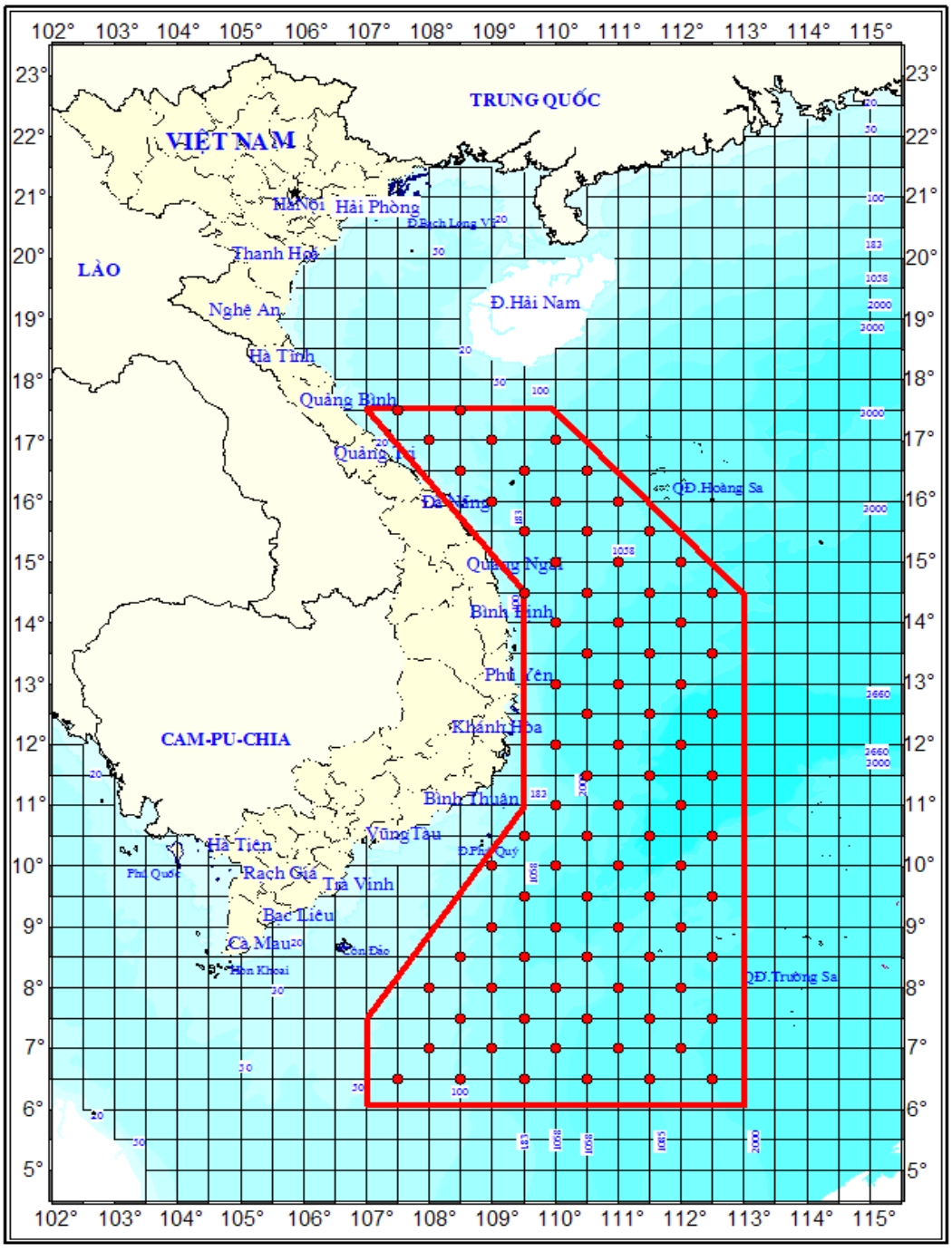

Figure 1. Map of study area and sampling stations

2. Vietnamese tuna fisheries

2.1. Major tuna species in the catch

Major tuna species that contribute to total catches of Vietnam's fisheries are:

- Small tuna: skipjack (*Katsuwonus pelamis)*, frigate tuna *(Auxis thazard)*, spotted-tuna *(Euthynnus affinis)*... Main fishing gear is purse seine.

- Oceanic tuna species: yellowfin tuna *(Thunnus albacares)* and bigeye tuna *(Thunnus obesus).* Target fishery is long line.

2.2. Number of tuna fishing fleet

Currently, tuna fisheries are mainly purse seine and longline fisheries. There are only the purse seiners and long liners with capacity more than 90 HP can fish in the offshore areas that belong the Vietnam's EEZ. The number of purse seine and longline vessels by regions and fisheries are indicated in table 1.

Table 1. Number of tuna purse seine and longline vessels by regions and fisheries

No	Fleets	Tonkin Gulf		Central area		Southeastern area		Southwestern area		Total
		<90	>90	<90	>90	<90	>90	<90	>90	
1	Purse seiner without light use	40	150	289	107	0	9	51	116	762
	Proportion (%)	5.2	19.7	37.9	14.0	0.0	1.1	6.7	15.2	100
2	Purse seiner with light use	34	249	2065	418	53	598	4	104	3525
	Proportion (%)	1.0	7.1	58.6	11.8	1.5	17	0.1	2.9	100
3	Longliner	0	0	584	632	5	47	0	0	1268
	Proportion (%)	0.0	0.0	46.1	49.8	0.4	3.7	0.0	0.0	100
Total		**74**	**399**	**2938**	**1157**	**58**	**654**	**55**	**220**	**5555**

Source: DECAFIREP–2009

2.3. Structure and equipment of tuna fishing vessels

Tuna purse seiners

In Vietnam, purse seiners are generally small size with the length of less than 25m and thus encircle speed is slow and consequently it is difficult to catch the fast movement stocks. Most of the purse seiners use the light and fishing aggregation devices (FAD) for fishing. However, purse seine vessels target tuna which use FADs is not many and just approximate 17.7%.

The size of each net panel is not large. Total length of net is less than 750m and the height is usually 80m.

Fishing equipment for tuna purse seine vessels is simple and not much mechanized and thus it is not listed as industrial fisheries.

Species composition of the purse seine fishery are mainly small tuna such as skipjack, spotted tuna, small yellowfin and bigeye tuna (3-4 kg/individual) and other small pelagic species.

Tuna long liners

Most of longline vessels are small size with the length from 14-16m and capacity of less than 150 CV. There are many types of longline vessels but the most abundance is oceanic tuna longliners (yellowfin and bigeye tuna).

Oceanic tuna fisheries have been strongly developed in the central provinces namely Binh Dinh, Phu Yen, Khanh Hoa. However, the well-equipped vessels are owned by fishing companies in the southeastern provinces.

Due to small size vessels, tuna catch is preserved only by using ice with a trip of 20-25 days, and thus product quality is reduced and trip revenue is reduced to 30-40% compared to the preservation of fish by using cool marine water. The main line length is usually 40 km using 700-800 hooks/haul.

In contrast, tuna fishing fleets of fishing industries have been fully equipped with advanced technology and good freezing system for product preservation. These fleets may operate in the bad conditions in offshore areas. The trip takes 30-40 day. Capacity of main engine is from 200 to 800 CV. The main line length reaches 80-100 km with 1,600 - 2,000 hooks/haul. In Vietnam, there are around 40 longliners of this type.

Gill net vessels

Gill net vessels are operating at small-scale. Their main catches are small pelagic and demesal fish species in the coastal areas. Though there are some gill net vessels are big, the number of vessels with capacity of less than 90CV is most abundance accounting for 96% of total vessels of gillnet fisheries. Number of vessels with capacity of more than 90CV is 1,320 vessels. However, there are only 20% of them operating in distant water and may exploit tuna species. Statistical data for tuna caught by gillnet fisheries is not available.

2.4. Tuna fishing capacity of main fishing gear

Purse seiners without using light

This fishery is used to surround and catch individuals that are hiding under the floating objects at sea (trees, timber). There are 762 vessels of this fishery accounting for 17.8% of total tuna purse seiners.

Due to the small size vessel and lack of equipment, these purse seiners are difficult to catch and surround the fast movement tuna schools. Main fishing ground is offshore areas.

The catch of a trip/month with these vessels is 4-15 tons including yellowfin and bigeye tuna at small size (2-4 kg/individual) accounting for 8-15% of total catches. Other tuna species account for 50-70%.

Purse seiners with light use

This fleet uses the FADs to attract fish and surround fish schools. Main fishing ground is the coastal areas with depth of less than 50m.

Operational principle of these vessels is suitable with the current small size purse seiners of Vietnam so they are usually occurred in all Vietnam's region. There are about 3,525 vessels of this type accounting for 82.2% of total vessels of the purse seine fishery.

Average production/trip is around 20-40 tons (for purse seiners of more than 350 HP), of which the tuna catch accounts for 18- 35% of total catch, the remaining is other fish species. Yellowfin and bigeye tuna are scarcely caught by this fishery (except for vessels operating offshore in submerged mound).

Tuna longline fishery

Fishing ground of oceanic tuna longline fishery is distant water in the central and southeastern regions. Depending on the capacity of vessels, exploitation efficiency will be different but average catch of each vessel reaches from 0.8 to 1.3 ton/vessel/trip (the trip duration was 14 - 24 days). In particular, some vessels gained 2.5 - 3 tons/trip.

For the catch composition of tuna longline fishery, yellowfin tuna accounts for 15% of total catches and bigeye tuna accounts for 10.5%, remaining is other fishes.

2.5. Tuna capture production in Vietnam

Annual unloadings statistics in Vietnam have just provided the pooled data of all species. There is no data on total catch that is classified by species, fisheries or provinces. As a result, annual tuna catch is not updated annually and therefore information on total catches is inaccuracy.

Table 2. Tuna production by years in Vietnam

Year	Tuna catch (1) (tons)	Total catch (2) (tons)	Proportion (%)
2001	15,800	1,347,800	1.17
2002	30,900	1,434,800	2.15
2003	17,500	1,426,223	1.22
First 10 months of 2004	15,772	1,724,200	-

Source: (1): FAO 2003 and (2): Ministry of Fisheries, Vietnam 2004

Table 3. Oceanic tuna production (yellowfin and bigeye tuna) during 1999-4/2005

Year	1999	2000	2001	2002	2003	2004	4/2005
Oceanic tuna production (tons)	1,100	1,800	1,750	1,750	3,480	4,150	2,300

However there are also several rough estimations of total tuna catches by years and this figure was estimated around 15,000 tons/year to 30,000 ton/year accounting for 1.17-2.15 % of national total catches.

Relating to fishing capacity, Vietnam's purse seiners are the small scale and backward fishing technology. Main fishing ground is coastal areas so the catchability of tuna species is low and thus tuna species may be under-exploitation in the Vietnam's EEZ.

2.6. Tuna resources

Some tuna stock assessment surveys has been conducted but these programs are short-term and not continuously and thus study results were only basic information without significance in decision making to fisheries management. In the future, it is necessary to implement further studies in order to assess the stock biomass and fishing capacity with higher accuracy.

In light of research results of Research Institute for Marine Fisheries in 2004, the biomass of big pelagic stocks in the central and south-eastern regions was estimated

of 1,156,000 tons and maximum sustainable yield (MSY) reached 405,000 tons. Of which tuna species accounted for 65%.

Synthesized data from studies on skipjack stock in central and southeastern region in 2004 also showed that the skipjack stock biomass was around 618,000 tons and the MSY was 216,000 tons. Standing biomass of yellowfin and bigeye tuna species was 44,850 and 52,590 tons, respectively and the MSY is 17,000 tons.

3. Some scientific information by fisheries

2.1. Gillnet

- ***Species composition***

Skipjack tuna (*Katsuwonus pelamis*) was the most abundance species in catch of the gillnet fishery and the figures fluctuated from 47.07 – 67.8% (Table 4). Followed that was ray fish species (*Mobula diabolus*) with a proportion of 2.34 – 14.59% and back marline (*Makaira indica*) of 1.53 – 9.71%. Meanwhile, frigate and yellow fin tuna only occurred in the catch with a low rate of 1.03 – 6.7 and 1.37 – 6.47%, respectively.

Table 4. Proportion of species composition in catches of the gillnet fishery in the central offshore areas of Vietnam (SW – southwest monsoon season, NE – northeast monsoon season). Data was also referred from ALMRV II, national project and the offshore programme in 2000, 2001, 2002

Scientific name	2000		2001		2002		2003		2004
	SW	NE	SW	NE	SW	NE	SW	NE	SW
Acanthocybium solandri	-	1.34	-	1.32	-	1.17	1.67	9.47	2.6
Alopias pelagicus	-	-	-	-	-	-	-	1.1	1.33
Auxis rochei	-	-	1.01	-	-	-	1.57	-	1.41
Auxis thazard	6.71	-	2.6	1.18	3.37	1.32	-	1.03	4.02
Brama japonica	-	-	-	-	-	-	-	1.49	-
Brama orcini	-	-	-	-	-	2.98	1.06	1.14	-
Carcharhinus sealei	-	-	-	1.15	-	-	-	-	-
Coryphaena hippurus	1.32	1.9	-	1.69	1.03	2.16	-	1.33	-
Dasyatis garouaensis	1.11	-	-	-	-	-	-	-	-
Euthynnus affinis	3.27	1.43	3.31	-	1.33	1.31	3.01	-	2.07
Istiophorus platypterus	3.27	1.47	-	2.9	-	2.2	1.4	1.4	3.96
Katsuwonus pelamis	49.74	67.8	62.22	65.24	64.03	61.67	47.07	53.75	53.46
Lobotes surinamensis	1.18	-	-	-	-	-	-	-	-
Makaira indica	1.53	2.18	-	-	4.22	3.07	8.15	1.85	9.71
Makaira mazara	-	-	1.51	-	1.44	-	4.64	2.77	-
Manta birostris	-	-	-	-	-	3.19	-	-	2.09
Mobula diabolus	6.94	5.49	14.59	6.75	4.63	8.53	16.64	4.7	2.34
Mobula japonica	9.02	1.24	1.07	2.93	8.43	-	3.83	3.58	-
Rhincodon typus	-	-	-	-	-	-	-	1.38	-
Sarda orientalis	-	-	-	-	-	-	-	1.47	-
Sthenoteuthis	-	-	-	-	2.58	1.05	1.47	-	-

oualaniensis									
Thunnus albacares	6.47	3.23	1.68	4.77	-	2.82	1.37	5.6	3.75
Thunnus obesus	-	3.11	2.11	1.62	-	-	-	-	-
Todarodes pacificus	-	1.04	-	-	-	-	-	-	-
Xiphias gladius	-	-	2.19	1.65	-	1.23	1.77	-	5.12
Other species	9.44	9.77	7.71	8.8	8.94	7.3	6.35	7.94	8.14
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

- ***Catch per unit effort***

Catch per unit effort (kg/km net) were sharply varied by different fishing areas and reduced temporally. Mean CPUE fluctuated from 27.6 to 34.9 kg/km net. Moreover, CPUE were also fluctuated spatially and this difference was very high because it was found that the catch was empty in some hauls (Table 5).

Table 5. Catch per unit effort (kg/km net) in the different regions

Year	Season	Region I			Region II			Region III		
		CPUE (kg/km)	**CV (%)**	**Variation range**	**CPUE (kg/km)**	**CV (%)**	**Variation range**	**CPUE (kg/km)**	**CV (%)**	**Variation range**
2000	SW	40.2	91.1	0-134	30.6	192.2	0-364	25.0	163.4	0-286
	NE	46.3	96.8	0-181	41.6	119.8	0-229	20.4	153.0	0-201
2001	SW	22.7	121.1	0-109	52.0	187.3	0-679	48.7	133.8	0-306
	NE	39.6	178.2	0-606	41.4	141.5	0-250	24.9	419.9	0-727
2002	SW	13.9	149.8	0-122	49.4	144.2	0-395	33.9	177.0	0-377
	NE	43.9	113.5	0-240	38.8	157.3	0-405	18.4	122.1	0 -94
2003	SW	19.5	152.5	0-145	11.1	206.9	0-146	24.2	161.3	0-242
	NE	12.7	142.5	0-121	24.2	126.3	0 -53	28.3	104.9	0-268
2004	SW	23.9	147.1	0-131	17.3	90.6	0-117	49.2	147.2	0 -71
Average		**27.6**	104.6	0-606	**34.9**	121.6	0-679	**30.4**	113.8	**0-727**

Table 6. Variations of catch proportions (%) of species of the gillnets

Season	Region	I					II					III				
	Specific name	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
Southwest monsoon	*1. Acanthocybium solandri*	0,31	1,57	1,18	1,56	3,33	0,43	0,87	0,39	5,48	0,62	0,42	0,45	0,15	0,70	3,15
	2. Auxis rochei	0,87	4,48	1,04	2,59	1,55	0,37	0,05	0,07	0,17	4,03		0,41	0,67	0,21	0,02
	3. Auxis thazard	10,76	0,21	3,02	0,69	3,16	0,40	0,57	0,41	1,11	0,18	7,12	4,43	6,48	1,25	6,45
	4 .Euthynnus affinis	1,82	0,03	1,06	2,03	0,46	0,34	1,46	0,43	0,54	0,35	7,65	5,33	2,39	5,46	3,87
	5. Katsuwonus pelamis	61,17	75,23	59,05	45,82	54,43	47,55	44,70	71,07	59,85	70,46	37,27	67,26	60,91	45,40	44,40
	6. Rastrelliger kanagurta			0,01								0,08		0,03	0,00	
	7. Sarda orientalis	0,57	0,31	0,28		1,20		0,10		0,38		0,39	0,26	0,13	0,05	
	8. Scomber japonicus				0,05											
	9. Scomberomorus commerson	0,07		0,21	0,81	0,02										0,03
	10. Scomberomorus guttatus			0,03												
	11. Thunnus albacares	8,71	3,15	0,37	2,01	1,76	5,77	1,25	0,34	0,10	0,19	4,27	1,44	0,81	0,64	6,71
	12. Thunnus obesus	0,89	0,97	1,99	0,17	0,45		0,61	0,29			0,79	3,27	0,31	0,08	
	13. Thunnus tonggol	0,00				0,06				0,01						
	Total	**85,16**	**86,19**	**68,24**	**55,72**	**66,41**	**54,85**	**49,61**	**73,00**	**67,64**	**75,83**	**57,98**	**82,85**	**71,90**	**53,80**	**64,64**
Northeast monsoon	*1. Acanthocybium solandri*	0,82	1,29	1,31	3,33		1,88	1,41	0,48	5,85		1,54	1,23	1,88	15,47	
	2. Auxis rochei	0,19	0,02	0,14	0,38		0,02	0,22	0,45	0,43		0,08	0,08	1,70	0,86	
	3. Auxis thazard	1,10	0,50	0,52	2,30		0,27	2,33	2,67	0,73		1,45	0,52	2,27	0,12	
	4. Euthynnus affinis	0,55	0,29	0,16	0,34		0,28	0,50	0,56	0,21		4,28	1,61	7,87	1,25	
	5. Gymnosarda unicolor				0,05											
	6. Katsuwonus pelamis	65,98	60,49	60,65	56,30		74,29	66,73	66,46	62,41		63,00	69,72	56,94	48,97	
	7. Rastrelliger brachysoma													0,02		
	8. Rastrelliger kanagurta							0,00	0,00					0,05		
	9. Sarda orientalis	0,02		0,16			0,04		0,44	0,25		0,70	0,07	0,30	3,02	
	10. Scomber japonicus			0,01												
	11. Scomberomorus commerson	1,58		0,04	0,19		0,77	0,08	0,03			0,29	0,35	0,35		
	12. Scomberomorus guttatus			0,06	0,03											
	13. Thunnus albacares		4,38	2,79	2,20		8,74	7,58	2,86	3,67		1,91	1,39	2,85	8,89	
	14. Thunnus obesus	5,78		1,08			0,26	0,85	0,79			2,13	4,95	0,02	1,46	
	15. Thunnus sp.	0,06														
	16. Thunnus tonggol								1,60				0,26	0,82		
	Total	**76,09**	**66,98**	**66,91**	**65,13**		**86,55**	**79,70**	**76,36**	**73,55**		**75,54**	**80,18**	**75,06**	**80,04**	

Table 7. Variations of CPUE (Kg/km net) of species in the gill nets

Season	Region	I					II					III				
	Specific name	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**	**2000**	**2001**	**2002**	**2003**	**2004**
Southwest monsoon	*1. Acanthocybium solandri*	0,11	0,34	0,18	0,31	0,41	0,10	0,43	0,20	0,46	0,16	0,07	0,21	0,05	0,14	0,91
	2. Auxis rochei rochei	0,35	1,03	0,23	0,54	0,18	0,37	0,03	0,04	0,02	1,04		0,21	0,25	0,06	0,01
	3. Auxis thazard	4,13	0,05	0,35	0,09	0,37	0,09	0,30	0,18	0,12	0,04	2,34	2,15	2,11	0,29	1,68
	4 .Euthynnus affinis	0,71	0,01	0,08	0,25	0,05	0,08	0,74	0,33	0,07	0,09	2,16	2,59	0,80	1,55	1,01
	5. Katsuwonus pelamis	24,84	17,07	8,57	10,05	7,19	16,92	23,18	34,66	6,97	16,92	9,04	32,76	19,86	10,54	12,81
	6. Rastrelliger kanagurta			0,00								0,02		0,01	0,00	
	7. Sarda orientalis	0,22	0,07	0,01		0,12		0,05		0,05		0,20	0,13	0,04	0,01	
	8. Scomber japonicus				0,01											
	9. Scomberomorus commerson	0,03		0,01	0,07	0,00										0,01
	10. Scomberomorus guttatus			0,00												
	11. Thunnus albacares	3,43	0,72	0,02	0,16	0,17	1,28	0,63	0,16	0,01	0,05	0,86	0,67	0,31	0,16	1,87
	12. Thunnus obesus	0,34	0,22	0,30	0,01	0,05		0,32	0,13			0,17	1,55	0,11	0,02	
	13. Thunnus tonggol	0,00				0,01				0,00						
	Total	***34,17***	***19,56***	***9,76***	***11,49***	***8,55***	***18,85***	***25,68***	***35,70***	***7,71***	***18,29***	***14,86***	***40,26***	***23,54***	***12,78***	***18,29***
Northeast monsoon	*1. Acanthocybium solandri*	0,44	0,50	0,30	0,73		0,76	0,57	0,21	0,69		0,30	0,15	0,32	5,71	
	2. Auxis rochei	0,09	0,01	0,03	0,07		0,01	0,09	0,21	0,07		0,02	0,01	0,42	0,39	
	3. Auxis thazard	0,52	0,20	0,20	0,64		0,11	0,97	1,01	0,12		0,30	0,12	0,49	0,04	
	4. Euthynnus affinis	0,26	0,12	0,06	0,06		0,12	0,21	0,27	0,08		0,85	0,29	1,53	0,70	
	5. Gymnosarda unicolor				0,01											
	6. Katsuwonus pelamis	30,16	23,78	27,12	13,40		30,89	27,55	25,29	10,68		13,20	12,25	9,73	25,75	
	7. Rastrelliger brachysoma													0,01		
	8. Rastrelliger kanagurta							0,00	0,00					0,01		
	9. Sarda orientalis	0,01		0,03			0,02		0,17	0,03		0,14	0,00	0,06	0,70	
	10. Scomber japonicus			0,00												
	11. Scomberomorus commerson	0,76		0,01	0,03		0,32	0,04	0,02			0,06	0,03	0,07		
	12. Scomberomorus guttatus			0,01	0,00											
	13. Thunnus albacares		1,76	1,21	0,44		3,66	3,10	1,03	0,56		0,36	0,18	0,50	2,91	
	14. Thunnus obesus	2,51		0,85			0,12	0,36	0,33			0,37	0,68	0,00	1,41	
	15. Thunnus sp.	0,03														
	16. Thunnus tonggol								0,70				0,08	0,17		
	Total	***34,78***	***26,36***	***29,81***	***15,39***		***36,00***	***32,89***	***29,24***	***12,23***		***15,63***	***13,80***	***13,30***	***37,61***	

2.2. Longline fishery

- ***Species composition***

Table 8. Occurrence frequency (%) of all species in the catch of longline fishery by year and season (SW – southwest monsoon season, NE – northeast monsoon season)

Scientific name	2000		2001		2002		2003	2004
	SW	NE	SW	NE	SW	NE	SW	NE
Acanthocybium solandri	2.85		2.93	1.58	4.48	2.34	12.04	1.00
Alepisaurus ferox	3.38		1.27		3.64	4.68	9.91	15.43
Alopias pelagicus	4.62			5.23	21.24	8.24	8.12	7.76
Caranx sexfasciatus			1.59					
Carcharhinus dussumieri		2.06	9.11					
Carcharhinus falciformis		2.18						7.71
Carcharhinus melanopterus	1.25	2.06						
Carcharhinus sorrah	4.79	2.07		7.06				
Carcharhinus sp.								3.82
Carcharhinus tilstoni	3.49				1.58			
Carcharodon carcharias	3.48							
Coryphaena hippurus			2.91	1.33	2.98	2.01		
Dasyatis bennetti						1.29	1.82	
Dasyatis garouaensis		5.39						
Dasyatis kuhlii					2.14	1.06	5.35	
Dasyatis matsubarai			2.42					
Drepane longimana				2.99				
Euthynnus affinis			1.99					
Gempylus serpens	1.38	1.90	1.21	1.45	7.62	15.66	17.28	25.57
Isistius brasiliensis		2.00						
Istiophorus platypterus	1.34	1.37	1.83	1.48	3.20		2.57	
Katsuwonus pelamis		1.12	2.52			1.51		
Lepidocybium flavobrunneum	8.42	7.11		1.89	1.76	6.09	2.42	3.72
Lobotes surinamensis						1.18		
Makaira indica	9.39	6.86			12.98	1.55	3.25	
Makaira mazara	2.45				6.45	1.79		
Manta birostris				2.72				
Mobula diabolus				11.34	3.63			
Mobula japanica			13.70					
Prionace glauca	5.39	12.47		24.07		2.87	7.01	
Promethichthys prometheus	1.33	6.27						
Pseudocarcharias	1.44							

kamoharai								
Sphyrna lewini	2.95					3.39		
Taeniura meyeni		4.37	2.41		1.42	2.57	4.47	3.46
Thunnus albacares	21.46	20.17	34.42	32.22	22.54	37.20	22.09	16.00
Thunnus obesus	9.56	5.67	8.45	3.20		1.88		
Trichiurus lepturus								2.93
Xiphias gladius	4.12	10.10	11.02		2.98	2.92		10.33
Other species	6.92	6.82	2.24	3.45	1.37	1.78	3.67	2.26
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

- ***CPUE***

Oceanic tuna catch ratio in the total catches of surveys using longline fishery is relatively high and belongs to one of the most abundant species in the catch of the longline fishery. Yellow fine tuna (*Thunnus albacares*) contributed 16.00 - 37.20% and big eye tuna (*Thunnus obesus*) was 1.88 - 9.56 % in the total catches.

In general, CPUE of oceanic tuna was very fluctuated by the different surveys (Table 9). In northeast monsoon season, CPUE seem higher than of those in southwest monsoon season, however this trend was not clear. With yellow fin tuna, CPUE is with an increase trend from 2000 – 2002 (both two monsoon seasons) and reduced rapidly from 2002 to 2004. With big eye tuna, CPUE is gradually deceased from 2000 to 2004 (Figure 2).

Table 9. Mean CPUE (kg/100 hooks) by surveys (NE and SW is northeast and southwest monsoon season, respectively).

Year	Season	Region I		Region II		Region III		All region	
		CPUE	CV (%)	CPUE	CV (%)	CPUE	CV (%)	CPUE	CV (%)
2000	SW	5.47	96	16.36	84	19.06	95	**13.88**	106
	NE	2.68	111	7.45	76	8.51	127	6.49	123
2001	SW	2.43	172	3.58	135	3.12	193	**3.00**	172
	NE	2.68	231	6.28	143	5.04	160	4.63	169
2002	SW	9.54	85	15.80	114	15.28	75	12.20	103
	NE	6.71	97	13.05	84	13.65	81	9.66	95
2003	SW	5.22	103	4.74	125	7.28	52	5.23	103
2004	NE	7.86	88	7.02	141	1.99	53	7.04	112
	Average	**5.32**		**9.28**		**9.24**		**7.77**	

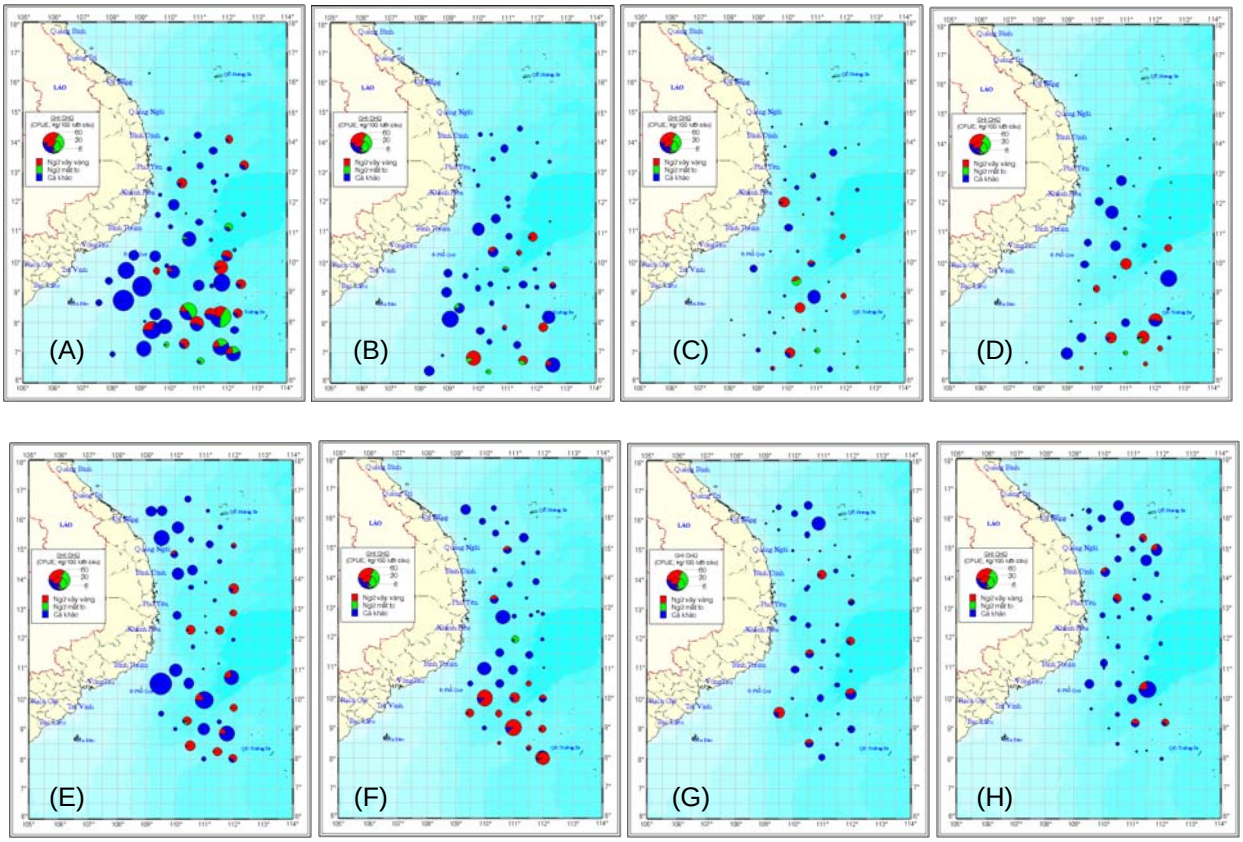

Figure 2. CPUE of yellowfin (red point), bigeye tuna (green point) and other fishes (blue point) in the offshore areas (A: SW, 2000; B: NE, 2000; C: SW, 2001; D: NE, 2001; E: SW, 2002; F: NE, 2002; G: SW, 2003; and H: SW, 2004).

4. General conclusions

Number of tuna fishing vessels in Vietnam is with small scale and lack of advance and well-equipped facilities and these lead to the low catchability.

Most of purse seiners are operating in the coastal areas (with the depth less than 50m) so it is said that tuna species are under-exploitation, especially with skipjack species.

Fishing technique of purse seiners and long liners is lack and weak. In the future, these need to be improved.

Vietnam fisheries data collection and statistics system does not provide necessary information to support the tuna management in particular and capture fisheries management in general.

Offshore marine resources in general and tuna resources in particular should be assessed, monitored and managed for its sustainable use.