

Prospect on pelagic fisheries in northern Sulawesi, Indonesia

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ABSTRACT

Approximately 90 per cent of total catches in northern Sulawesi are pelagic fishes. About two-third of them are large pelagic fish, such as tunas (*Katsuwonus*, *Thunnus*, *Euthynnus*). However the National Assessment Stock Commission reported that availability of the large pelagic fishes in Sulawesi and Maluku Sea is just about one-third of the total pelagic fish resources. Even in the last report the large pelagic fishes in the region are indicating nearly overexploited. In contrast, small pelagic fish such as mackerel scads, trevallies, sardine, needlefish, Indian mackerel, and flyingfish is less than 40 per cent of the total allowable catch (TAC) exploited. Fishing activities on large pelagic fish by means of pole and line, longline etc. are mainly conducted by fishing industries based in the area of Bitung. This situation may give negative impact on fishing industries due to overexploitation of the large pelagic fish. To maintain the current fishing industries, expansion in fishing fleets for large scale pelagic fisheries should be reviewed. And in another hand, the small pelagic fishing industries should be developing in terms of number of fleets and coverage area. As those small-pelagic fish industries are running by small-and middle scale industries, and concentrated only in two market area in North Sulawesi (Bitung and Manado), an infrastructure of fish storage for remote area in northern area such Sangihe and Talaud Islands should be develop.

Introduction

In terms of quantity caught, pelagic fish resources play important role in the region. Pelagic fish resources have been divided into two groups based on relative fish size which are somewhat overlapping between them: (1) large pelagic fish such as tunas, skipjack tuna, esteem little tuna, sharks, and (2) small pelagic fish, for instance, mackerel scads, trevallies, anchovies, sardinella, needle fishes, Indian mackerel, yellow tailed scads, flying fish, etc.

Base on investment scale size, those can be divided into two categories: (1) large scale commercial fishing, for instance pole and line fishing for skipjack and long line for other tunas, (2) small scale commercial fishing with a wide variety of boat size and gear types such as purse seine, small long-line, gill nets, hand-line. The term of *large* in north Sulawesi would be *small* for foreign fleet standard, since the *small* means less than five hundreds million rupiah investment (or about US \$ 55 000).

Northern Sulawesi Province that is situated on the top of Sulawesi Island give advantages for the local fisherman to cover Sulawesi Sea and Maluku Sea as the main fishing grounds. A total of 18.617 fishermen families in the northern Sulawesi Province (DPK 2004) are dominantly poor subsistence fishermen. Recently small scale pelagic fisheries tend to blame authority for lacking management control, in which there are many illegal foreign fleets invading their fishing ground, and the increasing numbers of rumpons in the region. Those were assumed causing catch declining on small scale fisheries (!). These issues make us interest to overview the pelagic fishery resources and fishing pressure level based on Fisheries Division data and some technical

reports available. Thus, the objective of this paper is to share idea about the current pelagic resource state and to find out the prospect of pelagic fisheries in north Sulawesi.

Current landings

Fisheries production of North Sulawesi Province derived from Fisheries Division data summarized in Table 1. It shows that the production for last several years slightly fluctuates. Approximately two-third of annual total catches is large pelagic fish, as a quarter is small pelagic fish, and the rest demersalfish. This proportion, fairly stable for years, does not reflect the proportion of the fish stock (or its availability in nature). High proportion of large pelagic fish is indirectly governed by demand, particularly overseas market (discussed later). Demersal fishery which is generally a small-scale commercial and subsistence, is fishing activities by drifting boat with hook and lines, and by spears for coral fish and lobster.

Tunas (large pelagic fish) are mostly caught by pole and line, and long-line fleets. There are 45 vessels (out of 52 in north Sulawesi) with in board >30 GT documented Bitung; and 340 pole and line fleets and 4857 long lines (including the small ones belong to small commercial scale fisheries (DPK, 2003).

Table 1. Marine fish landed in northern Sulawesi

Year	large pelagic fish (%)	small pelagic fish (%)	demersal (%)	total (tons)
2000	120 928.6 (65.0%)	46 511.0 (25.0%)	18 604.4(10.0%)	186 044.0
2001	123 727.4 (67.30%)	44 952.9 (24.5 %)	15 181.3 (8.3%)	183 861.6
2002	129 667.5 (66.0 %)	59 249.5 (30.2 %)	7 322.0 (3.7 %)	196 239.0
2003	114 775.0 (63.0 %)	62 412.0 (34.0%)	5 133.0 (3.0 %)	183 320.1

Modified from: DPK 2004, 2003, 2002, 2001

Table 2 presents the fish composition and related main fishing gears used. Large pelagic fish is mainly tuna fish group, composed of skipjack tuna *Katsuwonus pelamis*, little tuna *Euthynnus affinis*, big eye tuna *Thunnus obesus*, and various other tuna species. Skipjack tuna is the first most important species (30.6% of total pelagic fish), with annual landings exceeding those of all others. This species occur in surface feeding schools throughout the year, therefore it is helpful in pole and line fishing. Skipjack tuna and tunas become also the day-hand-line fishery targets by small scale fisheries.

Table 2. Catch composition of pelagic fish in northern Sulawesi. Main gear used PL=pole & line, LL=long-lines, HL=hand-lines, PS=purse-seine, GN=gill-net, SN=surround net

Marine fish	local name	landing (tons)	(%)	main gear
Large pelagic fish				
Skipjack, <i>Katsuwonus pelamis</i>	Cakalang	57 883.0	30.6	PL
Tunas (mixing species)		45 096.9	23.9	LL, HL
Esteem little tuna, <i>Euthynnus affinis</i>	Deho	24 504.8	13.0	HL, PS
Sharks (mixing species)	Gorango	2 109.9	1.1	LL, HL
Others		72.9	0.04	
Small pelagic fish				
Mackerel scads, <i>Decapterus macarellus</i>	Malalugis	44 174.3	23.4	PS
Trevallies, <i>Selaroides leptolepis</i> , <i>Selar sp</i>	Tude	3 401.3	1.8	HL
Anchovies, <i>Stolephorus indicus</i>	Teri	2 354.6	1.3	SN
Sardines, <i>Sardinella sp</i>	Lehoma/ Lemuru	2 174.4	1.2	PS
Needle fishes, <i>Hemirhamphus far</i>	Roa	1 616.1	0.8	PS
Indian mackerel, <i>Rastrelliger kanagurta</i>	Kembung	723.2	0.4	
Yellow tailed scad	Lolosi	633.2	0.3	GN
Flying fish, <i>Cypsilurus poecilopterus</i>	Antoni	513.0	0.3	GN
Others		3 659.4	1.9	
Total		188 917, 0	100.0	

Modified from: DKP 2003

The second component is mackerel scads, *Decapterus macarellus* (23.4% of the pelagic catches) that is the principal target of north Sulawesi small purse-seine fisheries. Minor components include anchovies, sardinella, needlefishes, Indian mackerel, yellow tailed scads, and flying fish. Hand line fishing gear also used by small-scale fishery for catching mackerel scads and trevalies. This fishery mainly takes place at night, by using light to illuminate an area around the boat. Flying fish mostly are caught by monofilament gillnets with canoe boat operated at night. Pole and line fishing fleets contributes to skipjack production as long-line fishing for tunas in north Sulawesi.

Fish stock

Fish stock availability is synonym with the amount of fish present with range of the local fishery. The major fishing grounds of the north Sulawesi's fishermen are within the area of Sulawesi Sea and Maluku Sea. National stock assessment commission (DKP 2002) reported the total number allowable catch (TAC) and production as shown in Table 3. It shows that stock availability of large pelagic fish in both Seas is less than that of small pelagic resources, or the large pelagic fish just one-third of the TAC; but in terms of production it is just the other way around (Table

1). The exploitation degree level of small pelagic fish is still relatively low, 20.29 per cent in Sulawesi Sea and 39.34 per cent in Maluku Sea. These resources mostly are exploited by small commercial scale fisheries, which are mainly operated several miles from shore.

Table 3. Total allowable catch (TAC) and exploitation in Sulawesi Sea and Maluku Sea (thousand tons).

Resources	Sulawesi sea		Maluku sea		Total
	TAC	Production (%)	TAC	Production (%)	
Large pelagic fish	140, 21	153, 43 (109, 43%)*	85, 21	37, 46 (43, 96%)	225, 42
Small pelagic fish	307, 00	62, 45 (20, 29%)	303	119, 43 (39, 34%)	610, 00
Total	447, 21		388, 21		835, 42

Modified from DKP 2002 * Over fishing

In Sulawesi Sea, the large fish indicated over fishing with exploitation level 109.43 per cent, but in Maluku sea is still 43.96 per cent. Since the pelagic fishes are highly migratory fish, it could be just takes such period of time to recovery, unless there is discrete population.

Over fishing on large pelagic fish in Sulawesi Sea is an interesting issue to find out. Some question need to be answered, for example, Does the production (small) fluctuation as shown in Table 1 relate with these issues? More research is needed to answer whether the increasing catch has affect on availability of large pelagic fish in the area. Lack of CPUE and data of fleet number entering to those areas is unlikely to give a speculate answer on that question.

There is also still a common assumption that pelagic population extend over much wider area than are covered by north Sulawesi fishery; especially large pelagic fishes that are highly migratory fish. Highly mobile large pelagic species may change their distribution in respond to seasonal or environmental condition which eventually affects the fish availability in the region

Catch rates & other relating factors

Catch rates is catch per unit effort (CPUE) calculating by dividing the total annual landing by the number of trip (a day) that the gear is used. Table 4 summarized average of CPUE of some fishing gears in this area operated by small commercial scale fisheries. It shows also that purse seine and long-line fisheries have better productivity than that of gillnet and hand lines.

Table 4. CPUE (Ton/trip) of some small commercial scale fishing gears for pelagic fish; PS= purse seine, GN=gillnet, LL=Long line, HL= hand lines

No.	Locations	PS	GN	LL	HL
1.	Melonguane/ Talaud	0.10	0.04	1.10	0.02
2.	Tabukan/ Sangihe	0.80	0.05	1.20	0.02
3.	Tagulandang	1.50	0.04		0.02
4.	Likupang*	1.33	0.05	1.2	0.02
5.	Belang*	1.44	0.05	1.2	0.06
6.	Manado*	1.10	0.06	0.6	0.03
7.	Kema*	1.30	0.05	-	0.10
8.	Tombasian*	1.90	-	-	0.03
9.	Tombariri*	2.10	-	-	0.04
10.	Bitung*	1.00	0.01	-	0.04

Source: Boneka *et al* (2002), *Paturusi *et al* (2002)

Small purse-seine fisheries are the most profitable small scale fisheries in the region. A total of 190 purse seine fleets operated in north Sulawesi, which are 120 units occur in mainland (locations 4-10), 38 units in Biaro-Siau Tagulandang (islands close to mainland), 23 units in Sangihe Is and 9 units in Talaud Islands (the most remote northern islands).

Numbers and its distribution in the region could be influenced by and infrastructure available, local market capacity to absorb the catches, accessibility to overseas market. High population, canning industries situated in Bitung and International airport in Manado may stimulate increasing numbers of purse seine fleets and its efficiency in mainland and near by islands (Biaro, Siau, and Tagulandang). But commercial fishing in Sangihe and Talaud Islands appear to be left behind. Local marketing opportunities for Sangihe and Talaud fishermen are limited, as might be expected in this isolated region. Each island has own small market. There is also poor infrastructure available, even ice cube taking from Bitung, about 12-15 hours

Catch per unit effort (CPUE) is also commonly used also as an index of stock abundance. CPUE in local fishery may decline if local fishing effort is so intense that most fish entering the local area are caught. Thus, the resources in near shore around mainland would be overexploited since the major fleets (63 per cent) are conducted there. However, Table 4 shows CPUE of purse seine around mainland do not show less value than that of Sangihe and Talaud where are just small number occur there. In another word, there is no indication of pelagic fish stock depletion.

Conclusion

There is no indication of over fishing for small pelagic fish. Small scale commercial fisheries still have prospect to develop in term of fleet numbers and extend capability to cove wider area, particularly to further north fishing ground. However, the expansion in fishing fleets for large scale pelagic fisheries should be reviewed.

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