Species and Size Composition of Priacanthid Fishes in the South China Sea and Adjacent Waters

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Bigeyes are the second most abundant among demersal fishes in the region, usually accounting for 10 to 20 % of total catch of trawl, and are consisted of five species, among which *Priacanthus tayenus* and *P. macracanthus* are commercially important. *P. tayenus* predominated over *P. macracanthus* and no other species occurred in areas where the catch per hour of bigeyes was high, while in areas of the poor catch *P. macracanthus* predominated and the species composition was diverse. As a whole, *P. macracanthus* was bigger in size than *P. tayenus*. The recruitment of *P. tayenus* into trawl grounds seems to take place in June-August season when young fish is about 80–90 mm in standard length, and the fish is considered to grow by 50 mm in the following six months and another 50 mm in the subsequent one year.

Bigeyes, *Priacanthus* spp., rank at the second position in catch, next to red snappers, *Lutjanus* spp., among demersal fishes in most trawl fishing grounds in the South China Sea and adjacent waters, usually occupying 10 to 20% of the total catch (Hooi, 1973; Senta and Tan, 1973; Senta, Tan and Lim, 1973). A limited number of papers on biology of bigeyes in the region have been published so far. Vien (1968) made a short description on the biology of *Priacanthus tayenus* and *P. macracanthus* in Tonkin Bay. Chomjurai and Bunnag (1970) studied the migration and growth of *P. tayenus* in the Gulf of Thailand by tagging experiments. Peng (1971), Nhon (1972), and Tu (1972) shortly reported on feeding, length-weight relationship and fecundity of *P. tayenus* in the South China Sea, respectively.

Data on species and body length composition of bigeyes collected through experimental trawlings conducted by the research vessel Changi of the Marine Fisheries Research Department (MFRD), Southeast Asian Fisheries Development Center (SEAFDEC), from July 1971 to February 1974 are presented here.

Materials and Methods

The fishing grounds visited by R/V Changi during the study period were divided into five areas as shown in Table 1. Being a research vessel of a regional organization, R/V Changi had not been allowed to enter into a territorial water of any country for investigation, and her activity was limited in the open sea. Because of the monsoons, R/V Changi carried out the investigations in the South China Sea mostly from April to October, and in the Straits of Malacca and the northern Andaman Sea from November to March. This, together with the diversity of requirements of the SEAFDEC member countries, made it impossible to collect year-round data of bigeyes in the same area.

The trawl net used was of four-seamed type, with head rope length of 36 m and cod-end stretch mesh size of 56 mm. The

Table 1. Trawl fishing grounds surveyed and the catch of bigeyes.

Areas	Off Vietnam (V)	Off Borneo (B)	Off Malay Pen. (T)	St. of Malacca (M)	Andaman Sea (A)
Lat. N*	07°10′– 09°30′	03°00′– 06°40′	01°35′– 04°44′	04°38′– 05°55′	15°07′–15°13′
Long. E*	106°15′–109°06′	109°40′–116°15′	104°02′–104°50′	99°00′–100°05′	95°09′–95°17′
Depth (m)	30–160	30–114	29–71	43–100	34–40
Years and months visited**	1971:IX.	1971:X. 1972:XI. 1973:V, X.	1971:IX, X, XI, XII. 1972:I, IV, VI, IX, X. 1973:III, IV, V, VIII, IX.	1971:VII, XII. 1972:II. 1973:I, XI, XII. 1974:I, II.	1972:XII. 1973:I, XI. 1974:I.
No. of hauls	39	138	235	78	63
Total catch (tons)	4.4	28.0	51.5	13.6	32.5
Bigeyes					
Total catch (kg)	52	2,330	8,815	2,100	16
Wt. examined (kg)	51	396	1,039	241	–

* Exclusive of territorial waters. ** I, January; II, February; and so forth.

net was towed at a speed of 2.5 to 4.5 knots for an average of 1.5 hours.

Table 1 also shows the number of hauls operated, the total catch, the catch of bigeyes, and the total weight of bigeyes examined. A total of 13313 kg of bigeyes was caught during the study period, and 1727 kg out of them was separated into species. The individual number and total weight were recorded for each species, and the punch card method was applied to obtain data for body length frequency analysis.

Results

Catch and Species Composition of Bigeyes by Areas

Fig. 1 represents the catch per hour of haul and the species composition of bigeyes in each surveyed area. The highest catch per hour, 25.8 kg, was obtained in the waters near Tioman Island off the east coast of Malay Peninsula (hereafter abbreviated as area T), followed by the fishing grounds in the Straits of Malacca (area M). The catch per hour in the waters off the north coast of Borneo (area B) was less than half that in area T. Bigeyes were considerably few in the waters off the south coast of Vietnam (area V), and almost negligible in the northern Andaman Sea (area A).

In all, five species of bigeyes occurred in the trawl catch of R/V Changi. They were *Priacanthus tayenus* Richardson, *P. macracanthus* Cuvier, *P. hamrur* (Forskål), *P. boops* (Schneider), and *Pseudopriacanthus niphonius* (Cuvier).

The species composition was simple in areas T and M, with only *P. tayenus* and *P. macracanthus* occurring in the catch. *P. tayenus* occupied 91 % in individual number of bigeyes in area T, and 75 % in area M. In area B, the predominancy of *P. tayenus* was not so remarkable, accounting for 57 % of total individuals of bigeyes, followed by *P. macracanthus* with 42 %. *P. hamrur* also occurred in this area, though few in number, 51 fish or 1.5 % of total.

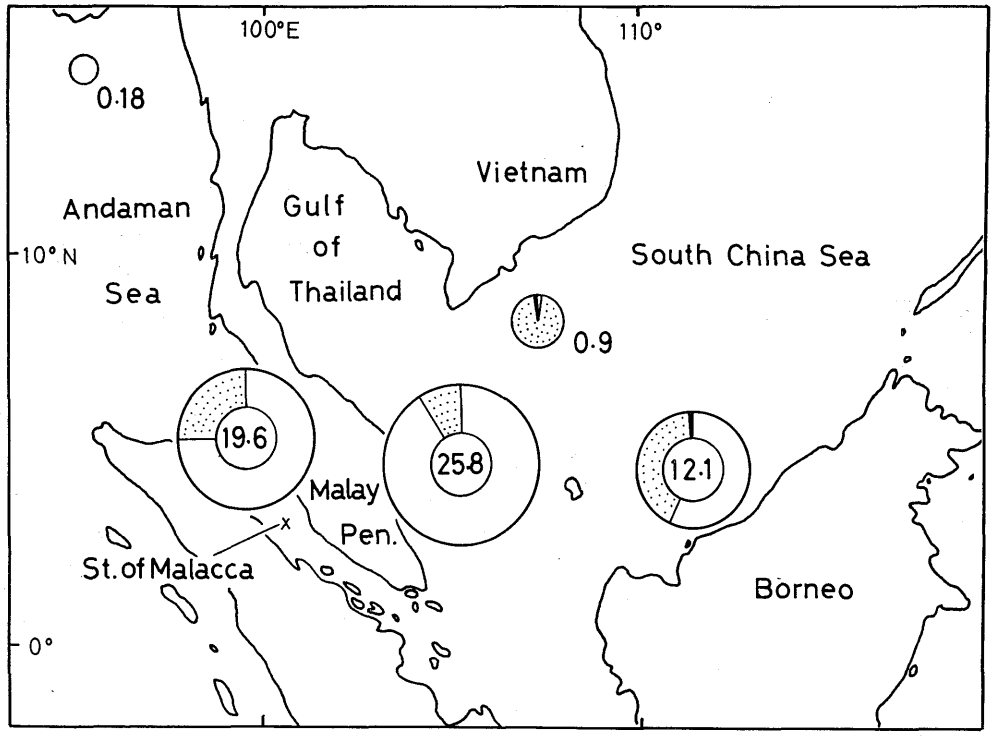

Fig. 1. Catch and species composition of bigeyes by areas based upon the data collected through experimental trawling of R/V Changi from July 1971 to February 1974. Numerals in or by circles show catch per hour of haul of bigeyes in kilograms. Blank, dotted, and solid sectors represent percentage in individual number of *P. tayenus*, *P. macracanthus*, and mixture of *P. hamrur*, *P. boops*, and *Ps. niphonius*, respectively.

The predominancy of *P. macracanthus* and the diversity in species composition characterized area V. All the five priacanthid fishes mentioned before appeared in the trawl catch in this area. *P. macracanthus* occupied 98 % in individual number of bigeyes, followed by *P. tayenus* of 1.3 % and *P. hamrur* of 0.8 %. A single *P. boops* and four individuals of *Ps. niphonius* were caught by a haul made in the deepest part (144–160 m) of this area.

Size of Bigeyes Appearing in the Trawl Catch

P. hamrur grows biggest among bigeyes. The fish caught by R/V Changi ranged from 165 to 300 mm in standard length, and individuals from 225 to 280 mm accounted for 73 % of total. The body weight of the biggest individual was 850 g.

Fig. 2 shows the body length frequency histograms of *P. macracanthus* and *P. tayenus* from four surveyed areas. Usually, *P. macracanthus* was bigger, with a considerable part of individuals exceeding 200 mm in standard length, while in *P. tayenus* most individuals were smaller than this length.

In both the species, the fish caught in area T tended to be bigger than those from the other areas. Most *P. macracanthus* occurring in area V were small sized; individuals of between 60 and 140 mm in standard length accounted for 96 % of total. R/V Changi visited this area only once, in the early part of September, 1971.

In standard length, *P. boops* was 116 mm

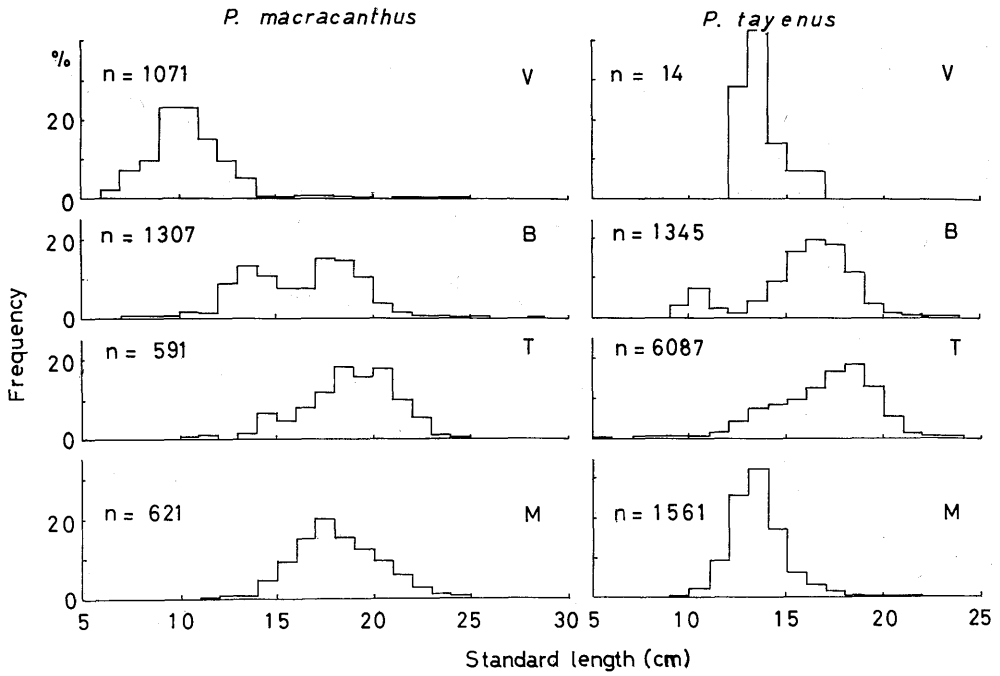

Fig. 2. Body length composition of *P. macracanthus* and *P. tayenus* by areas, aggregate for the whole study period. V, off the south coast of Vietnam; B, off the north coast of Borneo; T, off the east coast Malay Peninsula; M, Straits of Malacca.

and *Ps. niphonius* ranged from 148 to 177 mm.

Body Length Composition of *P. tayenus* in Area T by Season

As shown in Table 1 and Fig. 1, R/V Changi operated trawling most often in area T and *P. tayenus* was markedly predominant in the area. Fig. 3 compares the body length composition of *P. tayenus* in area T by seasons, aggregate for the whole study period.

The body length frequency histogram for March-May season was monomodal, with a peak at 170–180 mm, while the histograms for other seasons had two or three modes. In any season with polymodal distribution of body length frequency, a peak for the largest size group was the most prominent. The smallest size group with a mode at 80–90 mm appeared in June-August season. *P. tayenus* in December-February season consisted of two size

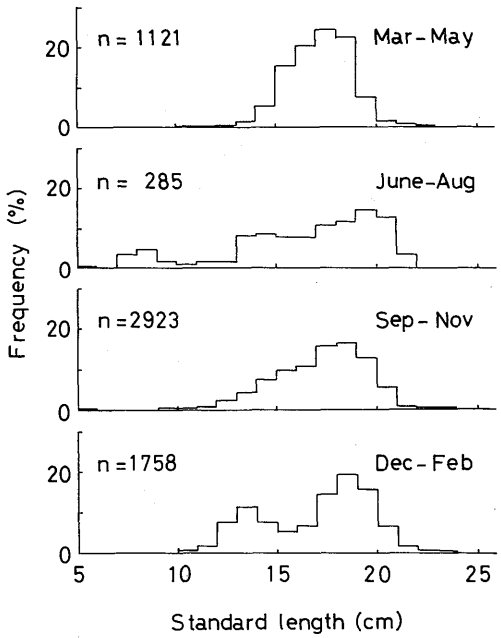

Fig. 3. Body length composition of *P. tayenus* by seasons in the waters off the east coast of Malay Peninsula (area T), aggregate for the whole study period.

groups, one with a mode at 130–140 mm and another at 180–190 mm.

Discussion

Bigeyes are the second most abundant group among the demersal fishes in the trawl fishing grounds in the southwestern part of the South China Sea and the Straits of Malacca, and a larger part of it is composed of *P. tayenus*. It is interesting to notice that the catch per hour of bigeyes was greater in the area where the predominancy of *P. tayenus* among bigeyes was higher. On the other hand, in area V off the south coast of Vietnam where *P. macracanthus* predominated and the species composition was the most diverse, the catch per hour of bigeyes was very low. According to Vien (1968), bigeyes accounted for only about 3 % of the catch of demersal fishes and *P. macracanthus* was much more abundant than *P. tayenus* in Tonkin Bay. Further north, bigeyes are not included even in twenty-three commercially important demersal fish species/groups in the East China Sea (Mako, 1961), where *P. macracanthus* predominates among bigeyes and almost no *P. tayenus* is seen (personal information from Mr. Masaru Tagawa of the Seikai Regional Fisheries Research Laboratory).

In all the polymodal distributions of body length frequency shown in Figs. 2 and 3, the most prominent peak was seen near the larger end of the body size range. This may mean that the survey area of R/V Changi had not covered whole the habitat of bigeyes. Younger bigeyes were probably distributed mainly in more coastal waters, viz. territorial waters. Investigations covering both territorial waters and open seas are needed.

In area T, the smallest size group of *P. tayenus* with a mode at 80–90 mm appeared in June–August season, suggesting that the recruitment of *P. tayenus* into the fishing ground off the east coast of Malay Peninsula might have occurred in June-August season, or in other words the south-west monsoon season. *P. macracanthus* caught in waters off the south coast of Vietnam in Septemer consisted almost exclusively of individuals smaller than 140 mm in standard length, with a peak at 90–110 mm. This may show that the recruitment of *P. macracanthus* into this area might have taken place just before the month.

As continuous year-round data in the same area are not available, it is impossible to trace the growth of any of the species with any certainty. A preliminary estimation on growth of *P. tayenus* in area T is as following. Let us assume that the smaller size group in December-February season can be related to the smallest size group seen in June-August season, and that the two size groups in December-February season differ from each other by one year in age. If this is true, *P. tayenus* grows by 50 mm in the first six months after recruitment and again by 50 mm in one year after that. Converting these into a daily growth rate, we obtain 0.28 mm for the fish from 80 mm to 130 mm and 0.14 mm from 130 mm to 180 mm. Based upon tagging experiments in the Gulf of Tahiland, Chomjurai and Bunnag (1970) estimated the daily growth rate of *P. tayenus* as 0.2 mm for the fish of 157–189 mm in fork length (about 149–166 mm in standard length) and as 0.024 mm for the fish 205–221 mm (180–196 mm). The present estimates on growth seem reasonable.

The spawning season of *P. tayenus* in Tonkin Bay was reported as from March to August (Vien, 1968). During the period from January 1970 to April 1971, R/V Changi executed 107 horizontal surface tows of a larval net in the South China Sea. Fish larvae collected amounted to 4969 individuals, but no single larva of *Priacanthus* species was caught (Yong, 1971). The survey on the spawning grounds and larval fish ecology is need.

Acknowledgements

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南支那海および周辺水域における キントキダイ類の種組成と体長組成

千 田 哲 資

キントキダイ科魚類は表記海域におけるトロール漁業の主要漁獲物のひとつで，多くの漁場においてフエダイ科魚類に次いで多獲順位の第2位を占める。イトヒキキントキとキントキダイが主要種であり，他にホウセキキントキ，チカメキントキ，クルマダイも出現するが量的には少ない。単位曳網時間当りキントキダイ類漁獲高の

高い水域（マレイ半島南部東岸沖，マラッカ海峡）ではイトヒキキントキの優占度が高く，種組成は単純である。逆に上記漁獲高の低い水域（ベトナム南岸沖）ではキントキダイが優占し，同時に種組成が複雑である。底曳網の漁獲物ではホウセキキントキが最も大きく，次いでキントキダイ，イトヒキキントキの順である。標準体長80～90㎜にモードをもつイトヒキキントキの補給群がマレイ半島沖のトロール漁場に出現するのは主に6～8月で，その後半年でほぼ50㎜大きくなり，更にその後1年で更に50㎜生長するようだ。