

Notes on the Flying-fishes of Hachijo Island, with Nomenclatorial Remarks on the Flying-fishes of the Mainland of Japan and Hokkaido.

II. *Cypselurus pinnatibarbatus japonicus*.* (With Additional

Notes on *Prognichthys agoo*)

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With the exception of *Prognichthys agoo* (TEMMINCK *et* SCHLEGEL) dealt with in a previous paper (ABE, 1953), all the other economically important forms of flying-fishes of Hachijo Island and the mainland of Japan are referable to the so-called *Cypselurus*. In the present paper some notes on the most important form for the people of Hachijo, namely, *Cypselurus pinnatibarbatus japonicus* (FRANZ), are given. This form is the giant among the Japanese flying-fishes, and economically important in the other parts of Japan, *e. g.*, southern parts of Kyushu, Shikoku, Kii Peninsula and Bōsō Peninsula. Japanese ichthyologists have adopted the name of "Hama-tobi-uo" for its adult, and probably "Seto-tobi-no-uo" for its young, but these names are not being used by fishermen and fish-dealers. This form is called "Haru-tobi" in Hachijo, and "Kaku-tobi" in Tokyo (*cf.* ABE, 1953, pp. 117, 118).**

In 1953, a very good catch of the "Haru-tobi" comparable to that of 1950 (*cf.* ABE, 1953, p. 115) was observed in Hachijo. Mr. Tadashi KUSAKARI, Hachijo Branch Station, Tokyo Prefectural Fisheries Experiment Station, has kindly gathered its catch record for the writer which is given in table 1. The writer wishes to express here his sincere thanks to Mr. KUSAKARI for his cooperation. The total number of the individuals of this flying-fish handled at the five fishing villages of the island during the fishing season, February 21–May 12, 1953, was 1,776,988, which weighed some 766.4 metric tons. The average weight of the individual fish was 0.431 kg (115 mon-me).

Table 1. Catch record of "Haru-tobi," *Cypselurus pinnatibarbatus japonicus* in 1953 from Hachijo [number of individuals and approximate weight in metric tons (in parentheses)]†

February 21–28	March			April			May 1–12	Total
	1–10	11–20	21–31	1–10	11–20	21–30		
7216 (3.1)	24821	125167	510753	558476	400083	143797	6675 (2.9)	1776988 (766.4)
	(285.0)			(475.4)				

* Aided by a grant-in-aid from the National Committee, UNESCO, Ministry of Education, Japanese Government.

** The name "Kaku-tobi" is sometimes misleading, because one of the flying-fishes taken commercially near Tanegashima, Japan Sea and southern Japan is likewise called "Kaku-tobi." It is a medium-sized form, *Cypselurus heterurus dōderleini* (STEINDACHNER).

† A considerable quantity of this flying-fish consumed by the fishermen and their friends is not included in the record.

The number of the individuals of this flying-fish handled at the five villages of Hachijo was:

Mitsune-mura	595,717	(256.9 metric tons)
Okago-mura	509,284	(219.7 ")
Nakanogo-mura	407,945	(175.9 ")
Sueyoshi-mura	218,463	(94.2 ")
Kashidate-mura	45,579	(19.7 ")
Total	1,776,988	(766.4 ")

As in usual years, large shoals of the "Haru-tobi" in 1953 were first seen by fishermen near Tori-shima (south of Hachijo I.) late in February. One of the fishing boats then took tens of metric tons of this fish near Tori-shima, and shipped them to Central Wholesale Market of Tokyo. The climax of the catch in 1953 was observed late in March and early in April near Hachijo. About three weeks prior to the closure of the fishing of this fish there (*cf.* table 1), smaller shoals of this fish appeared near Miyake I. (north of Hachijo I.) and Oshima (north of Miyake I.), whence more than a hundred metric tons of the fish were shipped to the market just mentioned. Early in May, 1953, smaller shoals of this flying-fish were found near the southern coast of Bōsō Peninsula, where in autumn of the same year a considerable quantity of the fish was taken as in the corresponding season of 1952. The present writer has seen only two adult examples of this fish taken during July - August of 1952 and 1953; an adult example was taken by a trap net off Yoichi (southern part of Ishikari Bay, Hokkaido on August 5, 1952, and another adult example was taken near Izu-shichito (probably a short distance south of Oshima) at the last of August, 1953. After September 17 till December, 1953, this flying-fish was taken commercially along the southern coasts of the mainland of Japan, and more especially near Bōsō Peninsula and Kii Peninsula as in the corresponding season of 1952*. According to Prof. IMAI, it is taken every year along the south-eastern coast of Kyushu during November-March by long-line (instead of by drift net).** Late in December, 1953, and in January, 1954, a considerable quantity of this flying-fish was shipped to the market of Tokyo from the southern coast of Shikoku. According to Mr. Haruo NAGATO, Kōchi Prefecture, it was also taken in the day-time by long line using attenuated pieces of squid muscle as bait. In the middle of February, 1954, the fishing of this giant flying-fish was again begun near Tori-shima and Hachijo by gill-net in the night.† Thus it may be said that this flying-fish is taken commercially all the year round, excepting for summer, somewhere in Japanese waters. The writer is now trying to learn more about the relationship between the shoals of this fish approaching Japanese coasts supposedly from Tori-shima (or more southerly seas) in February and those taken along the south-eastern coast of Kyushu and southern coast of Shikoku during November - March. At all events this form prefers colder water†† for breeding than do the other Japanese congeners.

It is rather surprising to see that the only account in considerable detail of this important flying-fish taken in Japanese waters is that of Dr. TANAKA (1913) under

* In autumn of 1952 and 1953, it was taken from time to time along the western coast of Sagami Bay by trap net.

** In November, 1952, the writer obtained several adult examples of this fish taken by a trap net at Akamizu, Kyushu (*cf.* table 2).

† After this paper went to press, this flying-fish was taken near Yakushima (south of Kyushu) by a fishing boat. The fishermen of the boat tried the fishing there by their gill-net for the first time probably following the suggestion by the writer. The fish was taken late in February, 1954.

†† The surface temperature of the water at the fishing ground near Hachijo, where also the fish spawns, is about 19°C, which is a little higher than the minimum surface temperature of a year there occurring in February or March. For the surface temperature see TAKANO, 1954.

the name of *Cypselurus agoo*; the original description by FRANZ is extremely brief. As Dr. TANAKA'S description, however, lacks some essential detail, it is thought timely to describe anew an adult example in more detail. Unfortunately, the writer has so far not been able to locate the specimen upon which Dr. TANAKA'S description and figures were based. It might have been damaged by the earthquake in 1923.

***Cypselurus pinnatibarbatus japonicus* (FRANZ)**

"Hama-tobi-uo"; "Kaku-tobi"; "Haru-tobi"; "Ō-tobi";
"Koshi-naga";? "Seto-tobi-no-uo" (young)

Figs. 1 - 6

Exocoetus lineatus japonicus FRANZ, 1910, p. 24 (Oyama, Sagami); 310-410 mm long.

Cypselurus agoo TANAKA, 1913, pp. 215-217, pl. 58, fig. 219, pl. 60, figs. 222, 223 (off Izu);
total length 355 mm.

? *Cypselurus solandri* JORDAN, TANAKA and SNYDER, 1913, p. 108 (Kōbe). - KAMOHARA, 1950, p. 70
(Wakayama Pref. and Kōchi Pref.).

**Description of the adult example depicted in fig. 1 (Cat. No. 47853,
Zool. Inst., Fac. Sci., Tokyo Univ.):**

The specimen was taken near Chikura (Bōsō Peninsula) on September 18, 1952, and collected by the writer on the next day at Central Wholesale Market of Tokyo. It measures *ca.* 430 mm in total length, 364 mm in fork length, 346 mm in standard length and weighs 490 g (130 mon-me). The following measurements are given in hundredths of the standard length: Length of head 20.2, greatest depth of body 17.1, greatest breadth of body 12.4, greatest breadth of trunk 10.8, least depth of caudal peduncle 5.5, diameter of orbit 5.3, bony interorbital breadth (above centers of orbits) 7.2, length of snout 6.4; predorsal length 74.0, preventral length 59.2, preanal length 79.8, distance between hind margin of opercular flap and origin of ventral fin 39.0, distance between ventral origin and base of anteriormost rudimentary caudal fin-ray 37.9, length of longest (2nd) dorsal fin-ray 10.1, length of longest (3rd) anal fin-ray 6.3, length of longest (3rd) pectoral fin-ray 68.2, length of longest (3rd from outside) ventral fin-ray 25.7 (left) or 26.3 (right), length of longest (lowermost branched) caudal fin-ray *ca.* 26.9, length of base of dorsal fin 14.7, length of base of anal fin 10.0.

General appearance, and color in formalin. The body is rather slender, slightly constricted below the posterior part of the pectoral bases and slightly expanded laterally at the ventral bases. The head is short. The posterior tip of the pectoral fin, when appressed, reaches a little beyond the base of the last dorsal fin-ray, but does not reach beyond the tip of the appressed last dorsal fin-ray. The posterior tip of the ventral fin, when appressed, reaches the interspace between the bases of the 7th and 8th anal fin-rays. The lateral line is along the ventral ridge of the trunk.

The dorsal part of head and trunk are brownish black (bluish black prior to preservation); the ventral part is light brown (whitish prior to preservation); there is a dark bluish or violet longitudinal band along the middle of the posterior part of the side of the trunk. The dorsal side of the pectoral fin is mostly light brownish violet, with

a whitish band of moderate breadth along the posterior margin and with a wide lighter part near the center of the fin. The dorsal fin is semi-transparent, with an indistinct black blotch distally (which is not shown in fig. 1). The anal fin is whitish. The ventral fin is whitish, only the dorsal side of the fin-rays being proximally dark brown. The caudal fin is blackish.

Teeth. The teeth of the jaws are long, distally conical, and arranged mostly in a single row (cf. "Notes on the other specimens" given below). The palatine and vomerine teeth are absent.

Scales. The scales are cycloid. The number of the predorsal scales (counted from the one just above the pair of the posterior horns of the supraoccipital to the smaller one covering the base of the 1st dorsal fin-ray) is 46. The number of the preventral scales (counted from the one on the isthmus to the one just in advance of the line connecting the anterior ends of the ventral bases) is ca. 31. The number of the series of scales from the dorsal corner of the gill-opening to the one covering the base of the caudal fin-ray is ca. 62. The number of scales in an oblique row above the lateral line* from dorsal origin is $1/2$ 6; the number of scales in an oblique row below the lateral line to the anal origin* is $2 \frac{1}{2}$. The number of scales along the lateral line is very difficult to count.

Fin-formulae. D. 12 (=i+11; 1st ray a little shorter than 2nd; last ray thick). A. 11 (=ii + 19; 1st ray very short; last ray bifid to the base). P. \underline{i} (very short; left and right halves proximally fused with one another) + 15 (=i+14) on each side.

The number of caudal fin-rays, branchiostegals and gill-rakers on 1st arch have not been examined (cf. "Notes on the other specimens" given below).

Notes on the other specimens listed in table 2:

Table 2. List of the other specimens examined of *Cypselurus pinnatibarbatu japonicus*

Number of specimens	Total length (mm)	Fork length (mm)	Standard length (mm)	Weight (g)	Sex	Maturity	Locality	Date of collecting, and remarks
1	ca. 400						Off Yoichi, Hokkaido	August 3, 1952. By a trap net
1	ca. 200		165				Onahama	Nonbarbelled. Depicted in fig. 3
3	ca. 400- ca. 415	341-360	320-346	405-490			Off Onjuku	Around September 11, 1953. By a gill-net
7	ca. 380- 460	331-382	312-360	330-550	♂ 4 ♀ 3	Testes very narrow. Eggs invisible for naked eye	Katsuura, Chiba Pref.	September 18, 1953. By a gill-net

*The counting was made after HUBBS and LAGLER, 1947.

1		393		575	♀		Manazuru	October 5, 1952. By a trap net
2		334, 352	324, 336	335, 390	♂, ♂		"	November 2, 1952. By a trap net
2	ca. 400, 450	333, 373	315, 355	310, 565	♂, ♀	Diameter of egg 1.2 mm. Testes fairly thick	"	Night of Decem- ber 6-7, 1952. By a trap net. No other flying- fish in the catch
1	ca. 450	365	349		♀	Eggs very small	Itō	October 7, 1953. By a trap net
5	430-470	356-390		490-630	♀, ♀, ♀, ♀,	"	Chikura	September 18, 1952
4	ca. 48.0- 127	ca. 42.0- 112	38.5-105				Izu-shichito	Barbelled. The largest and the smallest speci- mens depicted in figs. 4a, 4b, 4c, 6
1	198	166	157				"	Nonbarbelled.
10	403-429	335-361	318-342	370-455	♂ 8. 2 speci- mens not dissected		Near the entrance of Habu Harbor, Ōshima	April 24, 1953
1	80	70	66				Ōmurodashi (near Ōshima) (a fishing ground for the mackerel)	Night of May 19-20, 1953. Barbelled. Barbel red. Depicted in figs. 5a, 5b
3	79-115	68-100	64-94				"	Night of may 20-21, 1953. Barbelled
3	ca. 400- ca. 410						Hachijo I.	Spring of 1951
1	ca. 405	340	320		♂	Testes large	"	Spring of 1952. By a gill-net
20	385-420	322-353	302-333	370-520	♂ 20	"	"	Night of Febru- ary 24-25, 1953, By a gill-net
20	390-420	324-355	306-336	305-450	♂ 18, ♀ 2	After spawning	"	Night of March 7-8, 1953. By a gill-net
20	388-450	328-380	311-362	360-525	♂ 16, ♀ 4	"	"	Night of March 27-28, 1953. By a gill-net

20	400-440	333-368	312-346	320-480	♂ 18, ♀ 2	"	"	Night of April 27-28, 1953. By a gill-net
6	415-465	356-402	338-380	450-690	♂ 3, ♀ 3	Spawning	"	April, 1953. By a gill-net
1	108	94	87				0.5 miles off Ô-hirakata, Mitsune- mura, Hachijo I.	11 p. m., May 7, 1953. Barbelled. Attracted by a lamp. Surface temperature 20.5°C. Collect- ed from 4 individu- als of approxi- mately the same size. Bar- belled
3		332, 386, 395	310, 366, 375	400, 630, 745	♂ 1, ♀ 2	Eggs just visible for naked eye. Testes large	Akamizu, Nobeoka City, Kyushu.	November 1-10, 1952. By a trap net
2	ca. 402, ca. 423	342, 367	320, 346	400, 450	♂ 2		Near Aogashima	February, 1953. By a gill-net
2	ca. 400, ca. 402	339, 342	316, 322	370, 400	♂ 2		Near Torishima	February, 1953. By a gill-net

Vertebral column, interneural and interhaemal spines. The total number of vertebrae of *japonicus* is the largest among the Japanese flying-fishes of the genus *Cypselurus*; it is 51 (34+17 in 3 specimen; 35+16 in 5 specimens* or 52 (35+17 in 5 specimens). The last vertebra has a nearly horizontal stay on both sides.

The number of interneurals is 12 in 2 specimens, 13 in 9 specimens and 14 in 2 specimens. The 1st interneural has a pair of horns directed forward at its antero-dorsal corner; the last interneural has also a pair of horns directed backwards at its postero-dorsal corner. The lower limb of the 1st interneural is inserted between the neural spines of 28th and 29th vertebrae in 6 specimens and between the neural spines of the 29th and 30th vertebrae in 7 specimens. Correlated with the position of the 1st interneural, the relative length of the neural spine becomes abruptly smaller at the 29th or 30th vertebra; the neural spine just behind the lower limb of the 1st interneural is much shorter than the preceding neural spine. The lower limb of the last interneural is inserted between the neural spines of the 40th and 41st vertebrae in 9 specimens and between the neural spines of the 41st and 42nd vertebrae in 4 specimens. In most cases 1 interneural is inserted between 2 successive neural spines.

The number of interhaemals is 10 in 5 specimens and 11 in 8 specimens. There

* In 1 specimen the 35th vertebra has nearly a complete haemal arch but it is not closed ventrally.

are 2 interhaemals placed anterior to the 1st haemal spine in 1 specimen, 3 interhaemals at the corresponding place in 6 specimens and 4 interneurals at the corresponding place in 5 specimens. The last interhaemal has a pair of horns directed backwards at its postero-ventral corner. The last interhaemal is inserted between the haemal spines of the 40th and 41st vertebrae in 2 specimens, between the haemal spines of the 41st and 42nd vertebrae in 8 specimens and between the haemal spines of the 42nd and 43rd vertebrae in 3 specimens. The number of the interhaemals between 2 successive haemal spines is 1 or 2 (usually 1).

(to be concluded)

Explanation of figs. 1 - 7

Drawn by M. SHIRAO

Figs. 1 - 6: *Cypselurus pinnatibarbatu japonicus* (FRANTZ)

Fig. 1. Adult. Cat. No. 47853, Z. I. T. U. Total length *ca.* 430 mm; standard length 346 mm. *vide* pp. 195, 196.

Fig. 2. Right pectoral fin of an adult taken in the night. Cat. No. 9907, ABE. Total length *ca.* 420 mm; standard length 330 mm. Taken from Izu-shichito in spring, 1953.

Fig. 3. Young. Nonbarbelled. Cat. No. 37669, Z. I. T. U. Total length *ca.* 200 mm; standard length 165 mm. *vide* p. 196.

Figs. 4a, 4b, 4c. Barbelled young. Cat. No. 9709, ABE. Total length *ca.* 127 mm; standard length 105 mm. *vide* p. 197.

Figs. 5a, 5b. Barbelled young. Cat. No. 8928, ABE. Total length 80 mm; standard length 65.5 mm. *vide* p. 197.

Fig. 6. Barbelled young. Cat. No. 9079, ABE. Total length 48.0 mm; standard length 38.5 mm. *vide* p. 197.

Fig. 7. *Prognichthys agoo* (TEMMINCK *et* SCHLEGEL)

Young with a black pectoral spot. The ventral fin is blackish. The black blotch on the dorsal fin is very conspicuous. Cat. No. 9185, ABE. Total length 243 mm; standard length 193 mm. Taken near Miyake Island or Ō-shima (Izu-shichito) on July 23, 1953. When he published the first of the series of the papers (ABE, 1953), the writer was not aware of the remarkable changes in the coloration with advancing age in this species because of the lack of the young examples. In summer, 1953, he obtained numerous examples of this species, among which were several young examples showing that the coloration, especially of the pectoral and ventral fins, is much variable.

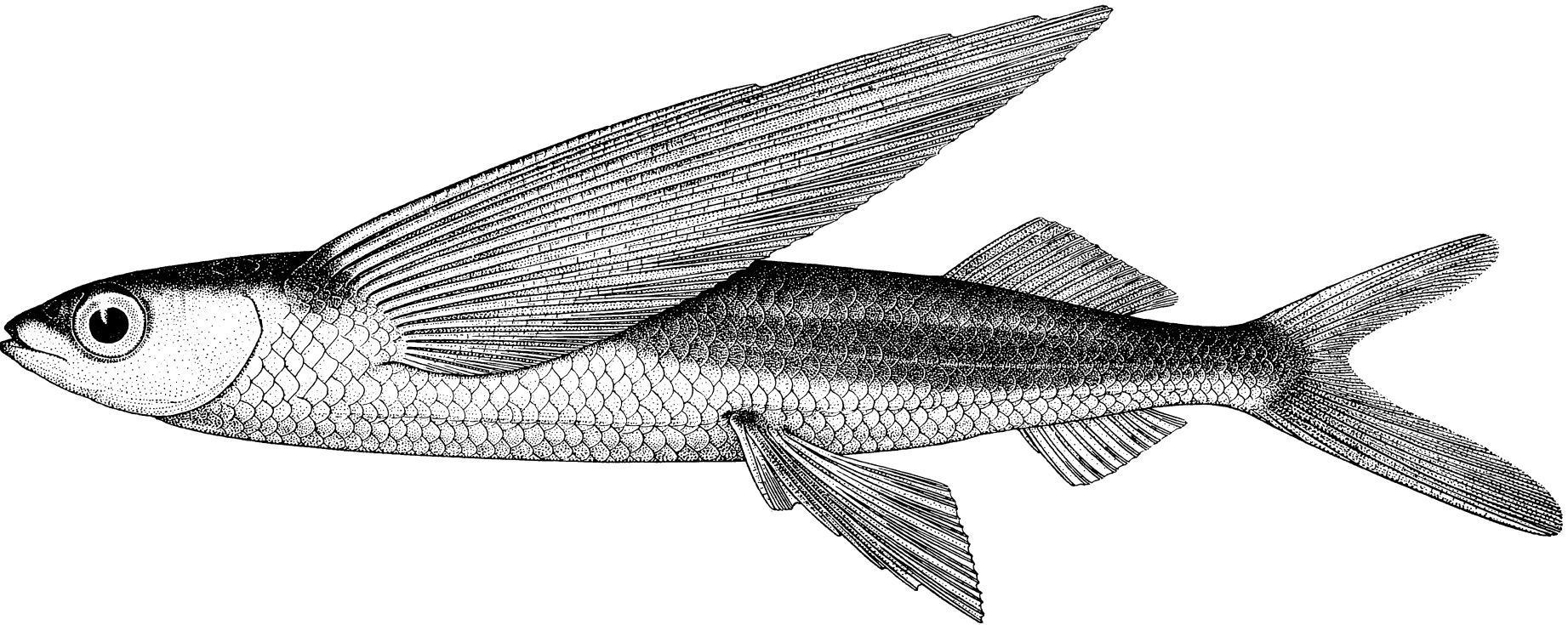


Fig. 1

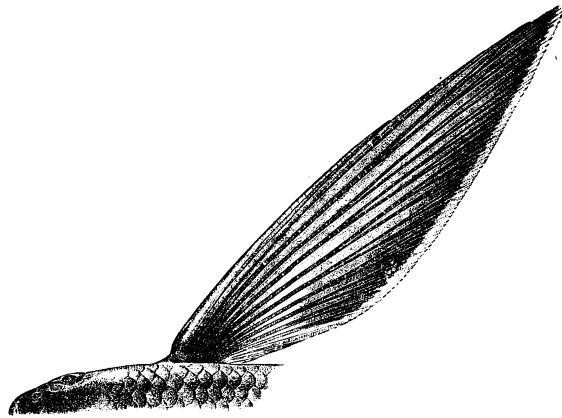


Fig. 2

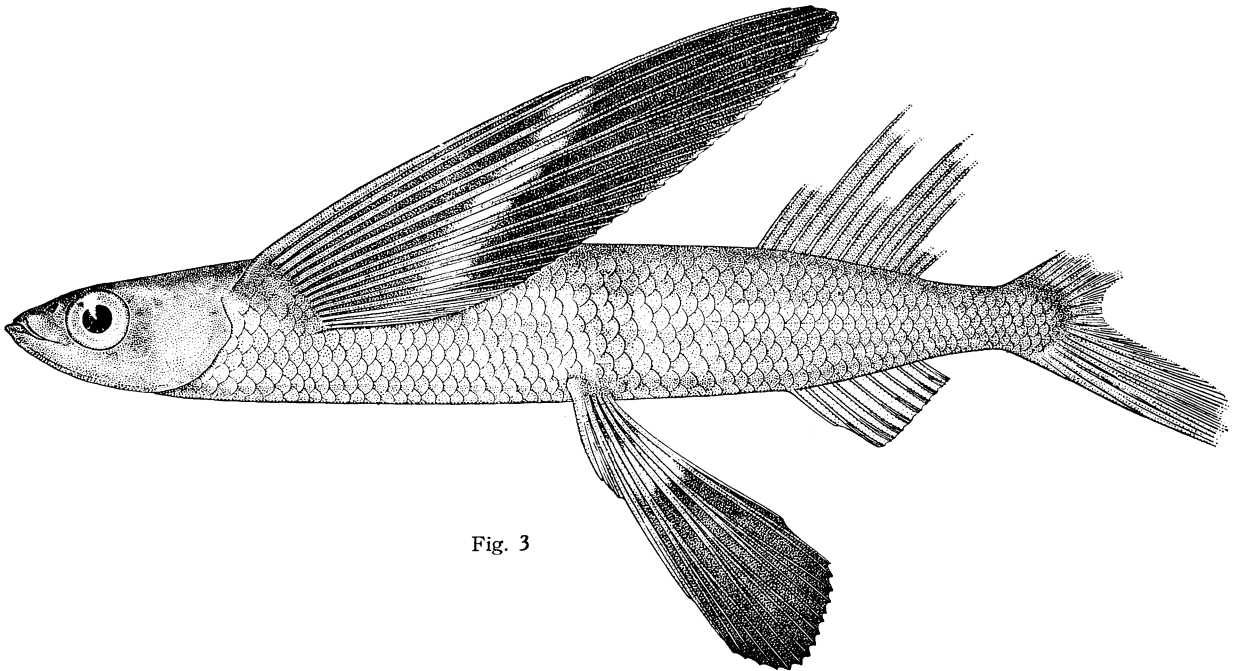


Fig. 3

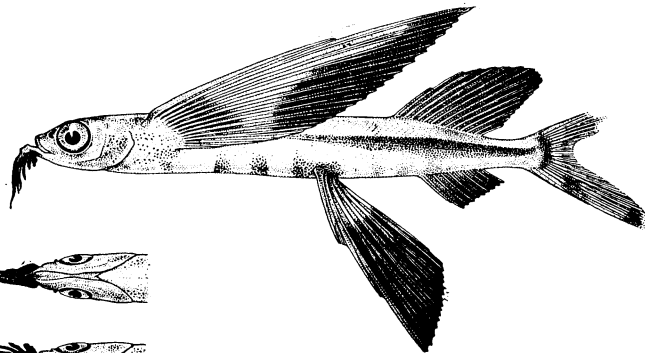


Fig. 4a

Fig. 4b



Fig. 4c



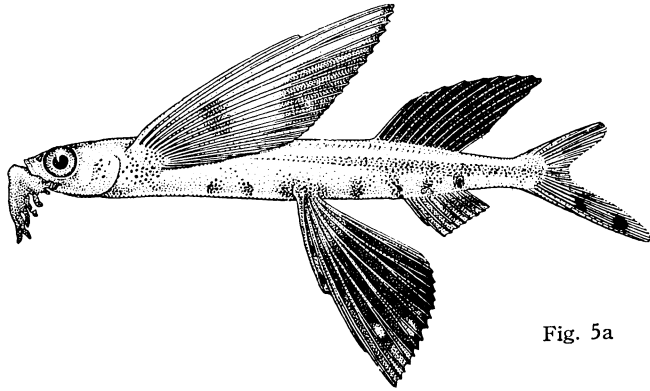


Fig. 5a

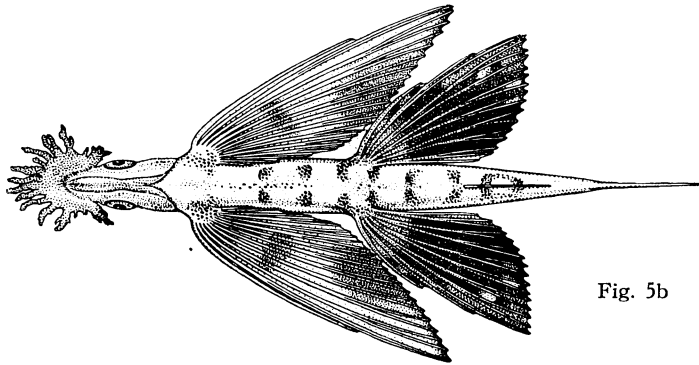


Fig. 5b

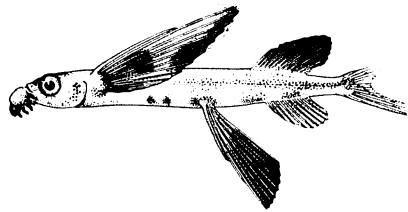


Fig. 6

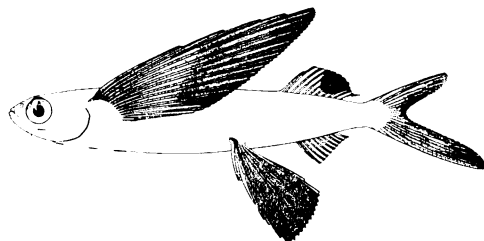


Fig. 7