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*) *Continued from p. 202*

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Visible portion of dorsal and anal fins. The relative height of the dorsal and anal fins changes greatly with advancing age, and the relative positions of the origins of these fins seem to vary to certain extent, although the anal origin is invariably behind the dorsal origin. Furthermore, the relative length of each fin-ray, especially that of the anteriormost fin-rays, varies considerably even in the adult. The change with age in the coloration of these fins is also very remarkable. It seems better to begin with the number of the fin-rays of the fins, which can easily be shown in table 3.

Table 3. Frequency distribution of the number of dorsal fin-rays (D) and that of anal fin-rays (A) in *Cypselurus pinnatibarbtus japonicus**

A \ D	12	13	14
9	1	1	1
10	7	14	1
11	7	20	4
12		1	1

The number of the anteriormost unbranched fin-rays in dorsal and anal fins is 1 or 2, oftener 1. Of the seven dorsal fins supported by 14 fin-rays, three have 2 unbranched fin-rays anteriorly; and of the two anal fins with 12 fin-rays, one has 2 unbranched fin-rays anteriorly. The 2nd, or the 3rd, and the subsequent fin-rays of the fins are branched, the last fin-ray usually being thick.

* Since this paper went to press, numerous specimens of *Cypselurus pinnatibarbatus japonicus* have been collected, of which the following have been examined in detail, and the results of the examination are incorporated hereafter:

Number of specimens	Total length (mm)	Fork length (mm)	Standard length (mm)	Sex	Maturity	Locality	Date of collecting, and remarks
1	410	343	322	♂	Testes fairly large	Manazuru	3～5/IV, '54. By a trap net
1	130		100			Off western coast of Hachijo I.	Night of 30～31/III, '54. Barbels reddish black. Bands of belly golden
1	132	112	105			〃	Night of 21～22/IV, '54. Barbelled
2	70,95	59,81	56.5, 75			〃	Night of 24～25/IV, '54. Barbelled

The relative height of the dorsal and anal fins, and more especially of the former, is remarkably great in the young of some 100 mm standard length. It may be of interest to compare the change with advancing age in the relative height of the dorsal fin in *Cypselurus pinnatibarbatus japonicus* with that of its close ally, *C. pinnatibarbatus californicus*, which was dealt with by HUBBS and KAMPA (1946). In the accompanying tables, the relative height of each fin-ray of the dorsal and anal fins in *japonicus* is first given (table 4), and the comparison of the highest dorsal fin-rays between the two forms just mentioned is made in table 5.

Table 4. Relative height of each fin-ray of dorsal (d) and anal (a) fins in *Cypselurus pinnatibarbatus japonicus*

Specimen	Standard length (mm)		Height / Standard length ×100 of 1st ray	2nd ray	3rd ray	4th ray	5th ray	6th ray	7th ray	8th ray	9th ray	10th ray	11th ray	12th ray	13th ray
Cat. No. 9797, ABE	100	d	18	21	26	28	29	28	26	25	22	20	14	10	6
		a	8	11	12	11	11	10	9	8	7	5			
Cat. No. 8746, ABE	320	d	10	13	13+	13+	13	12	10	8	7	6	5	4	5
		a	6	8	x	7	6	5	5	4	4	4	4		
Cat. No. 8741, ABE	324	d	9	11	12	11	10	9	8	7	x	6	4	5	
		a	3	7	7	6	6	5	5	4	4	4	4		

Table 5. Comparison of the relative height of the highest dorsal fin-ray between *Cypselurus pinnatibatus japonicus* and *C. p. californicus*. The data for the latter form have been cited from HUBBS and KAMPA, 1946, p. 203, table III.

japonicus			*californicus*		
Specimen from	Standard length (mm)	Height of highest dorsal ray / Standard length ×100	Specimen from	Standard length (mm)	Height of highest dorsal ray / Standard length ×100
Hachijo I.	56.5	25	near La Jolla	4.5	0.3
〃	75	25	off San Diego	69	24
Ō-murodashi	90	26			
〃	94	27	27°40′ N, 116° 50′W	164	19
Hachijo I.	100	29			
〃	105	29	27°30′ N, 115° W	194	14
Izu-shichitō	157	24	〃	225	13
Hachijo I.	320	13	〃	228	14
〃	324	12	〃	242	12
			Catalina I. (Type)	300	11
			Southern California	305	10
			〃	308	11
			〃	309	10
			〃	310	13
			〃	311	11
			27° 30′ M, 115° W	328	10
			Southern California	330	10
			〃	345	9
			27° 30′ N, 115° W	349	10
			Southern California	350	10
			〃	326	9
			〃	378	10

As is seen from table 4, the relative height of the anal fin in *Cypselurus pinnatibarbatus japonicus* is greater in the young than in the adult, but the diminution with advancing age is not so marked as in the dorsal fin.

The relative positions of the dorsal and anal origins are shown in table 6.

Table 6. Relative positions of dorsal and anal origins in *Cypselurus pinnatibarbatus japonicus*

Standard length (mm)	Position of origin of anal fin: Below interspace between			
	3rd and 4th dorsal fin-rays	4th and 5th dorsal fin-rays	5th and 6th dorsal fin-rays	6th and 7th dorsal fin-rays
38.5		x		
56.5		x		
58	x			
64		x		
66			x	
74	x			
75		x		
87	x			
90		x		
94		x		
100			x	
105			x	
105			x	
157		x		
165	x			
305				x
310			x	
310			x	
310				x
318		x		
318				x
320			x	
320			x	
320				x
322				x
324		x		
327				x
332				x
333			x	
336			x	
336				x
336				x
338				x
342			x	
344			x	
344				x
346			x	
346				x
349			x	
352				x
352				x
354				x
355				x
360			x	
363			x	
364				x
366			x	
368				x
370			x	
375				x
380			x	

The dorsal and anal fins of the young are mostly blackish, only the outer margin of these fins and the proximal part of the anal being hyalne or whitish. In the adult, the anal fin is whitish, and the dorsal fin also loses the black color, only a black blotch remaining distally in the middlemost portion of the dorsal. This black blotch is however, sometimes not conspicuous.

Pectoral fin and pectoral girdle. The uppermost rudimertary fin-ray of the pectoral is very difficult to see without removing the skin and tendons covering it (fig. 8). Each half of this ray is proximally fused with each other while the distal end is separable from one another. The 2nd fin-ray from the top has hitherto been regarded as the uppermost unbranched fin-ray of the pectoral by predecessors and the present writer himself. It may be better for practical purpose to treat hereafter the uppermost rudimentary pectoral fin separately from the other pectoral fin-rays which are visible without removing the coverings at the proximal part of the fin. The writer tentatively denotes the uppermost rudimentary fin-ray by a itlicized small letter of the Roman numeral, *i*, and the next, unbranched, conspicuous fin-ray by a small letter of the Roman numeral, i. Thus the pectoral fin-formula is given as, *e. g.*, P. *i*+15 (i+14) (left); *i*+15 (i+14) (right), and so on. The 3rd fin-ray from the top (not excluding the uppermost rudimentary ray) and the lower fin-rays are all branched excepting for the lowermost one which is often unbranched. The frequency distribution of the number of the pectoral fin-rays is given in table 7. Whether the lowermost fin-ray is branched or unbranched, is not indicated in the table.

Table 7. Frequency distribution of the number of pectoral fin-rays (P) in *Cypselurus pinnatibarbatus japonicus*

P					
left	*i*+14 (=i+13)	*i*+15 (=i+14)	*i*+14 (=i+13)	*i*+15 (=i+14)	*i*+16 (=i+15)
right	*i*+14 (=i+13)	*i*+14 (i=+13)	*i*+15 (=i+14)	*i*+15 (=i+14)	*i*+15 (=i+14)
Number of specimens	13	5	2	29	1

The change with advancing age in the relative length of the pectoral fin is not so marked as in the dorsal fin. In table 8 is shown the relative length of each fin-ray of the left pectoral of a young and an adult examples.

Table 8. Relative length of each fin-ray (excepting for the uppermost rudimentary fin-ray) of the left pectoral in *Cypselurus pinnatibarbatus japonicus*

Specimen	Standard length (mm)	Length / Standard length ×100 of														
		1st ray	2nd ray	3rd ray	4th ray	5th ray	6th ray	7th ray	8th ray	9th ray	10th ray	11th ray	12th ray	13th ray	14th ray	15th ray
Cat. No. 9797, ABE	100	39	67	67	63	60	53	47	43	38	33	30	23	12	5	1
Cat. No. 8746, ABE	320	45*	66	72	68	63	56	48	42	38	34	30	25	15	7+	6

* The length of the uppermost rudimentary fin-ray is 15 mm, namely, 5 % of the standard length.

The coloration of the pectoral fin varies considerably even in the adult. The writer long wondered whether the adult taken in Sagami Bay by trap net in the daytime were different from those taken from Hachijo Island by gill-net in the night because of the difference in the coloration of the pectoral. When Dr. A. BRUUN visited Japan in December, 1953, the present writer talked to him about the point, and Dr. BRUUN kindly suggested that the pectoral fin of flying-fishes taken in the night might be darker in color than that of the same species taken in the daytime. Dr. BRUUN further suggested that the salinity of the sea might have some relation with the coloration of the pectoral fin of flying-fishes. On checking the relation between the catching method (gill-net operated in the daytime; trap net lifted early in the morning; trap net lifted at 3 or 4 p. m.; long-line operated in the daytime) and the coloration of the pectoral fin of *Cypselurus pinnatibabartus japonicus*, the writer has realized that with some exceptions, the suggestions by Dr. BRUUN hold true for this flying-fish. In fig. 2 is shown a right pectoral fin of an adult of *japonicus* taken in the night near Izu Shichitō (which include Hachijo Island) by gill-net. The fin, when folded and seen from outside, is light brownish violet, with a hyaline band along the posterior margin and with a hyaline area near the base. The ventral parts of the upper fin-rays are light. When expanded and seen from inside (or, from above), the fin is light brownish violet, the fin-rays (excepting for the lowermost ones) being darker than the membranes. The hyaline band along the posterior margin is fairly conspicuous. The light oblique area of the lower and proximal parts of the fin is not sharply bordered, and extends obliquely from the bottom to the membrane between the 6th and 7th (counted from top; excluding the uppermost rudimentary fin-ray) fin-rays. The hyaline band along the posterior margin of the fin is continuous with the light area just mentioned. In the majority of the examples of this form taken in the daytime near the coast of Sagami Bay, the pectoral fin is much lighter in color, the posterior hyaline hand and the light area below are apt to be overlooked. The specimen described in vol. iii, nos. 3/4/5, pp. 195, 196, was taken from open sea off Chikura in the daytime, and the coloration resembles those taken in the night near Hachijo.

The coloration of the pectoral fin changes considerably with advancing age. In the two non-barbelled young measuring 157 mm and 165 mm (fig. 3), respectively, in standard length, the pectoral fin is black posteriorly and dark brown proximally, leaving the intervening oblique and very narrow triangular area and the very narrow posterior margin white (suggestive of some other members of *Cypselurus* and *Hirundichthys speculiger*). The bottom of this light oblique area ventrally extends and is confluent with the light lowermost part of the fin. The fin-rays, and more especially the uppermost two (excepting for the rudimentary ray), are lighter than the membranes in the smaller specimen just mentioned.

In the barbelled young (figs. 4-6), the coloration of the pectoral fin is suggestive of the non-barbelled young mentioned above, but the black or brown area is mnch narrower; *e. g.*, in a specimen of 64 mm standard length (not figured), the pectoral

fin is mostly hyaline, with a few brown blotches near the posterior margin and near the center of the fin.

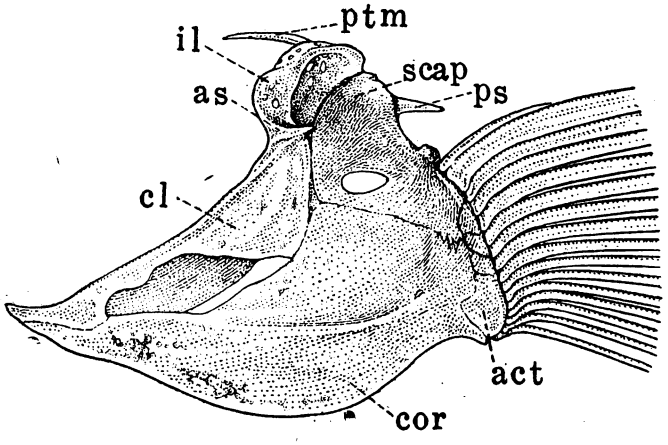

Fig. 8. Right pectoral girdle (exclusive of postcalvicle) and proximal part of pectoral fin of *Cypselurus pinnatibarbatus japonicus* taken near Hachijo I. in the night of March 7–8, 1953. Seen from inside. Total length of body 410 mm, standard length 322 mm. **act**: lowermost actinost. **as**: anterior spinule of clavicle. **cl**: clavicle. **cor**: coracoid. **il**: inner ledge of pocket of clavicle. **ps**: posterior spine of clavicle. **ptm**: posttemporal. **scap**: scapula. Drawn by M. SHIRAO and T. ABE.

So far, the present writer has examined the pectoral girdle of the genera *Oxyporhamphus, Exocoetus, Parexocoetus, Hirundichthys, Danichthys*, and the so-called *Cypselurus**, and has realized that there underlies a generealized "Cypselurus-type" of the girdle. Before describing the characteristics of the pectoral girdle in *Cypselurus pinnatibarbatus japonicus*, some general accounts of the "Cypselurus-type" of the pectoral girdle are thought necessary. Fortunately, STARKS (1930, p. 45) gave some description of the primary pectoral girdle of *Cypselurus pinnatibarbatus californicus*, and the present writer wishes here to give additional accounts of the "Cypselurus-type" of the pectoral girdle.

In the so-called *Cypselurus*, the supratemporal is absent. The posttemporal is rather short, slightly expanded at its ventral end, and its postero-ventral part covers the dorsal side of the supraclavicle, which is much smaller than the posttemporal. The former bone is ventrally attathed to the outer side of the dorsal ridge below the perforated "pocket" of the strongly developed clavicle. This pocket has anteriorly an inner "ledge" of varying width. The latter is sometimes perforated, probably irrespective of species. On the inside (namely, nearer to the vertebral column) of the ventral end of this ledge is a spinule of varying sharpness. This spinule is directed backwards, and invariably much smaller than the spine at the postero-dorsal corner of clavicle. The writer wishes here to propose the name "anterior spinule of the clavicle" for the former and "posterior spine of the clavicle" for the latter. The latter is also directed backwards and continuous with the dorsal ridge of the clavicle. The keel on the

* The pectoral girdle of *Prognichthys agoo* resembles that of the so-called *Cypselurus*. In the absence of the skeleton of *Prognichthys gibbifrons*, the writer is not able to mention about the pectoral girdle of *Prognichthys*; the adoption of *Prognichthys* for *agoo* is only for convenience' sake.

outside of the coracoid is long and fairly high, while the ridge (or ridges) on the inside of the bone is (or are) very low. The actinosts, four in number, are fitted so tightly to the scapula and coracoid, and posteriorly forming so smooth a contour, that it is with some difficulty to recognize each actinost at a glance. The postclavicle seems to be composed of only one bone, which is flexible and somewhat twisted.

Now, in *Cypselurus pinnatibarbatus japonicus* the pectoral girdle is very rigid, and the "anterior spinule" and "posterior spine" of the clavicle are well developed. The inner ledge of the pocket of the clavicle is broader than in manny of the Japanese members of *Exocoetidae*. The keel on the outer side of the coracoid is also prominent, runs not parallel to the posterior margin of the outer wing of the clavicle, but downward and forward towards the postero-ventral margin of the outer wing of the clavicle, and terminates far from the latter. The inner ledge of the pocket of the clavicle is sometimes perforated.

Ventral fin and pelvic girdle. The number of the ventral fin-rays is 6, all the rays being branched and segmented. The coloration and relative length of the ventral fin changes with age. In table 9 is shown the relative length of each fin-ray of the ventral in a barbelled young and an adult examples. The barbelled young has much longer ventral fin than the adult does.

Table 9. Relative length of each fin-ray of the left ventral fin in *Cypselurus pinnatibarbatus japonicus*

Specimen	Standard length (mm)	$\frac{\text{Length}}{\text{Standard length}} \times 100$ of					
		1st ray	2nd ray	3rd ray	4th ray	5th ray	6th ray
Cat. No. 9797, ABE	100	16	41	43	38	34	30
Cat. No. 8746, ABE	320	10	27	29	27	24	22

In the adult the ventral fin is mostly hyaline; only the dorsal side of the outer 5 fin-rays are brownish and the membranes near these rays are dotted with minute brownish violet dots. The innermost fin-ray is almost colorless. In the young examples of 38.5–165 mm standard length, the ventral fin is brown or black, outer rays, posterior tips of the rays and proximal part being light (figs. 3–6). Occasionally a few light spots appear near the posterior corner of the fin.

The pelvic girdle of *Exocoetidae* offers good taxonomic criteria for higher groups. There is a generalized "Cypselurus-type" as in the case of the pectoral girdle. The pelvic girdle of the so-called *Cypselurus* is composed of a pair of separate pubics (fig. 9), whiche are free from the vertebral column and pectoral girdle. The pubic has a nearly vertical limb, which is compressed and sharply pointed dorsally, and a few basal horns which proximally connected with each other by a semitransparent thin bone,

* Counted from outside.

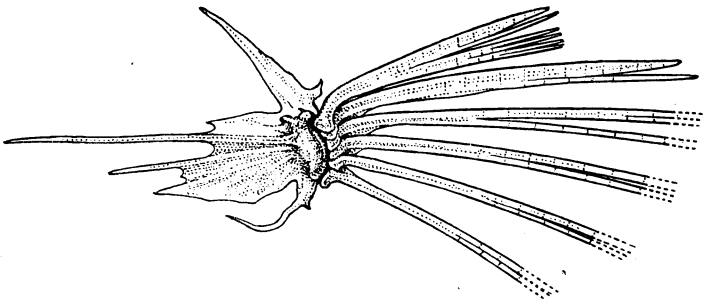

Fig. 9. Left half of pelvic girdle of *Cypselurus pinnatibarbatus japonicus* taken near Hachijo I. in the night of March 7–8, 1953. Seen obliquely from outside. Total length of body 410 mm, standard length 322 mm. Drawn by M. SHIRAO.

forming the "basal plate." The outermost horn of the basal plate is an attenuated rod, directed forwards, and connected by a semitransparent thin bone with the vertical horn of the pubic. The innermost horn of the basal plate of the pubic is curved, directing its tip outwards. The angle formed by the vertical horn and the basal plate is 90° or a little more, and the angle formed by the former and the outermost horn of the latter is 90° or a little less. It might be added here that the pelvic girdle of *Prognichthys agoo* belongs to the "Cypselurus-type". In *Cypselurus pinnatibarbatus japonicus* the number of the horns in the basal plate of the pelvic bone varies between 4 and 5. The outermost and innermost horn of the basal plate invariably retain the peculiar shape. The semitransparent thin bone connecting the vertical horn and the outermost horn of the basal plate is pointed anteriorly, and the postero-ventral corner of the vertical horn is flattened and has a few spines directed backwards and upwards.

The position of the ventral fin of *Cypselurus pinnatibarbatus japonicus* is farther backward than in the majority of the members of the so-called *Cypselurus*. In the adult the hind edge of the pubic is below the 24th vertebra (in 3 specimens), or 25th vertebra (in 5 specimens), or 26th vertebra (in 3 specimens). The preventral length in the adult is 58 % (in 2 specimens) and 60 % (in 2 specimens). The distance between the hind margin of the opercle and the ventral origin is not less than the distance between the latter and the base of the anteriormost ventral rudimentary fin-ray of the caudal as in *Cypselurus opisthopus hiraii*. In a barbelled young of 100 mm standard length, the preventral length is 58.5 % of the standard length, and the distance between the hind margin of the opercle and the ventral origin (38 mm) is slightly less than the distance between the latter and the base of the auteriormost rudimentary fin-ray of the caudal (40 mm).

Caudal fin. The powerfulness and the shape of the caudal fin seem to differ from species to species in certain cases, but as this fin is apt to be damaged by the catching or handling at the market it is not easy to state for certain about the specific difference in the relative length of the upper and lower lobes of the fin. Here the measurement of only an example of the adult is given. The skin and tendons at the base of the fin has been removed, and the root of each fin-ray has been exposed. The length of the longest (namely, the uppermost branched) fin-ray in the upper lobe is 22 % of the

standard length, 328 mm, and the length of the longest (namely, the unbranched fin-ray just below the lowermost branched) fin-ray is 32 % of the standard length. The posterior contour is deeply forked, and the lower lobe exceeds the upper greatly in length and strength.

The number of the fin-rays of the caudal in *Cypselurus pinnatibarbatus japonicus* is vi/6/7/viii (in 1 specimen); vi/6/7/ix (in 1 specimen); vii/6/7/viii (in 2 specimens); vi/6/8/viii (in 1 specimen); vii/6/7/ix (in 5 specimens); viii/6/7/ix (in 1 specimen). The number of the epeurals is mostly 3; only in 1 example it was 2.

The colorationof the caudal fin changes with age; whereas the barbelled young have two large black blotches on the lower lobe of the caudal fin, the caudal fin in the nonbarbelled young of some 160 mm standard length and the adult is uniformly dark, occasionally the central part of the hind margin being a little darker. The blackish vertical band at the caudal base, which appears in some of the young examples, is absent in the adult.

Scales. This flying-fish is externally easily recongnized by the higher number of the predorsal and preventral scales coupled with the backward position of the ventral fin and the large size attained by the adult. The number of the predorsal and preventral scales varies considerably from individual to individual as will be seen from tables 10 and 11. The predorsal scales are counted from the one just above the root of the posterior divergent horns of the supraoccipital backwards to the smaller one covering the base of the 1st dorsal fin-ray. In counting the preventral scales, the scale on, or in front of, the line connecting the ventral origins is regarded as the last preventral scale, and the anteriormost scale on the isthmus is regarded as the starting point of the counting.

Table 10. Frequency distribution of the number of the predorsal scales in *Cypselurus pinnatibarbatus japonicus*

Number of predorsal scales							
40	41	42	43	44	45	46	47
1	1	8	9	9	10	6	4

Table 11. Frequency distribution of the number of the preventral scales in *Cypselurus pinnatibarbatus japonicus*

Number of preventral scales						
29	30	31	32	33	34	35
1	2	4	4	5	6	4

The number of scales in an oblique row above the lateral line and passing the dorsal origin is mostly ½+7 or ½+8, and the number of scales in an oblique row below the lateral line and passing the anal origin is mostly 2+½ or 3+½.

The scales on the top of the head are sometimes modified in texture, bearing conspicuous irregular ridges. The writer has not been able to state for certain whether they are correlated with the maturity or not.

Branchiostegals. The left branchiostegal membrane ventrally broadly covers the right one, and the number of the branchiostegals of the left side tends to be greater than on the right side as will be seen from table 12.

Table 12. Frequency distribution of the number of the branchiostegals in *Cypselurus pinnatibarbatus japonicus*

	Number of branchiostegals						
Left	11	11	11	12	12	12	13
Right	9	10	11	9	10	11	11
	2	4	1	1	5	2	1

Gill-rakers. The gill-rakers on the first arch in the present form is rather less numerous than in the majority of the other Japanese commercial species of flying-fishes. The rakers on the upper limb (epibranchial) increase in length downwards, and those of the lower limb (ceratobranchial and hypobranchial) diminish in length downwards. The rakers below the joint of the upper and lower limbs are rather strong, not slender, and spaced fairly widely apart. The upper-most rakers of the upper limb and the lowermost rakers of the lower limb are sometimes rudimentary. The frequency distribution of the number of the gill-rakers on the first arch is given in table 13. Whereas the number of the branchiostegals on the left side tends to exceed that of the right side, the number of the gill-rakers on the first arch in the present form seems not to differ between the two sides in the same direction.

Table 13. Frequency distribution of the gill-rakers on the first arch in *Cypselurus pinnatibarbatus japonicus*

Left	6+14	7+14	6+15	6+14	6+15	7+15	7+15	7+15	7+15	7+15	7+16	7+16	7+16	7+16
Rtigh	6+15	7+14	6+15	7+15	6+16	6+15	6+16	7+15	7+16	6+17	6+16	6+17	8+16	7+17
	1	1	2	1	1	1	1	2	2	1	1	1	1	1

*Dentition.** In the present form teeth are present only on the jaws. The jaw teeth are long and usually conical; occasionally the tip is slightly expanded and provided

* As for the dentigerous pharyngeal bones, REGAN'S figure (1911) of *Exocoetus lineatus* well agrees with *japonicus*.

with one or two outer extra cups. The teeth are arranged in a narrow band anteriorly, and the latter tapers laterally and posteriorly, finally becoming a single row of the teeth. The number, shape and size of the teeth seem to vary considerably from individual to individual. In a few adult examples the length of the anterior teeth have been measured. The ratio of the length of these teeth to standard length was 0.0013–0.0022. In the barbelled young also the jaw teeth are long and very conspicuous.

Skull. The skull of the flying-fishes sometimes differ in shape from genus to genus, but there underlies a generalized "Flying-fish-type" of skull. *Oxyporhamphus* and *Parexocoetus* are considerably far apart from *Exocoetus, Cypselurus, Hirundichthys* and *Danichthys* in cranial features, the latter four genera having much in common in these features. But among the so-called *Cypselurus* are found considerable variation from species to species in regard to the skull. GREGORY'S account (1933) of the skull of *Exocoetus volitans* LINNAEUS (given a *Halocypselus evolans*), and STARKS' account (1926) of the bones of the ethmoid region of *Parexocoetue brachypterus, Cypselurus bahiensis* and *C. pinnatibarbatus californicus* well apply to the "Flying-fish-type" of skull. The writer wishes here to give some supplementary notes. In the Japanese members of the so-called *Cypselurus*, the bony interorbital space is usually broad, flat or slightly concave, and the lateral margin of the cranium is incised just behind the sphenotic. The posteriorly projecting horns of the supraoccipital are well developed and usually bifid; occasionally there is an extra horn (fig. 10). The spine of the epiotic and that of the exoccipital is either present or absent depending on species. But the development of these spines is by no means symmetrical on both sides (fig. 10). In *japonicus* (fig. 10) the horns and spines just mentioned are all well developed; the roof of the cranium is never concave; the expanded pterotic slopes down from its joint with the frontal.

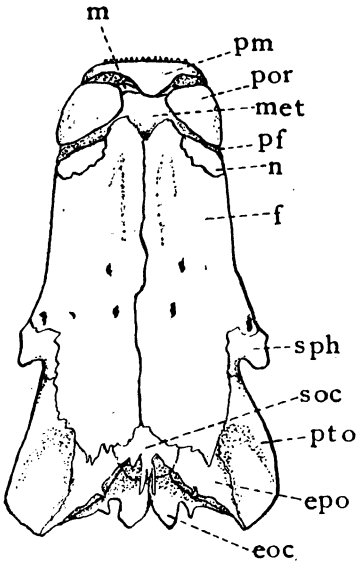

Fig 10. Dorsal view of skull of *Cypselurus pinnatibabatus japonicus* taken near Hachijo. I. in the night of March 7–8, 1953. Total length of body *ca.* 405 mm. **eoc**: exoccipital. **epo**: epiotic. **f**: frontal. **m**: maxillary. **met**: mesethmoid. **n**: nasal. **pf**: prefrontal. **pm**: premaxillary. **por**: preorbital. **pto**: pterotic. **soc**: supraoccipital. **sph**: sphenotic. Drawn by T. ABE.

Barbel, and bands on belly of the young. Probably correlated with the large size attained by the adult, the present form retains the juvenile characters (such as the coloration of the fins and belly, presence of the large fimbricate barbel of the lower jaw, unusually great height of the dorsal fin) till a considerably late stage of development; the young of 132 mm total length have still the barbel, and the young of 200 mm total length have still very high dorsal fin and juvenile color pattern of the pectoral and ventral fins. Prior to preservation the barbel is reddish black, and the bands on the ventral side of the body, about nine in number, are golden and blackish. In earlier stages the barbel is fleshy (figs. 5a, 5b, 6), and later, at the total length of some 127 mm (figs. 4a, 4b, 4c), it becomes much thinner.

Remarks on taxonomic postion:

As FRANZ considered, the present form closely resembles *Cypselurus lineatus* (VALENCIENNES) of the Atlantic. The latter name, as HUBBS and KAMPA (1946) pointed out, is believed to be a synonym of *Cypselurus pinnatibarbatus pinnatibarbatus* (BENNETT). On the other hand, *japoniaus* is very close to *Cypselurus pinnatibarbatus californicus* (COOPER). In the absence of specimens of the close allies of *japonicus* from the Atlantic and the eastern Pacific, only the following might be stated here: *californicus* seems to spawn in August (after HUBBS and KAMPA, 1946, p. 191) while *japonicus* spawns during February-May near Hachijo I., where the surface tempertaure of the sea is then just rising from the minimum; the surface temperature near Hachijo at the beginning of the spawning is about 19°C. The diameter of the eggs seem to differ between the two forms whereas the number and distribution of the filaments of the eggs seem not to differ. The present writer wishes to turn to these points elsewhere.

Additional notes on *Prognichthys agoo*

In 1953 *Prognichthys agoo* was first shipped to the Central Wholesale Market of Tokyo from Nishizaki (Tateyama City, Chiba Pref.) on May 25. The number of the fish was very small, and the size was a little smaller than the adult predominating in number in summer. They were taken by a trap net. The adult of this species were taken in considerable quantity during July 10 ~ middle of September, 1953, near Izu-shichitō. In September, 1953, this species was shipped to Tokyo from the southern parts of Chiba Pref. During the summer of the same year, the writer saw several examples of some 200–250 mm total length which differed considerably in coloration from the adult (*vide* p. 199, explanation of fig. 7). Most striking was the presence of a black spot of the pectoral fin in some specimens. Unfortunately the figure has been reproduced very poorly. In some other specimens the black spots of the pectoral are more than 1 in number.

In 1954, a few adult examples of this species were first seen at the Central Wholesale Market of Tokyo on July 6. They were shipped from Izu-shichitō.

On September 5, 1954, this flying-fish was taken by a trap net off Tamanoura (Gotō Is.; west of Nagasaki), from which two adult examples were collected and sent to the writer by Mr. S. MITO (Kyushu Univ.). The writer wishes here to express his sincere thanks for Mr. MITO's kindness. Whereas this flying-fish is taken commercially along the Pacific coasts of the southern parts of the mainland of Japan, its occurrence near Nagasaki seems not to have been recorded since the original description by TEMMINCK and SCHLEGEL*.

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* Dr. M. BOESEMAN has kindly informed the writer (personal correspondence) that the material used by TEMMINCK and SCHLEGEL was collected at Nagasaki and vicinity.

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Ichthyological Notes

New, Rare or Uncommon Fishes from Japanese Waters. V. Notes on the Rare Fishes of the Suborders *Stromateoidei* and *Tetragonuroidei* (BERG). (*continued from p. 192.*) By Tokiharu ABE

C. Records of Ariomma lurida from Sagami Bay. i) An adult male from Akazawa (north of Shimoda).* On April 12, 1952, an adult male, measuring *ca.* 430 mm in total length, of *Ariomma lurida* JORDAN *et* SNYDER was taken by a trap net off Akazawa, Tajima-mura, Shizuoka Prefecture. It was deposited at the Itō Branch Station of the Shizuoka Prefectural Fisheries Experiment Station, and later sent to the writer for study. This specimen is believed to be the second to be recorded from Japanese waters. The first record was given in 1952 by Prof. M. KATAYAMA. His specimen was collected at the market of Kōchi City on November 30, 1950. It measured *ca.* 183 mm in total length. As JORDAN (1923) and KATAYANA (1952) pointed out, *Ariomma* is a genus belonging to the family *Nomeidae.*

The specimen from off Akazawa measures 387 mm in fork length and 356 mm in standard length. The following measurements are given in hundredths of the standard length: Length of head 27.0, greatest depth of body 26.3, greatest breadth of body 17.7, least depth of caudal peduncle 5.5, diameter of eye** 6.5 (left) and 6.0 (right), interorbital (not bony) breadth (above centers of orbits) 10.3, length of snout 9.4, lentgh of highest (4th) dorsal spine 11.7, length of highest (2nd) soft fin-ray of dorsal 6.7, length of highest (2nd) anal spine 2.7†, length of longest pectoral fin-ray 13.6 (left) and 13.3 (right), length of ventral spine 6.5, length of longest (2nd on the left side; 1st on the right side) ventral soft-ray 10.7.

D. XI. I 15 (posterior soft-rays widely apart; last fin-ray thick); A. II 15; P. 24 on both sides (uppermost 2 rays unbranched; length of uppermost fin-rays increases down to 4th or 5th ray); V. I 5 (all fin-rays branched) on both sides. Ventral fins are received in a shallow groove, and the innermost fin-ray is connected with the belly by an extremely thin, semi-transparent membrane.

Pseudobranchiae well developed. Inner fold of left branchiostegal mambrane seems to cover its parther proximally. Branchiostegals *ca.* 6 on both sides. Gill-rakers 11+18 (left) and 9+1+19 (right). Tongue very wide, concave dorsally, and its anterior margin is nearly straight. It has numerous minute tubercles on the dorsal side. Inner side of opercle and proximal 2/3 of skinny ledge

(*continued on p. 246*)

* A new Japanese name, "Ōme-kon-nyaku-aji", is here proposed.

** The adipose eyelid is well developed, but covering the margin of the orbit only for a short distance. The measurement of the diameter of orbit was taken from the exposed part of the eye.

† The soft anal fin-rays have been damaged. The 3rd fin-ray seems to be the highest (excepting for the last fin-ray which is thick and long), which measures *ca.* 5.1 % of the standard length.