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Revision of the Family Draconettidae

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Abstract The taxonomy of the family Draconettidae is revised and the following seven species are recognized: *Centrodraco acanthopoma*, *C. pseudoxenicus*, *C. oregonus*, *C. insolitus*, *C. ornatus*, *C. otohime* and *Draconetta xenica*. The relationships of the draconettids are discussed based on the external characters and geographic distributions.

The draconettids are small demersal fish inhabiting sandy-muddy bottoms along the edge of continental shelf or on seamounts. They are widely distributed throughout the tropical and temperate waters of the world except the eastern Pacific (Fig. 1). There are only a few species of draconettids and none are common. The study of this family, however, is very important in order to understand the systematic position of the family Callionymidae, because the draconettids are closely related to the callionymids.

Jordan and Fowler (1903) established Draconettidae with only one genus *Draconetta* on the basis of the species *D. xenica* from Japan. Later, Regan (1913) erected the genus *Centrodraco* based on *Draconetta acanthopoma*. For a long time, many authors have included only the genus *Draconetta* in the Draconettidae, overlooking *Centrodraco*. Briggs and Berry (1959) first revised this family, but they recognized *Centrodraco* as a synonym of *Draconetta*. Nakabo and Yamamoto (1980), however, regarded *Centrodraco* as a valid genus. Following them, I include two genera, *Centrodraco* and *Draconetta* in this family.

The present paper mainly deals with taxonomy based on the external characters. A study of the comparative anatomy of this family is now in preparation.

Measurements and counts follow Hubbs and Lagler (1947). The body width and depth are measured at the origin of the first dorsal fin. The spines and soft rays are measured from the posterior bases to the tips. Proportional measurements of the draconettid species are shown in Table 1.

Family Draconettidae

Body round and elongate, without scales. Snout pointed with two nostrils. Eye large. Interorbital space narrow. Upper jaw protractile. Teeth on both upper and lower jaws villiform in broad bands. Both opercle and subopercle with strong retrorse spines; the interspace between them covered by a soft membrane. Lateral line grooved (Fig. 2). Cephalic lateral line canal well developed; supraorbital canal reaching anterior part of interorbital area but not extending to tip of snout; infraorbital canal simple, not extending below eye; postocular commissure reaching the uppermost end of gill-cover, not connected to preoperculomandibular canal.

Dorsal fin separated into two parts. First dorsal fin with three spines. Dorsal rays unbranched except the last; tips of most rays simple. Anal rays unbranched except the last; tips of rays bifurcate. Pectoral fin large and rounded. Pelvic fin with one spine and five rays, and falcate. Caudal fin rounded.

Remarks. Draconettids have been thought to have no lateral line on the body, but grooved lateral lines are present.

Key to the genera of Draconettidae

A_1 Dorsal spines stout (Fig. 2A); second dorsal fin with 14 rays. Anal fin with 13 rays. Retrorse spine of opercle not curved upward. Tips of median caudal rays multifurcate ..... *Centrodraco*.

A_2 Dorsal spines soft (Fig. 2B); second dorsal fin with 12 rays. Anal fin with 12 rays. Retrorse spine of opercle curved upward. Tips of median caudal rays bifurcate ..... *Draconetta*.

Genus *Centrodraco* Regan, 1913

Centrodraco Regan, 1913: 145 (type species by

Table 1. Proportional measurements as the percent of standard length in the draconettid species.

	C. acanthopoma		
	East coast of the United States		
Sex	male	female	?
No. fish	8	5	5
Standard length (mm)	46.5～98.3	59.1～81.1	36.0～78.5
Body width	17.3～20.0 (18.3, 8)	17.3～20.4 (18.5, 5)	16.4～19.5 (17.9, 5)
Body depth	12.3～15.2 (13.6, 8)	12.9～14.1 (13.5, 5)	13.5～14.3 (13.9, 5)
Caudal peduncle depth	5.9～ 6.7 (6.2, 8)	6.1～ 6.9 (6.4, 5)	5.8～ 6.6 (6.2, 5)
Predorsal length	32.7～38.7 (35.6, 8)	35.4～37.1 (36.4, 5)	35.2～38.6 (36.1, 5)
Caudal fin length	18.7～22.6 (20.6, 8)	18.8～22.7 (21.5, 5)	19.6～23.3 (21.7, 5)
Head length	29.8～33.2 (32.2, 8)	31.2～34.4 (32.9, 4)	30.9～33.2 (32.3, 5)
Eye diameter	12.3～15.1 (13.6, 7)	11.5～15.4 (13.8, 5)	14.0～14.6 (14.2, 5)
Snout length	6.7～10.0 (8.2, 7)	7.3～ 8.3 (7.9, 5)	7.5～ 8.5 (7.9, 5)
Upper jaw length	8.8～ 9.6 (9.1, 7)	8.4～10.7 (9.4, 5)	7.5～ 9.2 (8.7, 5)
Interobital width	1.0～ 1.7 (1.4, 8)	1.2～ 1.7 (1.5, 5)	1.0～ 1.4 (1.2, 5)
1st dorsal spine length	4.4～ 5.6 (4.9, 8)	4.4～ 5.0 (4.7, 4)	3.8～ 5.7 (4.9, 5)
2nd dorsal spine length	6.1～ 9.0 (7.9, 8)	7.8～ 8.8 (8.2, 5)	8.2～10.5 (8.9, 5)
3rd dorsal spine length	4.0～ 5.6 (4.7, 8)	2.9～ 7.4 (4.8, 5)	4.0～ 5.3 (4.6, 5)
1st dorsal ray length	9.3～11.4 (10.7, 8)	10.0～12.5 (10.8, 5)	9.0～11.2 (10.3, 5)
Last dorsal ray length	6.0～ 7.4 (6.7, 7)	6.5～ 7.1 (6.8, 5)	6.3～ 8.6 (6.7, 5)
1st anal ray length	5.1～ 6.5 (5.7, 8)	5.1～ 6.3 (5.8, 5)	4.7～ 6.5 (5.6, 5)
Last anal ray length	7.9～ 8.8 (8.2, 8)	9.1～ 9.9 (9.4, 5)	7.8～ 9.0 (8.6, 4)
Pectoral fin length	19.5～24.5 (21.9, 8)	20.1～24.8 (22.9, 5)	21.4～22.3 (21.3, 2)
Pelvic fin length	24.2～31.9 (28.2, 8)	25.8～32.7 (29.2, 5)	27.5～34.2 (30.8, 5)

	C. oregonus			*C. insolitus*		*C. otohime*
	Northeast coast of South America	Saya de Malha Bank				
Sex	female	male	female	male	female	male
No. fish	13	1	1	1	1	8
Standard length (mm)	68.7～91.2	122.9	123.3	71.9	88.0	67.9～110.8
Body width	14.1～17.7 (16.2, 13)	17.0	14.7	16.3	16.0	14.9～17.1 (15.6, 8)
Body depth	11.1～14.5 (13.3, 13)	13.7	12.2	14.0	14.2	12.9～15.4 (14.0, 8)
Caudal peduncle depth	4.5～ 5.1 (4.7, 13)	5.8	4.9	5.3	5.5	5.5～ 6.2 (5.9, 8)
Predorsal length	32.7～37.0 (35.2, 12)	31.1	32.3	33.4	33.0	29.6～33.6 (31.8, 8)
Caudal fin length	17.6～22.3 (20.5, 13)	22.3	18.9	21.7	20.6	20.5～23.3 (21.9, 8)
Head length	30.7～34.0 (32.8, 13)	29.2	30.0	30.5	31.3	29.1～32.0 (30.5, 8)
Eye diameter	10.7～13.6 (12.7, 13)	8.9	10.7	11.8	12.7	9.5～11.9 (10.6, 8)
Snout length	7.4～ 8.7 (8.3, 12)	8.5	8.1	7.1	7.6	7.6～ 9.7 (8.7, 8)
Upper jaw length	8.3～10.2 (9.7, 13)	8.6	8.5	8.3	8.3	7.6～ 8.7 (8.3, 8)
Interorbital width	1.1～ 1.6 (1.3, 13)	1.3	1.3	1.3	1.5	0.9～ 2.1 (1.4, 8)
1st dorsal spine length	5.9～ 9.6 (7.9, 12)	12.6	8.1	—	9.2	13.7～18.0 (16.5, 7)
2nd dorsal spine length	8.2～ 9.9 (9.0, 12)	7.6	7.5	8.9	7.6	6.5～ 8.7 (8.1, 8)
3rd dorsal spine length	5.1～ 7.0 (5.8, 11)	4.6	4.6	4.2	4.5	4.3～ 5.9 (4.9, 8)
1st dorsal ray length	12.0～15.9 (13.3, 13)	37.3	11.9	27.8	—	15.3～31.4 (21.8, 6)
Last dorsal ray length	6.3～ 8.7 (7.4, 13)	10.2	6.6	7.8	5.8	8.7～11.4 (10.3, 8)
1st anal ray length	4.4～ 6.6 (5.6, 13)	6.8	5.7	5.7	5.2	5.8～ 7.1 (6.4, 8)
Last anal ray length	9.9～12.0 (11.0, 13)	12.8	12.1	10.0	8.0	11.7～13.3 (12.6, 8)
Pectoral fin length	22.9～25.4 (23.7, 13)	22.2	19.3	19.6	22.3	21.1～24.3 (22.6, 7)
Pelvic fin length	28.2～33.3 (30.6, 12)	—	23.5	27.8	26.7	28.2～33.9 (30.6, 8)

Data show ranges; the means and sample sizes are in parentheses.

C. acanthopoma	*C. pseudoxenicus*		*C. oregonus*	
Kyushu-Palau Ridge			Northeast coast of South America	
male	male	female	male	Sex
1	5	3	17	No. fish
92.5	73.0~77.3	67.0~95.3	79.5~110.7	Standard length (mm)
17.9	14.9~17.2 (16.3, 5)	16.6~17.6 (17.0, 3)	14.8~19.0 (16.5, 17)	Body width
13.4	12.4~14.7 (13.9, 5)	13.2~14.6 (13.8, 3)	12.1~14.0 (13.3, 17)	Body depth
5.4	5.3~ 5.6 (5.4, 5)	4.8~ 5.5 (5.3, 3)	4.6~ 5.4 (5.0, 17)	Caudal peduncle depth
34.6	31.6~32.9 (32.4, 5)	30.0~34.6 (32.3, 3)	31.9~34.5 (32.9, 17)	Predorsal length
19.5	20.1~21.3 (20.6, 5)	18.5~20.1 (19.3, 3)	19.5~22.9 (21.0, 17)	Caudal fin length
31.0	27.4~32.9 (30.0, 5)	26.0~30.6 (28.6, 3)	30.8~33.5 (31.7, 17)	Head length
12.2	11.2~12.9 (12.2, 5)	11.3~13.5 (12.3, 3)	9.6~12.8 (11.3, 17)	Eye diameter
9.2	7.4~ 8.7 (8.1, 5)	7.2~ 8.4 (7.8, 3)	7.9~10.4 (8.9, 17)	Snout length
8.5	7.6~ 8.3 (7.9, 5)	7.5~ 8.6 (8.0, 3)	8.7~10.3 (9.8, 17)	Upper jaw length
1.4	0.9~ 1.4 (1.2, 5)	0.5~ 1.5 (0.9, 3)	0.9~ 1.9 (1.5, 17)	Interorbital width
5.6	11.3~14.9 (12.6, 3)	11.2 (11.2, 1)	12.4~17.3 (15.0, 17)	1st dorsal spine length
8.8	8.2~ 9.2 (8.7, 5)	6.9~ 8.5 (7.8, 3)	6.7~ 9.9 (8.8, 17)	2nd dorsal spine length
6.8	4.8~ 5.9 (5.2, 5)	3.9~ 4.9 (4.5, 3)	4.7~ 6.4 (5.5, 17)	3rd dorsal spine length
10.3	21.7~28.0 (25.8, 5)	12.4~14.0 (13.1, 3)	23.1~44.9 (32.0, 14)	1st dorsal ray length
6.6	7.6~ 9.6 (8.0, 5)	6.3~ 7.2 (6.7, 3)	8.1~10.2 (9.5, 16)	Last dorsal ray length
5.2	5.2~ 5.9 (5.5, 5)	4.8~ 6.2 (5.7, 3)	4.3~ 7.0 (6.0, 16)	1st anal ray length
9.5	8.3~ 9.3 (8.9, 5)	7.4~ 8.3 (7.8, 3)	10.1~13.8 (12.2, 16)	Last anal ray length
22.1	21.3~24.2 (22.6, 5)	20.9~22.5 (21.8, 3)	22.0~25.7 (23.6, 17)	Pectoral fin length
25.9	23.8~27.3 (25.1, 5)	22.9~25.6 (24.4, 3)	28.0~38.1 (34.1, 17)	Pelvic fin length

C. otohime	*D. xenica*		
female	male	female & young	Sex
2	14	2	No. fish
80.2~92.5	60.0~91.9	43.8~68.5	Standard length (mm)
14.9~17.1 (16.0, 2)	13.4~19.1 (16.9, 14)	17.8~18.2 (18.0, 2)	Body width
14.5~15.0 (14.8, 2)	11.8~14.5 (12.8, 14)	13.9~14.3 (14.1, 2)	Body depth
5.4~ 5.9 (5.7, 2)	4.3~ 5.2 (4.9, 14)	4.6~ 5.1 (4.9, 2)	Caudal peduncle depth
33.9~34.2 (34.1, 2)	27.7~34.3 (30.9, 14)	33.0~34.0 (33.5, 2)	Predorsal length
20.3~21.1 (20.7, 2)	21.3~25.6 (23.1, 14)	21.8 (21.8, 1)	Caudal fin length
30.7~31.2 (31.0, 2)	28.0~33.3 (31.1, 14)	30.8~32.3 (31.6, 2)	Head length
10.6~12.7 (11.7, 2)	9.8~12.5 (10.9, 14)	11.6~12.1 (11.9, 2)	Eye diameter
8.0~ 8.1 (8.1, 2)	7.0~ 8.8 (7.7, 14)	8.5~ 8.9 (8.7, 2)	Snout length
8.3~ 8.9 (8.6, 2)	9.8~11.8 (10.6, 14)	9.8~10.9 (10.4, 2)	Upper jaw length
0.7~ 0.9 (0.8, 2)	0.7~ 1.7 (1.1, 14)	0.9~ 1.4 (1.2, 2)	Interorbital width
10.1~10.2 (10.2, 2)	18.8~28.5 (23.9, 14)	15.3~16.0 (15.7, 2)	1st dorsal spine length
7.5 (7.5, 2)	14.9~20.6 (17.2, 14)	14.0~15.3 (14.7, 2)	2nd dorsal spine length
4.1~ 4.4 (4.3, 2)	12.6~16.8 (15.0, 14)	11.4~12.1 (11.8, 2)	3rd dorsal spine length
11.5~11.9 (11.7, 2)	14.6~19.3 (16.7, 13)	10.0~14.6 (12.3, 2)	1st dorsal ray length
8.0~ 8.7 (8.4, 2)	13.7~19.1 (15.7, 14)	8.0~10.7 (9.4, 2)	Last dorsal ray length
5.2~ 5.9 (5.6, 2)	7.4~ 9.8 (8.6, 13)	7.9 (7.9, 1)	1st anal ray length
12.2~13.1 (12.7, 2)	11.3~14.2 (13.1, 11)	—	Last anal ray length
22.9~23.4 (23.2, 2)	21.1~26.6 (24.6, 14)	24.5 (24.5, 1)	Pectoral fin length
29.9 (29.9, 2)	24.7~29.4 (27.5, 13)	24.0~26.1 (25.1, 2)	Pelvic fin length

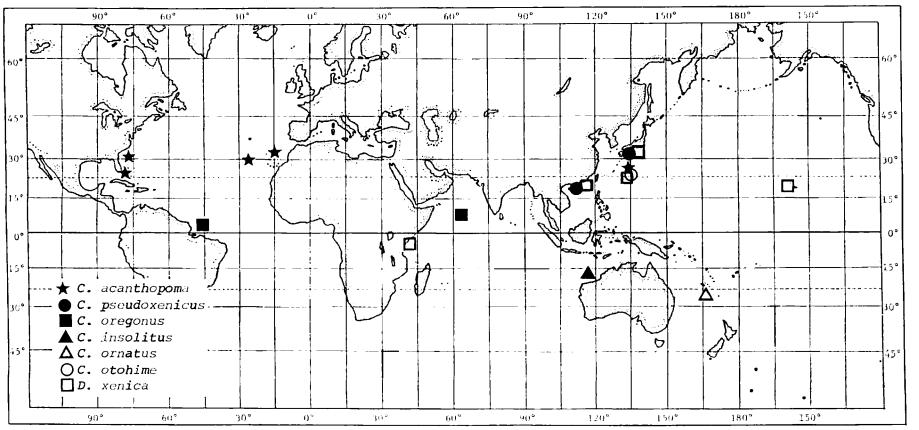

Fig. 1. Distribution in the draconettid species.

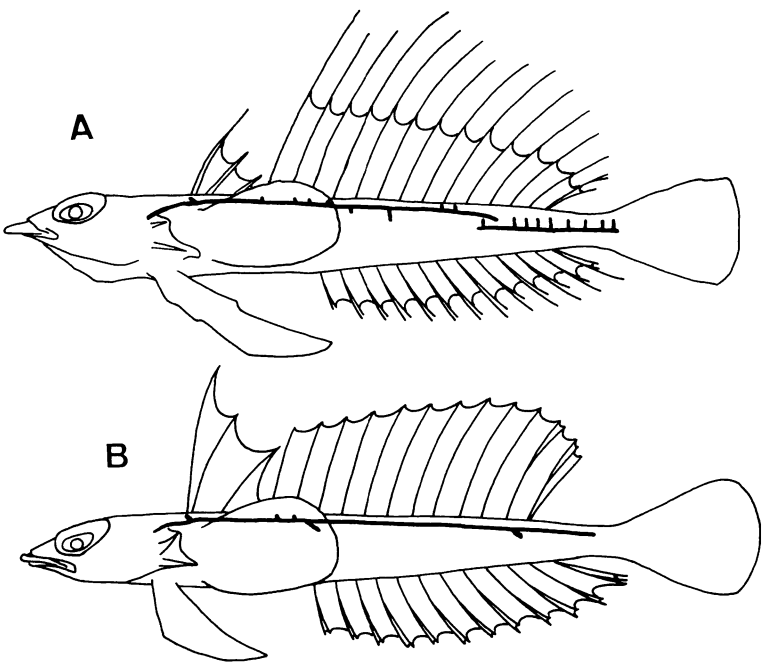

Fig. 2. Lateral line on the body, expressed as thick solid lines, in two draconettid species. A: *Centrodraco oregonus*. B: *Draconetta xenica*.

original designation, *Draconetta acanthopoma* Regan).

Description. Retrorse spine of opercle not curved upward. Lateral line grooved, interrupted and with some short branches; anterior part running along dorsal side of body, posterior part along mid-lateral axis of body (Fig. 2A). Supratemporal canal absent; supraorbital canal connected to infraorbital canal and postocular commissure; lines of sensory pores on each side of snout, cheek, ventral part of head, occipital region and preopercular region (Fig. 3A).

First dorsal fin beginning above end of gill-cover; dorsal spines short and stout. Tips of median caudal rays multifurcate.

Remarks. The specific names, *pseudoxenica*, *oregona*, *insolitum* and *ornata* are changed respectively to *pseudoxenicus*, *oregonus*, *insolitus*

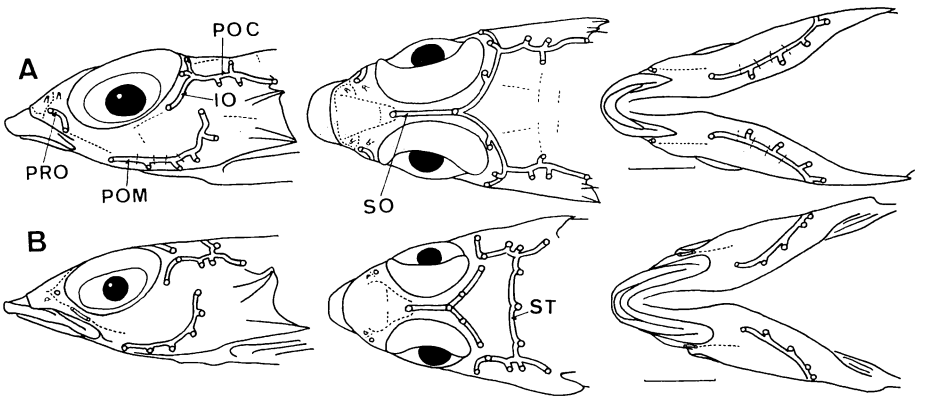

Fig. 3. Cephalic lateral line system in two draconettid species. A: *Centrodraco acanthopoma*. B: *Draconetta xenica*. IO, infraorbital canal; POC, postocular commissure; POM, preoperculo-mandibular canal; PRO, preorbital canal; SO, supraorbital canal; ST, supratemporal canal. Left, lateral view; middle, dorsal view; right, ventral view. Scales indicate 5 mm.

and *ornatus* because *Centrodraco* is masculine (*acanthopoma* (*poma*=noun) is not changed).

Key to the species of *Centrodraco*

A_1 Second dorsal spine the longest. A large darker mark on opercular region; body with four transverse broad dark bands .... *C. acanthopoma.*

A_2 First dorsal spine the longest, and elongate in males.

B_1 Pectoral fin with 22~26 rays.

C_1 Body with many small dark spots .... *C. pseudoxenicus.*

C_2 Head with vermicular dark marks; upper side of body with 2 or 3 longitudinal elongate dark marks .... *C. oregonus.*

C_3 Some small dark spots on occipital region, on body behind pectoral fin and on side of caudal peduncle .... *C. insolitus.*

C_4 Many longitudinal vermicular marks, margined with dark brown, on upper part of body ..... *C. otohime.*

B_2 Pectoral fin with 17 rays..... *C. ornatus.*

Centrodraco acanthopoma (Regan)
(Fig. 4)

Draconetta acanthopoma Regan, 1904: 130 (type locality: the north Atlantic); Jordan et al., 1930: 450 (the North Atlantic in deep water); Briggs and Berry, 1959: 127, figs. 4~6 (off the east coast of the United States); Davis, 1966: 841, fig. 2c (off the east coast of the United States); Maul, 1976: 52, fig. 29 (Great Meteor Seamounts, the northeast Atlantic).

Centrodraco acanthopoma, Regan, 1913: 145 (reference).

Materials examined. USNM (United States National Museum) 156956, 7 males and 4 females, 46.5~98.3 mm in standard length, Combat Sta. 436, 24°13′N, 81°42′W, 300 fathoms, July 21, 1957. USNM 45752, 2 specimens, 42.1~78.5 mm, Albatross Sta. 2666, 30°47′30″N, 79°49′W, 270 fathoms, May 5, 1886. USNM 134187, 1 specimen, 36.0 mm, Albatross Sta. 2672, 31°31′N, 79°05′W, May 5, 1886. USNM 46015, 1 specimen, 72.0 mm, Albatross Sta. 2667, 30°53′N, 79°42′30″W, 273 fathoms, May 5, 1886. USNM 156957, 1 female, 81.1 mm, Combat Sta. 310, 30°40′N, 79°57′W, 210 fathoms, Apr. 24, 1957. USNM 156958, 1 male, 80.5 mm, Combat Sta. 439, 25°03′N, 80°01′W, 225 fathoms, July 22, 1957. ANSP (The Academy of Natural Sciences of Philadelphia) 83825, 1 female, 69 mm, Combat Sta. 436. BSKU (Department of Biology, Faculty of Sciences, Kochi University) 29331, a male, 92.5 mm, 28°04′42″N, 134°39′56″E, the Kyushu-Palau Ridge, 550~600 m, Dec. 19, 1979.

Description. D. III, 14; A. 13; P_1. 24~26; P_2. I, 5; C. ii+8+ii (rarely iii+8+iii).

Second dorsal spine the longest. No elongate

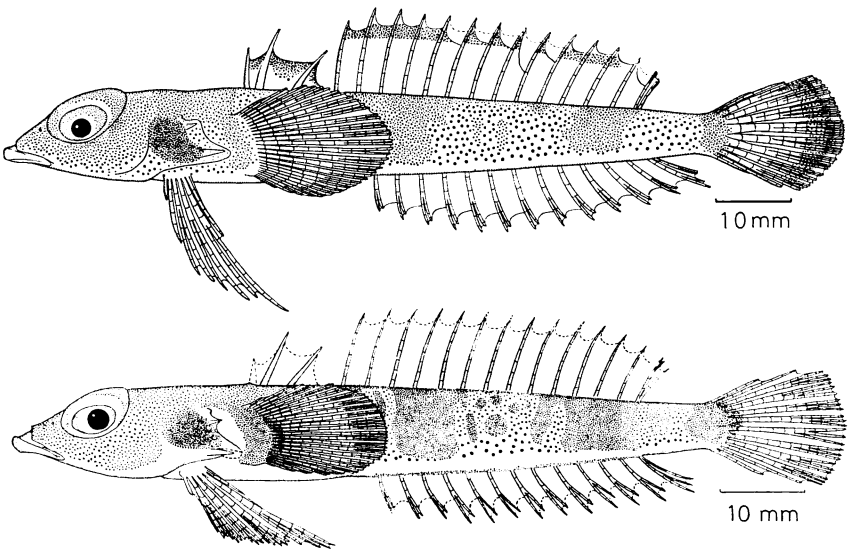

Fig. 4. *Centrodraco acanthopoma* (Regan). Upper, lateral view of a male, 92.5 mm in standard length (SL), BSKU 29331 (from the Kyushu-Palau Ridge); lower, a female, 81.1 mm, USNM 156957 (from the western Atlantic).

nor filamentous dorsal rays in either sex. Sexual dimorphism almost absent. Anterior part of grooved lateral line on body reaching 6th～7th dorsal rays.

Color in 70% ethyl alcohol. Body with four transverse broad dark bands. A large darker mark on opercular region. First and second dorsal fins with dark margin.

Color in life (of the male specimen from the Kyushu-Palau Ridge). Body light brown with four dark brown transverse bands above, white below. A large darker brown mark on cheek. Distal margins of first and second dorsal fins dark brown. Pectoral fin reddish. Pelvic fin white with pinkish mark. Anal fin white with one pinkish longitudinal line. Caudal fin white with dark brown margin.

Geographic variation. Tips of median pelvic rays multifurcate in specimens from the east coast of the United States, but bifurcate in the specimen from the Kyushu-Palau Ridge.

Distribution. Off the east coast of the United States (at 378～540 m); Great Meteor Seamounts (at 170～505 m); Kyushu-Palau Ridge (at 550～600 m).

Remarks. This species was formarly recorded only from the Atlantic Ocean, but one specimen was recently collected from the Kyushu-Palau Ridge, extending its range to the Pacific.

Centrodraco pseudoxenicus (Kamohara) (Fig. 5)

Draconetta pseudoxenica Kamohara, 1952: 88, fig. 86 (type locality: Mimase, Kochi Pref., Japan); Matsubara, 1955: 710 (key); Briggs and Berry, 1959: 126 (reference).

Draconetta margarostigma Cheng et Tain, 1980: 175, fig. 1 (type locality: off the eastern coast of Hainan Is., South China Sea).

Materials examined. BSKU 333 (holotype), a male, 75.1 mm in standard length, Mimase, Kochi Pref., Feb. 5, 1951. BSKU 1891, 1892, a male and a female, 73.3～95.3 mm, Mimase, Mar. 1952. BSKU 4435, a female, 81.3 mm, Mimase, Dec. 30, 1954. BSKU 12528, a male, 73.6 mm, Mimase, Jan. 28, 1967. FAKU (Department of Fisheries, Faculty of Agriculture, Kyoto University) 49469, 49470, a male and a female, 67.0～73.0 mm, off Kochi Pref., July 8, 1976. FAKU 49706, a male, 77.3 mm, data unknown.

Description. D. III, 14; A. 13; P_1. 24～27; P_2. I, 5; C. ii+8+ii.

First dorsal spine the longest, more elongate in males. Dorsal rays elongate and filamentous in males. Anterior part of grooved lateral line

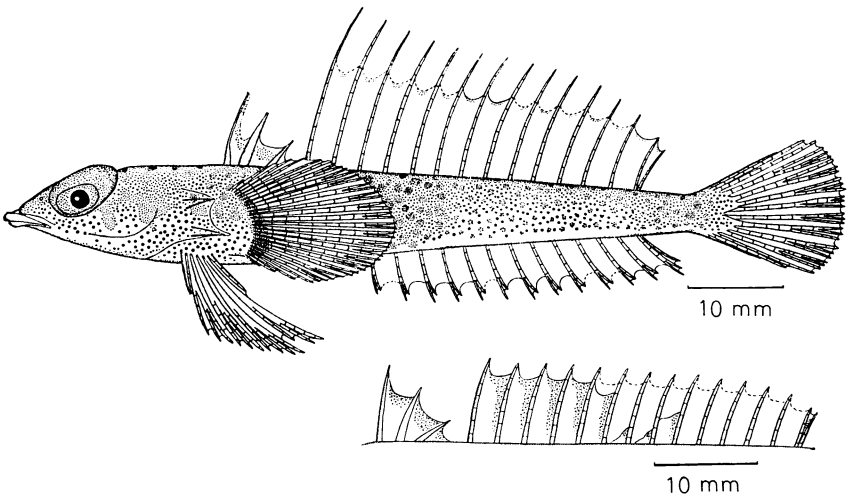

Fig. 5. *Centrodraco pseudoxenicus* (Kamohara). Upper, lateral view of a male, 73.0 mm in SL, FAKU 49469; lower, first and second dorsal fins of a female, 67.0 mm, FAKU 49470.

on body reaching 10th～11th dorsal rays.

Color in 10% formalin. Body with many small dark spots; darker spots concentrate near first dorsal fin, behind pectoral fin and on caudal peduncle. First dorsal fin with a dark oblique band near distal margin. Distal margin of second dorsal fin faintly dark in males; distal margin and posterior part of each membrane dark in females.

Distribution. Off Kochi Prefecture; off the eastern coast of Hainan Island, South China Sea (at 210 m).

Remarks. Since Kamohara (1952) described it with 16 pectoral rays, the systematic position of this species has been misunderstood. I found that the holotype (BSKU 333) has 25 pectoral rays; Kamohara's description of the number of pectoral rays is mistaken. In the figure of the original description, the elongated first dorsal spine was not drawn due to the brittleness of the spine.

Draconetta margarostigma Cheng et Tain is a synonym of this species based on the resemblance in color pattern between these two species.

Centrodraco oregonus (Briggs et Berry)
(Fig. 6)

Draconetta oregona Briggs et Berry, 1959: 129, figs. 5～7 (type locality: off the northeast coast of South America); Davis, 1966: 841, fig. 2a, b (off the northeast coast of South America).

Materials examined. USNM 159776 (holotype), a male, 110.7 mm in standard length, Oregon Sta. 2080, 2°04′N, 47°00′W, 125 fathoms, Nov. 17, 1957. USNM 158875 (paratypes), 16 males and 12 females, 69.9～106.6 mm, Oregon Sta. 2082, 1°51′N, 46°50′W, 200 fathoms, Nov. 17, 1957. ANSP 83826 (paratype), a female, 96.7 mm, collected with the holotype. FAKU 49959, 49960, a male and a female, 122.9～123.3 mm, 12°02′S, 61°50′E～12°02′S, 61°41′E, 264～284 m, the Saya de Malha Bank, Oct. 27, 1977.

Description. D. III, 14; A. 13; P_1. 24～26; P_2. I, 5; C. ii+8+ii.

First dorsal spine the longest, more elongate in males. Dorsal rays elongate and filamentous in males. Anterior part of grooved lateral line of body reaching 10th～11th dorsal rays.

Color in 70% ethyl alcohol and 10% formalin. Two or three rows of elongated longitudinal dark marks on upper side of body. Some vermicular dark marks on occipital region and on opercular region. An oblong dark mark on base of pectoral fin. Two small dark marks on base of caudal fin. First dorsal fin with some faint dark spots in males; with dark distal margin in females. Second dorsal fin with dark distal margin in each sex.

Color in life (of the specimens from the Saya de Malha Bank). Body reddish with four deeper reddish broad transverse bands. Upper

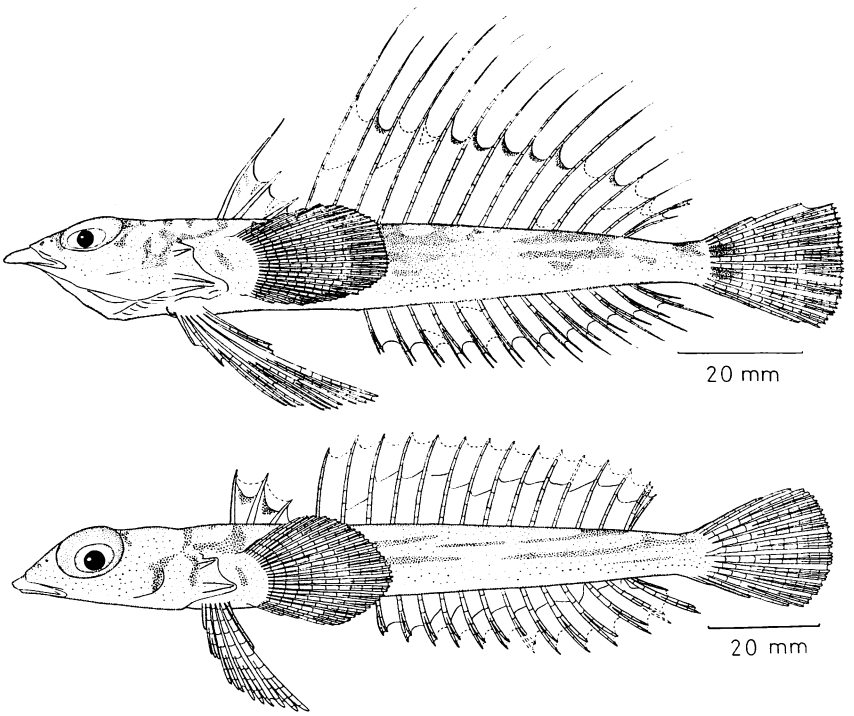

Fig. 6. *Centrodraco oregonus* (Briggs et Berry). Top: lateral view of a male, 110.7 mm in SL, USNM 159776 (holotype); bottom: lateral view of a female, 121.6 mm, FAKU 49960 (from the Saya de Malha Bank).

side of body with two rows of elongated longitudinal pinkish lines on deeper reddish broad transverse bands and reddish yellow between them in the male; with two rows of elongated longitudinal olive-brown lines in the female. Occipital and opercular regions with some vermicular pinkish marks and reddish-yellow between them in the male; with some vermicular olive brown marks in the female. First dorsal fin white with reddish yellow distal margin in the male; white with reddish-brown distal margin in the female. Second dorsal fin white with dark brown distal margin in the male; white with reddish-brown distal margin in the female. Pectoral fin pinkish. Caudal fin yellow with transparent distal margin.

Geographic variation. The specimens from the northeast coast of South America have longer pelvic fins than those from the Saya de Malha Bank.

Distribution. Off the northeast coast of South America (at 225～405 m); the Saya de Malha Bank (at 264～284 m).

Remarks. The male and female specimens of this species from the Saya de Malha Bank are new to the western Indian Ocean.

Davis (1966) figured that the supraorbital canal extended near the snout in this species, but I was unable to confirm this in the specimens examined. The supraorbital canal of the specimens examimed extends only to the anterior part of the interorbital area.

Centrodraco insolitus (McKay)
(Fig. 7)

Liopsalon insolitum McKay, 1971: 45, fig. 5 (type locality: 17°17′S, 119°57′E, at 350 m).

Materials examined. WAM (Western Australian Museum)-P, 19165, 19166 (paratypes), a male and a female, 71.9～88.0 mm in standard length, 17°17′S, 119°57′E, at 350 m, Dec. 20, 1969.

Description. D. III, 14; A. 13; P_1. 26; P_2. I, 5; C. ii+8+ii or ii+8+iii.

First dorsal spine the longest, more elongate in the male. Dorsal rays elongate and fila-

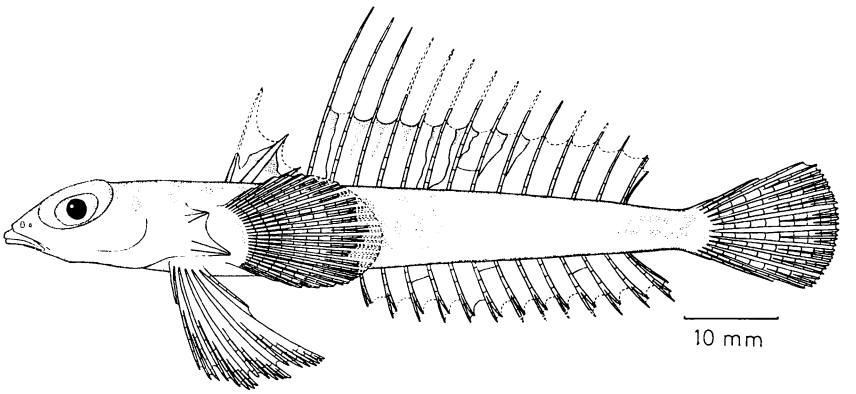

Fig. 7. *Centrodraco insolitus* (McKay). Lateral view of a male, 71.9 mm in SL, WAM-P 19166 (paratype).

mentous in the male. Anterior part of grooved lateral line of body reaching 10th dorsal ray.

Color in 70% ethyl alcohol. Some small dark spots on occipital region, on body behind pectoral fin and on side of caudal peduncle. First dorsal fin with an oblique dark line in the male. Each membrane of second dorsal fin edged with dark in the male.

Distribution. Off the northwest coast of Australia (at 350 m).

Remarks. McKay (1971) described this species as a member of the family Percophididae, but apparently this species belongs to *Centrodraco* of the family Draconettidae.

Centrodraco otohime Nakabo et Yamamoto (Fig. 8)

Centrodraco otohime Nakabo et Yamamoto, 1980: 325, figs. 1, 2 (type locality: the Kyushu-Palau Ridge).

Materials examined. HUMZ (Laboratory of Marine Zoology, Faculty of Fisheries, Hokkaido University) 75058 (holotype), a male, 110.8 mm in standard length, 26°46.0′N, 135°20.0′E～26°44.0′N, 135°24.3′E, at 342 m, Feb. 13, 1978. HUMZ 79194～79198 (paratypes except for HUMZ 79195), 3 males and 2 females, 67.9～124.6 mm, 26°46.9′N, 135°20.0′E～26°46.2′N, 135°22.3′E, at 360 m, Nov. 17, 1978. HUMZ 80237 (paratype), a male, 105.5 mm, 26°05.1′N, 135°49.4′E～26°10.8′N, 135°45.7′E, at 360 m, Nov. 20, 1978. HUMZ 80295 (paratype), a male, 103.6 mm, 26°46.0′N, 135°21.6′E～26°45.0′N, 135°20.9′E, at 330～350 m, Nov. 18, 1978. BSKU 29300, a male, 95.3 mm, 26°46′01″N, 135°21′26″E, at 320～395 m, Dec. 18, 1979. BSKU 29360, a male, 100.7 mm, 26°05′00″N, 135°50′09″E, at 358～375 m, Dec. 16, 1979.

Description. D. III, 14; A. 13; P_1. 22～24; P_2. I, 5; C. ii+8+ii.

First dorsal spine the longest, more elongate in males. Dorsal rays elongate and filamentous in males. Anterior part of grooved lateral line of body reaching 8th～10th dorsal rays.

Color in life (from the holotype). Body rose-pink above, creamy-white below; three transverse broad wine-red bands on upper side of body. Approximately three rows of longitudinal vermicular yellow marks, margined with dark brown, on upper side of body. An oblique yellow mark on pectoral base. First dorsal fin pinkish anteriorly, with a yellow band distally. Second dorsal fin membrane with dark margin distally and with an elongated yellow spot ventroposteriorly. Anal fin white with a pinkish longitudinal line. Pectoral fin rose-pink. Pelvic fin white; only last ray slightly pinkish. Caudal fin yellow with transparent margin.

Remarks. The description of the coloration of the body in the original description of this species (Nakabo and Yamamoto, 1980) was insufficient, so it is redescribed in the present paper.

Centrodraco ornatus (Fourmanoir et Rivaton) (Fig. 9)

Draconetta ornata Fourmanoir et Rivaton, 1979: 418, fig. 10 (type locality: the south of the Pins Is., at 300 m).

Description (from Fourmanoir and Rivaton,

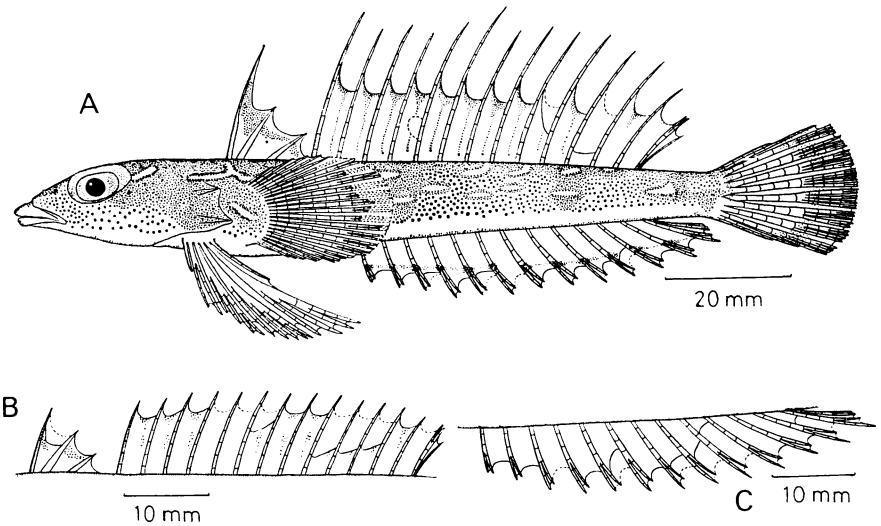

Fig. 8. *Centrodraco otohime* Nakabo et Yamamoto. A: lateral view of a male, 110.8 mm in SL, HUMZ 75058 (holotype). B: 1st and 2nd dorsal fins of a female, 80.2 mm, HUMZ 79198 (paratype); anal fin of a female, 92.5 mm, HUMZ 79197 (paratype). (From Nakabo and Yamamoto, 1980).

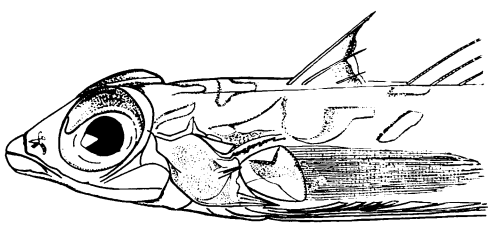

Fig. 9. *Centrodraco ornatus* (Fourmanoir et Rivaton). (From Fourmanoir and Rivaton, 1979).

1979). D. III, 15; A. 13; P_1. 17.

First dorsal spine the longest.

Color in life. Dorsally, body rose-lilac with irregular short yellowish-green bands. Lateral side of body with transverse brown-red bands under yellow bands located dorsally. Margin of eye yellowish-green.

Remarks. The number of the pectoral fin rays of this species is very peculiar in *Centrodraco*. This species is known only from the holotype, and it is possible that abnormalities in characters are present. More specimens of this species are needed.

Genus *Draconetta* Jordan et Fowler, 1903

Draconetta Jordan et Fowler, 1903: 939 (type species by original designation, *Draconetta xenica* Jordan et Fowler).

Description. Retrorse spine of opercle curved upward. Lateral line grooved, running along dorsal side of body and reaching near caudal peduncle (Fig. 2B). Supratemporal canal present; supraorbital canal not connected to infraorbital canal and postocular commissure; lines of sensory pores on each side of snout and cheek (Fig. 3B).

First dorsal fin broad, beginning above end of gill-cover; larger in males. Dorsal spines soft. Second dorsal fin larger in males. Tips of median caudal rays bifurcate.

Draconetta xenica Jordan et Fowler (Fig. 10)

Draconetta xenica Jordan et Fowler, 1903: 939, fig. 1 (type locality: Suruga Bay, Japan); Kuroda, 1951: 385 (Sagami Bay; Suruga Bay; Kii, all in Japan); Kamohara, 1952: 88 (Mimase, Kochi Pref., Japan); Matsubara, 1955: 710, fig. 260 (Kumano-nada, Japan); Briggs and Berry, 1959: 127 (reference); Cheng and Tain, 1980: 176 (off the east of Hainan Island, South China Sea).

Draconetta hawaiiensis Gilbert, 1905: 652, pl. 91 (type locality: channel between Molokai and Maui).

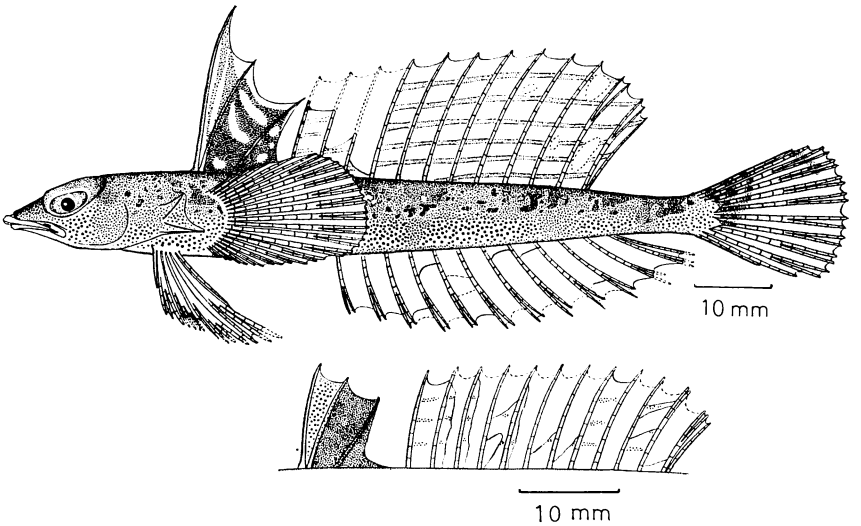

Fig. 10. *Draconetta xenica* Jordan et Fowler. Upper, lateral view of a male, 86.9 mm in SL, FAKU 49468; lower, first and second dorsal fins of a female, 68.5 mm, FAKU 1999.

Draconetta africana Smith, 1963: 548, fig. 1 (type locality: the coast of south Kenya).

Materials examined. FAKU 1997, 1999, 2000, 2002, 2008, 2009, 2011, 2037, 7 males and a female, 60.0～83.6 mm in standard length, Owase, Mie Pref., Japan, Apr. 13, 1936. FAKU 4366, a male, 75.6 mm, Kumano-nada, Japan, Nov., 1936. FAKU 49467, 49468, 2 males, 86.9～91.9 mm, off Kochi Pref., July 8, 1976. FAKU 49705, 50480, 2 males, 80.7～82.3 mm, data unknown. HUMZ 36485, a male, 85.4 mm, Mimase, Kochi, data unknown. BSKU 29385, a male, 69.6 mm, 26°46′01″N, 135° 23′06″E, at 330～350 m, Kyushu-Palau Ridge, Dec. 18, 1979. USNM 51633 (holotype of *D. hawaiiensis*), a young specimen, 43.8 mm, channel between Molokai and Maui, at 122～132 fathoms.

Description. D. III, 12; A. 12; P_1. 20～23; P_2. I, 5; C. ii+8+ii.

First and second dorsal fins larger in males than in females. Grooved lateral line reaching near caudal peduncle.

Color in 10% formalin. Body dark brown with many small darker spots above; white below. First dorsal fin blackish-brown with several white oblong marks and white distal margin in males; blackish-brown with white first membrane in a female. Second dorsal fin with many longitudinal dark lines. Pectoral, pelvic and anal fins transparent.

Remarks. *Draconetta africana* Smith is a synonym of this species, because it has bifurcate anal rays (P. C. Heemstra's personal communication) and the same coloration of the body as *D. xenica*.

Based on the result of my examination of the holotype (USNM 51633), I agree with Briggs and Berry (1959) who stated that *Draconetta hawaiiensis* Gilbert is a synonym of *D. xenica*.

Relationships

Jordan and Fowler (1903) established Draconettidae and put it near Callionymidae because of the resemblance of external characters between them. Recently, Davis (1966) and Maul (1976) included *Draconetta* in the Callionymidae. But, Draconettidae should be valid and separated from Callionymidae. These two families are closely related in having no scales, the preorbital canal and in their general physiognomy, but the differences in such characters as body-shape, nostrils, preopercular spine, gill-cover, pelvic fin and lateral line, are at the familial level. The draconettids are more specialized than the callionymids in lacking the anterior branches of the supraorbital canal and in having a degenerate lateral line. However, the draconettids are more primitive than the callionymids in having a rounded body, two

nostrils, falcate pelvic fins, normal gill-cover and no strong preopercular spine.

Draconetta is closer to the callionymids than *Centrodraco* in having soft dorsal spines and bifurcate caudal rays. *Centrodraco* is more specialized than *Draconetta* and the callionymids in lacking the supratemporal canal.

The coloration of the body and geographic distribution suggest that *C. acanthopoma* is the most primitive among the species of *Centrodraco*. *C. otohime* and *C. ornatus* have faint dark transverse bands under many yellow marks on the side of the body. *C. oregonus, C. insolitus* and *C. pseudoxenicus* have many smaller dark marks or spots on the areas where dark transverse bands occur in *C. acanthopoma*. Therefore, the coloration of the body in the above five species have possibly been derived from that of *C. acanthopoma*, in which only dark transverse bands appear on the body. *C. acanthopoma* is distributed widely from the Atlantic to the Pacific, but the other species are less widely known. Therefore, in geographic distribution *C. acanthopoma* is the most primitive. Morphologically, *C. acanthopoma* is different from the other five species in having a very short first dorsal spine and no elongate dorsal rays in males (but, in *C. ornatus*, the male's character remains unknown).

Remarks for the geographic distributions

The distributions of *C. acanthopoma* and *C. oregonus* cross the Mid-Atlantic Barrier and the Old World Land Barrier (the continental mass of Eurasia and Africa) which Briggs (1974) described. Since the draconettids inhabit deep seas, they do not seem to migrate broadly. Perhaps, *C. acanthopoma* and *C. oregonus* evolved before the establishment of the above two barriers. North America separated from Europe in the Eocene, 49 million years ago (Pielou, 1979), and the Mid-Atlantic Barrier has been present since that time. Europe and Africa rejoined in the late Miocene, 17 million years ago (Pielou, 1979), and the Old World Land Barrier has been in effect since then. Therefore, these two species seem to have remained unchanged for at least 49 million years.

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イナカヌメリ科魚類の分類学的再検討

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現在までに世界から報告されている本科魚類の属と種について，鰭・側線系・斑紋等の外部形質を用い，分類学的再検討を行った．

本科魚類には *Centrodraco*（ハナガサヌメリ属）と，*Draconetta*（イナカヌメリ属）が含まれる．*Centrodraco* は背鰭3棘14軟条，臀鰭13軟条を有し，背鰭棘が硬い．それに対して *Draconetta* は，背鰭3棘12軟条，臀鰭12軟条を有し，背鰭棘は柔らかい．他に両属は，尾鰭軟条先端の分枝状態，側線系の分布状態に相違点を有する．

Centrodraco は *C. acanthopoma*（セイヨウハナガサヌメリ：新称，太平洋初記録），*C. pseudoxenicus*（ハナガサヌメリ），*C. oregonus*（西部インド洋初記録），*C. insolitus*, *C. otohime*（オトヒメヌメリ），*C. ornatus* の6種を含む．*C. acanthopoma* は短い背鰭第1棘を持つことと，雌雄間に形態的差異があまりみられない，ということで他の5種と区別される．他の5種は，3本の背鰭棘のうち第1棘が最長であり，背鰭軟条は雄において糸状に伸びる．これらの5種は互いによく似ており，主として斑紋によって区別される．

Draconetta は *D. xenica*（イナカヌメリ）のみが知られている．

外部形質に地理的分布による知見を加え，本科魚類の類縁関係を論じた．その結果，本科魚類はネズッポ科魚類に比べて特殊化の度合が低く原始的であること，*Draconetta* が *Centrodraco* よりもネズッポ科魚類に近い形質を有していること，そして，*Centrodraco* 内では *C. acanthopoma* が最も原始的な種であることが推察された．

C. acanthopoma と *C. oregonus* は，大西洋と，インド・西太平洋にまたがって分布しているが，その歴史的意味について若干の考察を加えた．

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