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THE FAMILY SYNGNATHIDAE (PISCES: SYNGNATHIFORMES) OF TAIWAN[1]

SIN-CHE LEE

Institute of Zoology, Academia Sinica, Taipei, Taiwan 115, Republic of China

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Sin-Che Lee (1983) The family Syngnathidae (Pisces: Syngnathiformes) of Taiwan. *Bull. Inst. Zool., Academia Sinica* **22**(1): 67-82. A systematic review of the syngnathid fishes found in the waters of Taiwan and its adjacent islands documents a total of 22 species in 16 genera. Among them, *Dunckerocampus dactyliophorus*, *Coelonotus liaspis*, *Halicampus koilomatodon*, *Microphis manadensis*, *Hippichthys heptagonus*, *H. spicifer*, *Syngnathus pelagicus*, *Corythoichthys flavofasciatus*, *Solegnathus hardwickii*, *Haliichthys taeniophorous* and *Hippocampus erinaceus* are new records for the Taiwan area. A family diagnosis, key to genera and species, brief synonyms, diagnosis, remarks and illustrations of each species are given.

The syngnathids including the pipefishes and seahorses are small fishes of tropical and moderately warm temperate shallow coastal waters. Seahorses are more highly specialized than pipefishes but most seahorses are confined to marine waters and restricted to particular habitat. On the other hand pipefishes have a wider distribution; they can tolerate greater temperature and salinity ranges. Some pipefishes are found in rivers.

About 150 species of pipefishes in 34 genera and 25 species of seahorses in two genera are found throughout the world (Nelson, 1976). The latest accounts of the syngnathids of Taiwan was that of Chen (1969) who listed 12 species, namely, *Microphis boaja*, *Syngnathus argyristictus*, *S. cyanospilus* (=*Hippichthys cyanospilus*), *Corythoichthys fasciatus* (misidentification of *Hippichthys heptagonus*), *Trachyrhamphus serratus*, *Syngnathoides biaculeatus*, *Hippocampus takakurai* (=*H. trimaculatus*), *H. kelloggi* (=*H. kuda*), *H. atterimus* (=*H. kuda*), *H. kuda*, *H. histrix* and *Solegnathus guntheri*. Among them, *Hippocampus takakurai* is considered as a synonym of *H. trimaculatus* and both *H. kelloggi* and *H. atterimus* are synonyms of *H. kuda*. *Solegnathus guntheri* and *Syngnathus argyristictus* are provisionally removed from the list since no data are available. Thus only 8 valid species are remained in Chen's list of Taiwan syngnathids. Neverthless, after a period of intensive collection the present author has found 13 additional species making a total 21 syngnathid species in Taiwan.

MATERIALS AND METHODS

Fish specimens were mainly collected from the coastal waters in the immediate vicinities off Tachi, Tainan, Kaohsiung and Tungkang by otter trawls, partly from the estuaries of Tamshui River and Chianchung River by hand net, from other streams by electric shocking and from rocky and reef areas in the littoral zone around the island with ichthyocides.

The terminology used in this paper followed Herald (1953). The measurements of body parts include standard length (SL, tip of lower jaw to base of caudal fin if any for

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TABLE 1

Proportional measurements of the syngnathid species

Species	No. fish measured	Length / Head	Trunk / Head	Tail / Trunk	Tail / Trunk+Head	D. base / Head	Head / Snout	Snout / Postorbital
Choeorichthys sculptus	3	5.79-6.0	2.43-2.69	0.92-1.01	0.67-0.71	0.86-0.91	2.45-2.50	—
Ichthyocampus belcheri	2	7.63-8.02	2.45-2.54	1.74-1.79	1.24-1.28	0.71-0.83	2.83-3.0	—
Dunckerocampus dactyliophorus	1	4.17	1.72	0.92	0.58	0.30	1.42	—
Coelonotus liaspis	1	9.64	3.01	1.87	1.4	2.06	2.74	—
Halicampus koilomatodon	3	9.09-11.13	2.69-3.09	2.04-2.25	1.49-1.70	0.54-0.68	2.46-2.92	—
Trachyrhamphus serratus	3	14.18-14.51	4.32-4.38	2.01-2.13	1.63-1.73	1.01-1.09	2.41-2.72	—
Doryrhamphus melanopleura	2	4.32-4.38	2.12-2.24	0.52-0.57	0.36-0.39	0.54-0.58	1.94-2.18	—
Microphis manadensis	1	7.26	3.0	1.09	0.82	0.97	2.06	—
M. boaja	1	5.20	1.89	1.21	0.79	0.62	1.60	—
Micrognathus mataafae	1	14.88	3.29	2.37	1.82	1.16	3.91	—
Hippichthys cyanospilus	2	8.16-9.0	2.04-2.42	2.36	1.67-1.70	0.79	2.33	—
H. heptagonus	1	9.90	2.24	2.97	2.05	0.88	1.30	—
H. spicifer	1	7.95	2.15	2.21	1.51	0.75	2.22	—
Syngnathus pelagicus	1	7.65	2.42	1.76	1.25	0.86	1.81	—
Corythoichthys flavofasciatus	1	9.69	2.55	2.41	1.73	1.11	2.33	—
Syngnathoides biaculeatus	1	5.05	1.78	1.28	0.82	0.75	1.74	—
Solegnathus hardwickii	1	6.58	2.79	1.0	0.74	0.83	1.71	—
Haliichthys taeniophorous	2	6.08-6.29	1.94-2.10	1.52-1.62	1.07	0.48	1.72-1.77	—
Hippocampus histrix	1	—	1.15	—	—	0.30	1.73	2.01
H. erinaceus	5	—	1.47-1.88	—	—	0.38-0.45	2.03-2.35	1.21-1.44
H. trimaculatus	2	—	1.66-1.73	—	—	0.58-0.59	2.20-2.26	1.13-1.25
H. kuda	1	—	1.61	—	—	0.39	1.92	1.38

TABLE 2
Some meristic counts of syngnathid species

Species	No. fish counted	Dorsal rays	Anal rays	Pectoral rays	Caudal rays	Body rings (Subdorsal)
Choeroichthys sculptus	3	30-31	4	20	9	19+22(6+2)
Ichthyocampus belcheri	2	20-21	3	12	9	16+31(1+5)
Dunckerocampus dactyliophorus	1	23	4			18+20(1+4)
Coelonotus liaspis	1	55	4	19		17+33(4+9)
Halicampus koilomatodon	3	20	4	18	10	17+36(2-3+2)
Trachyrhamphus serratus	3	26-28	3	17-18	8	23+44-48(3-4+3)
Doryrhamphus malanopleura	2	22	4	19-21	10	18+14-15(4-5+2-3)
Microphis manadensis	1	41	4	19	10	20+24(3+6)
M. boaja	1	49	3	27		23+34(4+6)
Micrognathus mataafae	1	21	2	12	10	15+35(1+4)
Hippichthys cyanospilus	2	22	2	14	10	13+33-34(1+5)
H. heptagonus	1	25	3	13	10	15+41(0+6)
H. spicifer	1	29	2	14	10	15+39(0+6)
Syngnathus pelagicus	1	33	4	14	10	18+34(1+7)
Corythoichthys flavofasciatus	1	31	4	16	9	16+38(0+6)
Syngnathoides biaculeatus	1	40	4	23	0	17+43(2+9)
Solegnathus hardwickii	1	47	4	27	0	25+50(0+11)
Haliichthys taeniophorous	2	24-27	4	20-21	0	19+43-45(3+2-3)
Hippocampus histrix	1	17	4	17	0	11+35(2+2)
H. erinaceus	5	18	4	16-17	0	11+36-37(2+2)
H. trimaculatus	2	21	4	17	0	11+41(2+2)
H. kuda	1	17	4	17	0	11+35(2+2)

pipefishes; tip of the coronet to the lowerest part of the curve of the tail for seahorses), head length (HL, tip of snout to rear margin of operculum), snout length (SNL, snout tip to anterior edge of orbit), trunk length (TRL, rear margin of operculum to anus), tail length (TAL, rear margin of anus to base of caudal fin). Counts of trunk rings begin with the ring bearing with pectoral base and end with that bearing the anus; tail rings count the rest of rings following the anal ring. Results of proportional measurements and meristic counts are given in Tables 1 and 2.

RESULTS

Systematic accounts

Family Syngnathidae

Diagnosis: Body elongated, entirely armoured by body scutes (or shields) arranged regularly in the form of rings. Trunk in seahorses much stouter than the slender tail. Snout tubular, with a terminal oblique mouth. Teeth absent on vomer, palatines and pterygoids. Opercular bone present. Gill apparatus lobate like (lophobranchiate); the gill opening reduced to a small dorsal aperture. One dorsal fin (by the exception absent in *Penetopteryx*) with soft rays only. Pectoral fin present or absent. Ventral fin absent. Anal fin usually present, very small. Caudal fin very small or absent in the species bearing prehensile tail. Males take care of the eggs which were enclosed in the pouch on the abdomen or on the tail.

Key to the genera of Syngnathidae

1. Caudal fin present, tail not prehensile....2
   Caudal fin absent, tail prehensile.....13
2. Superior keels of trunk and tail continuous 3
   Superior keels of trunk and tail discontinuous.....4

3. Egg pouch abdominal; anus behind middle of body length.....*Choeroichthys*
   Egg pouch caudal; anus before middle of body length.....*Ichthyocampus*
4. Operculum without a keel, or only feebly developed; lateral keel of trunk and inferior keel of tail continuous.....5
   Operculum with a prominent complete or basal incomplete keel; lateral keel of trunk and inferior keel of tail continuous or discontinuous.....6
5. Dorsal rays 23, base much shorter than head length; subdorsal rings 1+4; edge of shield (ring) with a pronounced posterior spine; upper profile of snout scarcely separated from forehead; snout much longer than the rest of head.....*Dunckerocampus*
   Dorsal rays 55, base longer than twice the head length; subdorsal rings 4+9; edge of shield indistinct, rounded; snout distinctly separated from forehead; snout shorter than the rest of head....*Coelonotus*
6. Opercular keel convex, bent upward to gill-opening, with radial lines; dorsal base raised.....7
   Opercular keel rectilinear; dorsal base not raised.....8
7. Edges of shields spinuous; dorsal profile of snout and head spinuous; orbital part of head prominent and strongly separated from snout.....*Halicampus*
   All the edges and ridges of head smooth except a serrated median keel on snout.....*Trachyrhamphus*
8. Trunk-rings equal to or generally less numerous than tail rings; most part of dorsal base on tail; caudal equal to or shorter than postorbital part of head.....9
   Trunk-rings more numerous than tail rings; most part of dorsal base on trunk; caudal longer than postorbital part of head (about $\frac{1}{2}$ head length).....*Doryrhamphus*
9. Egg pouch caudal.....10
   Egg pouch abdominal; anus behind middle of body length; snout longer than the rest of head.....*Microphis*
10. Inferior keel of trunk and tail continuous; lateral keel of trunk and inferior keel of tail discontinuous.....11
    Inferior keel of trunk and tail discontinuous; lateral keel of trunk and inferior keel of tail continuous; snout forming no angle with orbital part of head.....*Micrognathus*
11. Upper profile of snout evenly continued in that of forehead; orbit not prominent...12
    Snout forming an angle with the prominent orbital part of head.....*Corythoichthys*
12. Lateral trunk keel deflected ventrally to or near the continuous inferior keel of tail.....*Hippichthys*
    Lateral trunk keel not deflected ventrally but subcontinuous with superior keel of tail.....*Syngnathus*
13. Body compressed, not or scarcely dilated.....14
    Body depressed or subcylindrical; snout rather stout; no praenuchial shield.....*Syngnathoides*
14. Dorsal base raised; dorsal situated on trunk and tail; operculum with convex keel bent upward to gill-opening.....15
    Dorsal base not raised; dorsal situated on tail only; operculum without keel but with smooth or serrated radial ridges.....*Solegnathus*
15. Longitudinal axis of head and trunk nearly in the same plane; praenuchial shield without a coronet; numerous long cutaneous appendages.....*Haliichthys*
    Longitudinal axis of head forming a right angle with axis of trunk; praenuchial shield surmounted by a coronet; no cutaneous appendages.....*Hippocampus*

Genus *Choeroichthys* Kaup, 1856

1. *Choeroichthys sculptus* (Günther, 1870)

Fig. 1

Doryichthys sculptus Günther, 1870: 185.
Choeroichthys sculptus, Weber and de Beaufort, 1922:

Fig. 1. *Choeroichthys sculptus* (Günther), 61.8 mm SL.

61; Matsubara, 1955: 428; Smith, 1963: 530; Munro, 1967: 154; Chang *et al.*, 1977: 13; Jones and Kumaran, 1980: 162.

Materials: 1 specimen, 61.8 mm SL, May 1978, Chengkong, Taitung County; 1 specimen, 62.7 mm SL, January 1978, Hsiaoliuchiu, Pingtung County; 1 specimen, 60.8 mm SL, July 1975, Hengchun, Pingtung County; all from rocky littoral zones.

Diagnosis: Snout slightly turned upward, with finely granulated median keel; length somewhat equal to postorbital part of head. Operculum with a complete longitudinal keel from which many ridges radiated out. Body rings sharp edged but not ended in spine; each scute on the trunk with two additional keels, making a total of 5 edges on the trunk. Tail slightly shorter than trunk; caudal fin small, rounded. Brown with light centred dark spots on body side.

Remarks: This species differs from *C. brachysoma* (Weber and de Beaufort, 1922) in having a higher ring counts and additional keels on each scute.

Genus *Ichthyocampus* Kaup, 1856

2. *Ichthyocampus belcheri* (Kaup, 1856)

Ichthyocampus belcheri Kaup, 1856: 30 (Type locality: China); Günther, 1870: 177; Weber and de Beaufort, 1922: 92; Chen, 1935: 5; Fowler, 1935: 62; Herald, 1953: 241 (key).

Ichthyocampus nox Snyder, 1909: 598. (c. f. Herald, 1953)

Hippichthys nox, Matsubara, 1955: 429; Chang *et al.*, 1977: 13.

Materials: 2 specimens, 52.1–57.2 mm SL, June 1975 and November 1977 respectively, Hengchun, Pingtung County; 1 specimen, 58.5mm SL, May 1978, Chengkong, Taitung County; all from rocky littoral zones.

Diagnosis: Snout turned upward, slightly shorter than postorbital part of head. Superior and inferior keels of trunk and tail continuous; lateral trunk keel extending to the end of 3rd tail ring. Anus before middle of body. Brood pouch on ventral surface of tail. Tail much longer than trunk; caudal fin very small, rounded. Color uniformly brown.

Remarks: This species is distinguishable from the *I. kampeni* (Weber and de Beaufort, 1922) in having shorter lateral keel which extends only to the end of 3rd tail ring instead of 14–17th tail rings in *I. kampeni.*

Genus *Dunckerocampus* Whitley, 1933

3. *Dunckerocampus dactyliophorus* (Bleeker, 1853)

Fig. 2

Doryichthys dactyliophorus, Günther, 1870: 186.

Acanthognathus dactyliophorus, Weber and de Beaufort, 1922: 42.

Dunckerocampus dactyliophorus, Herald, 1953: 252; Smith, 1963: 525; Munro, 1967: 155; Masuda *et al.*, 1980: 184.

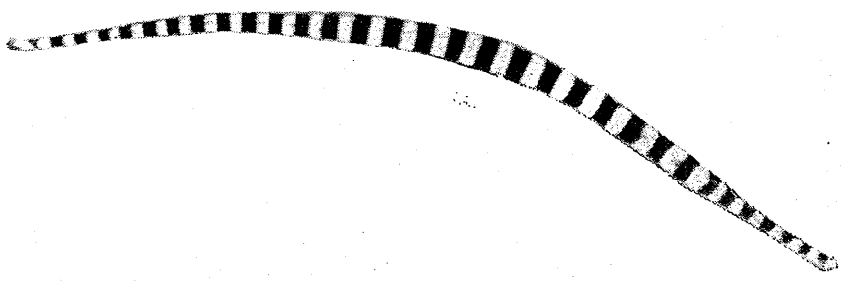

Fig. 2. *Dunckerocampus dactyliophorus* (Bleeker), 169 mm SL.

Materials: 1 specimen, 169 mm SL, November 1971, rocky littoral zone off Hengchun, Pingtung County.

Diagnosis: Snout much longer than the rest of head. Operculum granulated without distinct keel. Keel of each body ring (scute) ended in a sharp spine; lateral keel of trunk continuous with inferior keel of tail. Tail shorter than trunk. Yellowish with about 30 black rings.

Genus *Coelonotus* Peters, 1855

4. *Coelonotus liaspis* (Bleeker, 1853)

Fig. 3

Hemithylacus leiaspis, Kaup, 1859: 61.
Coelonotus liaspis, Günther, 1870: 188; Weber and de Beaufort, 1922: 57; Smith, 1963: 528; Masuda *et al.*, 1980: 183.

Materials: 1 specimen, 132 mm SL, March 1980, estuary of Milung River, Hualien County, from the water with muddy sand bottom.

Diagnosis: Snout slightly shorter than postorbital part of head. Operculum without keel but with several finely granulated lines instead. Intermedial scutella present between every two neighbouring shields. Lateral keel of trunk continuous with inferior keel of tail. Edges of body rings smooth without any sharp spines. Tail much longer than trunk. Brood pouch abdominal, formed by the skin of abdomen. Body light brown speckled with dark brown forming brown edged ocelli centre on each intermedial scutella; a dark line running from rear edge of orbit along the side of trunk.

Genus *Halicampus* Kaup, 1856

5. *Halicampus koilomatodon* (Bleeker, 1858–1859)

Fig. 4

Syngnathus grayi, Günther, 1870: 169.
Halicampus koilomatodon, Jordan and Snyder, 1901: 10; Weber and de Beaufort, 1922: 103; Chen, 1935: 11; Matsubara, 1955: 427; Smith, 1963: 532.

Materials: 1 specimen, 127.2 mm SL, April 1978; 1 specimen, 145.8 mm SL, April 1978; 1 specimen, 178 mm SL, April 1980; catches of

Fig. 3. *Coelonotus liaspis* (Bleeker), 132 mm SL.

Fig. 4. *Halicampus koilomatodon* (Bleeker), 178 mm SL.

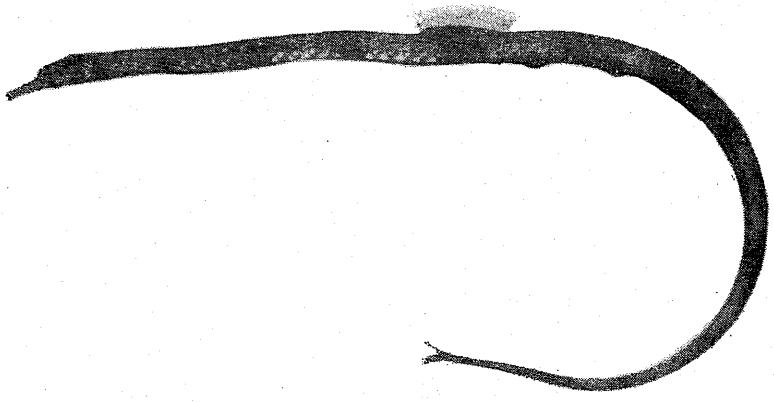

Fig. 5. *Trachyrhamphus serratus* (Temminck and Schlegel), 253 mm SL.

trawlers operated in the vicinities off Tachi, Ilan County; Tungkang, Pingtung County and Kaohsiung, respectively.

Diagnosis: Snout shorter than the rest of head. Dorsal profile of head spinuous; orbital area rather prominent. Opercular keel with basal prominent spine, bent upward to gill-opening. Edges of body rings (shields) spinuous. Tail slightly longer than twice the trunk length. Egg pouch caudal. Brownish with whitish marblings.

Remarks: This species is distinguishable from *H. elegans* in having more trunk rings (17–18 *vs* 14).

Genus *Trachyrhamphus* Kaup, 1856

6. *Trachyrhamphus serratus* (Temminck and Schlegel, 1847)

Fig. 5

Syngnathus serratus Schlegel in Temminck and Schlegel, 1847: 272; Day, 1878: 677.

Trachyrhamphus serratus, Kaup, 1856: 23; Weber and de Beaufort, 1922: 99; Fowler, 1934: 317; Chen, 1935: 12; Matsubara, 1955: 427; Lindberg and Legeza, 1965: 268; Chen, 1969: 261; Masuda *et al.*, 1980: 186.

Materials: 1 specimen, 253 mm SL, July 1978; 2 specimens, 276.5–284.5 mm SL, March 1980; catches of trawlers operated in the vicinities off Tachi, Ilan County and Kaohsiung, respectively.

Diagnosis: Snout with median serrated keel, length shorter than the rest of head. Operculum with basal convex keel, bent upward. Oval intermedial scutella present between every two neighbouring shields. Edges of body rings smooth. Superior keels of trunk and tail discontinuous; lateral keel of trunk and inferior keel of tail continuous. Tail longer than twice the trunk length; caudal fin very small. Egg pouch subcaudal. Brownish with dark diffuse cross bars.

Genus *Doryrhamphus* Kaup, 1856

7. *Doryrhamphus melanopleura* (Bleeker, 1858)

Fig. 6

Doryrhamphus melanopleura, Weber and de Beaufort, 1922: 64; Herald, 1953: 246; Matsubara, 1955: 426; Smith, 1963: 530; Yu and Chung, 1975: 3; Masuda *et al.*, 1980: 183; Jones and Kumaran, 1980: 164.

Materials: 1 specimen, 42.9 mm SL, April 1977; 1 specimen, 56.2 mm SL, May 1970; 1 specimen, 55.4 mm SL, March 1977; from rocky littoral zones off Hengchun, Pingtung County; Tachi, Ilan County and Hsiaoliuchiu, Pingtung County, respectively.

Diagnosis: Snout equal to or slightly longer than the rest of head; head with a median serrated keel. Opercular keel prominent, rectilinear and bifurcated, with 8 additional radiating lines. Edges of body rings prominent and sharply pointed posteriorly. Superior keels of trunk and tail discontinuous; lateral keel of trunk and inferior keel of tail continuous. Tail much shorter than the trunk; caudal fin longer than half of head length. Yellowish with a black longitudinal band from snout to gill opening which extends continuously toward the base of caudal fin as a broad bluish band; caudal fin brownish with yellowish markings.

Genus *Microphis* Duncker, 1910

Key to species of *Microphis*

1. Inferior keels of trunk and tail discontinuous; lateral keel of trunk and inferior keel of tail continuous; D. 35–42..... ..... *M. manadensis*

Fig. 6. *Doryrhamphus melanopleura* (Bleeker), 56.2 mm SL.

Inferior keels of trunk and tail continuous; lateral keel of trunk and inferior keel of tail not continuous; D. 47-61....*M. boaja*

8. *Microphis manadensis* (Bleeker, 1856)

Fig. 7

Doryichthys manadensis, Günther, 1870: 184; Weber and de Beaufort, 1922: 46.
Oostethus manadensis, Munro, 1967: 156.

Materials: 1 specimen, 152.4 mm SL, September 1976, Chiuju, Hsiatamshui River, Pingtung County.

Diagnosis: Snout subequal to or slightly longer than the rest of head. Longitudinal opercular keel prominent with 4 radiating ridges below it. Superior keels of trunk and tail discontinuous; lateral keel of trunk and inferior keel of tail continuous. Egg pouch abdominal. Anus behind the origin of dorsal fin. Tail slightly longer than trunk; caudal fin shorter than postorbital part of head. Brownish with a longitudinal dark band running from snout tip to rear edge of operculum; underside of head with dark cross bars.

Remarks: This species differs from *M. brachyurus* (Weber and de Beaufort, 1922), in having shorter head and snout.

9. *Microphis boaja* (Bleeker, 1851)

Fig. 8

Doryichthys boaja, Günther, 1870: 180.
Microphis boaja, Weber and de Beaufort, 1922: 47; Fowler, 1934: 313; Chen, 1935: 6; Matsubara, 1955: 426; Chen, 1969: 262.

Materials: 1 specimen, 273 mm SL, March 1980, catch of trawler operated in the vicinity off Kaohsiung.

Diagnosis: Snout much longer than the rest of head. Longitudinal opercular keel prominent, bent downward posteriorly, with many radiating lines from it. Edges of body rings sharp ending in a spine posteriorly. Lateral keel of trunk discontinuous with superior keel of tail; inferior keel of trunk continuous with that of tail. Egg pouch abdominal. Tail longer than trunk; caudal fin minute. Light brown with vertical dark band on each body ring; caudal fin black.

Genus *Micrognathus* Duncker, 1912

10. *Micrognathus mataafae* (Jordan and Seale, 1906)

Fig. 9

Micrognathus mataafae, Weber and de Beaufort, 1922: 77; Herald, 1953: 262; Smith, 1963: 534; Chang *et al.*, 1978: 76.

Materials: 1 specimen, 128 mm SL, November 1977; rocky littoral zone off Hengchun, Pingtung County.

Diagnosis: Snout much shorter than postorbital part of head; 3 spines on the median keel. Opercular keel short, restricted to its basal third, with several radiating lines from it. Intermedial scutella present between every

Fig. 7. *Microphis manadensis* (Bleeker), 152.4 mm SL.

Fig. 8. *Microphis boaja* (Bleeker), 273 mm SL.

Fig. 9. *Micrognathus mataafae* (Jordan and Snyder), 128 mm SL.

two neighbouring shield. Lateral keel of trunk continuous with inferior keel of tail. Tail much longer than twice the trunk length; caudal fin subequal to eye diameter. Generally brownish.

Remarks: The species differs from the closely related *M. brevirostris* (Weber and de Beaufort, 1922), in having much shorter snout and in having a median serrated keel on snout dorsum.

Genus *Hippichthys* Bleeker, 1949

Key to species of *Hippichthys*

1. Dorsal fin situated entirely on tail; total rings over 50.....2
   Dorsal fin inserted on last trunk ring; total rings less than 50 (trunk ring 12-14, mostly 13); D. 21-25; A. 2-3; rings 13+32-36. .....*H. cyanospilus*
2. Lateral snout keel prominent; snout distinctly shorter than the rest of head but slightly shorter than or subequal to postorbital part of head; body without dark cross bands; D. 25; A. 3; rings 15+41... ....*H. heptagonus*
   Lateral snout keel absent; snout shorter than the rest of head but longer than postorbital part of head; trunk ventrally with 15 dark cross bars, snout spotted ventrally; D. 33; A. 4; rings 18+34.....*H. spicifer*

11. *Hippichthys cyanospilus* (Bleeker)

Fig. 10

Syngnathus cyanospilus, Weber and de Beaufort, 1922: 83; Matsubara, 1955: 427; Smith, 1963: 538; Munro, 1967: 158; Chen, 1969: 264; Jones and Kumaran, 1980: 165.

Hippichthys cyanospilus, Dawson, 1978: 150.

Materials: 2 specimens, 80 and 94.5 mm SL, August 1979 and June 1980, Chiang-mei, Penghu County, sandy littoral zone with eel grass.

Diagnosis: Snout slightly longer than postorbital part of head. Operculum with a complete longitudinal keel from which radiated out dorsally and ventrally numerous oblique lines. Dorsal origin on last trunk ring. Lateral keel of trunk deflected ventrally and subcontinuous with inferior keel of tail; inferior keel of trunk continuous with that of tail. Tail longer than twice the trunk length; caudal fin slightly shorter than postorbital part of head. Pale brown with dark cross bands on trunk and white dots on tail; dorsal fin with oblique lines; caudal fin black with white markings; ventral keel blackish.

12. *Hippichthys heptagonus* (Bleeker, 1849)

Hippichthys heptagonus, Dawson, 1978: 136.

Syngnathus djarong, Weber and de Beaufort, 1922: 79; Chen, 1935: 8.

Syngnathus spicifer, Kaup, 1856: 34; Günther, 1870: 172.

Bombonia djarong, Munro, 1967: 157.

Materials: 1 specimen, 123.7 mm SL, January 1959, catch of trawler operated in the vicinity of Tungkang, Pingtung County.

Diagnosis: Snout much shorter than the rest of head. Opercular keel pattern identical with that of *H. cyanospilus*. Lateral keel of trunk deflected ventrally and almost subcontinuous with inferior keel of tail. Tail much longer than twice the trunk length; caudal fin much shorter than postorbital part of head. Generally brownish, much darkened on caudal fin.

Remarks: The preserved specimen labelled *Corythoichthys fasciatus* in the Museum of Taiwan Fisheries Research Institute, is in fact a misidentification of this species.

Fig. 10. *Hippichthys cyanospilus* (Bleeker), 94.5 mm SL.

13. *Hippichthys spicifer* (Ruppell, 1840)

Fig. 11

Syngnathus spicifer, Weber and de Beaufort, 1922: 80; Chen, 1935: 8; Fowler, 1934: 316; Smith, 1963: 537.
Hippichthys spicifer, Dawson, 1978: 142.
Bombonia spicifer, Munro, 1967: 157.

Materials: 1 specimen, 97 mm SL, July 1981; estuary of the Tamshui River, Taipei County.

Diagnosis: Snout shorter than the rest of head, but longer than postorbital part of head. Opercular keel pattern almost identical with that of the previous two species. Lateral keel of trunk subcontinuous with inferior keel of tail; inferior keel of trunk continuous with that of tail. Tail longer than twice the trunk length; caudal fin shorter than postorbital part of head. Brownish with dark cross bands on ventral sides of trunk and with black spots on ventral surface of snout; caudal fin black, other fins transparent.

Genus *Syngnathus* Linnaeus, 1758

14. *Syngnathus pelagicus* (Linnaeus, 1758)

Syngnathus pelagicus, Kaup, 1856: 36; Weber and de Beaufort, 1922: 87; Fowler, 1934: 314; Chen, 1935: 9; Smith, 1963: 539.

Materials: 1 specimen, 145.4 mm SL, catch of trawler operated in the vicinity off Keelung, date of collection unknown.

Diagnosis: Snout longer than rest of head. Opercular keel short, restricted to its basal third only. Lateral keel of trunk subcontinuous with superior keel of tail. Tail much longer than trunk; caudal fin much shorter than postorbital part of head. Uniformly brownish without any markings.

Remarks: This species resembles *S. acus* (Weber and de Beaufort, 1922), but differs from the latter in having less dorsal rays (33 *vs* 35–45) and tail rings (34 *vs* 38–44) and with shorter tail (trunk 1.76 times tail length *vs* at least twice tail length).

Genus *Corythoichthys* Kaup, 1856

15. *Corythoichthys flavofasciatus* (Ruppell, 1838)

Fig. 12

Corythoichthys flavofasciatus conspicillatus, Herald, 1953: 273; Smith, 1963: 535.
Corythoichthys flavofasciatus, Dawson, 1977:306, Masuda *et al.*, 1980: 185.

Materials: 1 specimen, 110.5 mm SL, June 1980; rocky littoral zone of Lutao, Taitung County.

Diagnosis: Dorsal profile of orbit rather prominent. Snout slightly longer than postorbital part of head. Dorsal base longer than head length (0.9 in head length). Lateral keel of trunk close to superior keel of tail. Tail much longer than twice the trunk; caudal fin subequal to postorbital part of head. Trunk and tail pale grey with about 20 dark cross bars formed by irregular brown lines somewhat in reticulation; lateral side of head with two longitudinal dark bands; ventral surface of anal ring cobalt blue.

Remarks: This species is distinguishable from *C. intestinalis* (Dawson, 1977), by the presence of cobalt bluish color on the ventral surface of anal ring (in male), and two longitudinal bands on head side (numerous in *C.*

Fig. 11. *Hippichthys spicifer* (Ruppell), 97 mm SL.

Fig. 12. *Corythoichthys flavofasciatus* (Ruppell), 110.5 mm SL.

intestinalis), and in having shorter head (9.69 in SL *vs* 8.0 in SL), longer dorsal base and more numerous tail rings.

Genus *Syngnathoides* Bleeker, 1851

16. *Syngnathoides biaculeatus* (Bloch, 1875)

Fig. 13

Syngnathoides biaculeatus, Weber and de Beaufort, 1922: 40; Chen, 1935: 15; Fowler, 1935: 63; Matsubara, 1955: 429; Smith, 1963: 523; Lindberg and Legeza, 1965: 271; Munro, 1967: 154; Chen, 1969: 264; Jones and Kumaran, 1980: 166; Masuda *et al.*, 1980:186.

Materials: 1 specimen, 166.8mm TL, June 1965, catch of trawler operated in the vicinity off Tungkang, Pingtung County.

Diagnosis: Operculum without keel but with smooth radial striations instead. Ventral surface of body much broadened. Skin on body and head with dermal filaments. Superior and inferior keel of trunk continuous with those of tail; lateral keel of trunk rising posteriorly and reaching the superior keel of tail behind the dorsal fin. Caudal fin absent; tail prehensile, longer than trunk length but shorter than the combination of trunk and head.

Genus *Solegnathus* Swainson, 1839

17. *Solegnathus hardwickii* (Gray, 1830)

Fig. 14

Syngnathus hardwickii, Richardson, 1846: 202.
Solegnathus hardwickii, Kaup, 1856: 20; Günther, 1870: 195; Chen, 1935: 16; Fowler, 1935: 65; Smith, 1963: 523; Dawson, 1982: 142.

Materials: 1 specimen, 271.3 mm TL, May 1979, catch of trawler operated in the vicinity off Kaohsiung.

Diagnosis: Snout about twice the postorbital length. Opercular keel absent, but with radiating granular lines instead. Dorsal base shorter than head length. Body compressed, higher than wide. Superior keel of trunk discontinuous with that of tail; lateral keel of trunk rising posteriorly and reaching the superior keel of tail behind the dorsal fin; inferior keel of trunk continuous with that of tail. Each body ring (or shield) with radial rugosites and edged with conical tubercles. Caudal fin absent, tail about equal to trunk length. Pale brownish, dorsal edge and lateral side of each shield with a dark brown spot.

Remarks: This species is easily separable from *S. lettiensis* (Weber and de Beaufort, 1922) in having more numerous dorsal rays (47 *vs* 35–36 in *S. lettiensis*). The dorsal fin ray counts of the present species equal to *S. guntheri* of Weber and de Beaufort, however, it lacks of rounded black blotches on trunk and its snout is shorter (snout length nearly twice longer than its postorbital part *vs* nearly thrice longer in *S. guntheri*). All these three species are valid.

Genus *Haliichthys* Gray, 1859

18. *Haliichthys taeniophorous* (Gray, 1859)

Fig. 15

Haliichthys taeniophorous, Weber and de Beaufort, 1922: 106.
Phyllopteryx taeniophorous, Günther, 1870: 197.

Materials: 2 specimens, 241.4–252.5 mm TL, April 1978, catches of trawlers operated in the vicinity off Kaohsiung.

Fig. 13. *Syngnathoides biaculeatus* (Bloch), 166.8 mm TL.

Fig. 14. *Solegnathus hardwickii* (Gray), 271.3 mm TL.

Fig. 15. *Haliichthys taeniophorous* Gray, 241.4 mm TL.

Diagnosis: Snout about twice the postorbital length. Opercular keel much convex, running upward to gill-opening. Dorsal base raised, much shorter than head length. Body slightly compressed, shield edged with long spine, and with cutaneous appendages at the base of spine. Superior and inferior keels of trunk discontinuous with those of tail, but the lateral trunk keel continuous with inferior keel of tail. Brownish with irregular cross bands on body side.

Genus *Hippocampus* Rafinesque, 1810

Key to species of *Hippocampus*

1. Occiptal keel behind coronet without spines or merely with rough ridge; tubercles on keels not elongated as long spines, much shorter than eye diameter.....3
   Occiptal keel behind coronet with two distinct spines; tubercles on keels extended as long spines 2
2. Occiptal spines about as high as coronet; spines on keels nearly as long as eye size; snout much longer than the rest of head, and nearly twice the length of postorbital part of head; D. 17; A. 4; P. 17; rings 46(11+35).....*H. histrix*
   Occiptal spines shorter than coronet; spines on keels shorter than eye size; snout shorter than or nearly equal to the rest of head, and about 1.4 times the length of postorbital part of head; D. 18; A. 4; P. 16; rings 48(11+37).....*H. erinaceus*
3. Dorsal rays 21; body rings 11+41; 3 black blotches on superior keel of trunk between pectoral fin and dorsal origin.....*H. trimaculatus*
   Dorsal rays 17; body rings 11+35; black blotches on superior keel absent...*H. kuda*

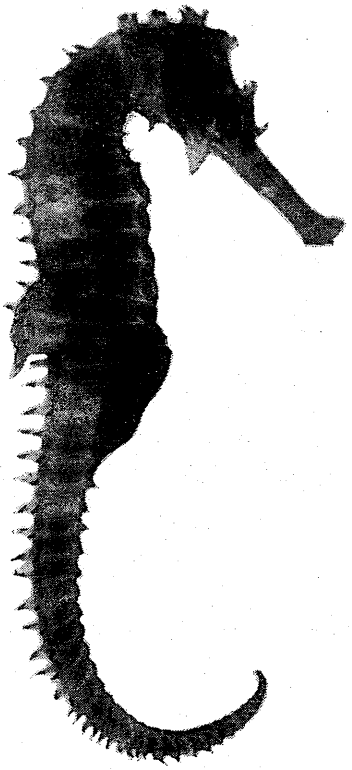

Fig. 16. *Hippocampus histrix* Kaup, 104 mm BL.

19. *Hippocampus histrix* (Kaup, 1856)

Fig. 16

Hippocampus histrix Kaup, 1856: 17; Günther, 1870: 206; Day, 1878: 683; Jordan and Snyder, 1901: 16; Weber and de Beaufort, 1922: 109; Chen, 1935: 18; Fowler, 1935: 68; Matsubara, 1955: 431; Smith, 1963: 518; Lindberg and Legeza, 1965: 274; Munro, 1967: 154; Chen, 1969: 264; Jones and Kumaran, 1980: 168.

Materials: 1 specimen, 104 mm BL, March 1980, catch of trawler operated in the vicinity off Kaohsiung.

Diagnosis: Snout longer than the rest of head; nearly twice longer than postorbital length. Occiptal keel behind the coronet with two distinct compressed crown-like spines with

the height almost equal the coronet. Tubercles on keels of shields extended as long slender spines measuring nearly as long as eye diameter. Generally brownish, snout dark banded and spines black tipped.

20. *Hippocampus erinaceus* (Günther, 1870)

Fig. 17

Hippocampus erinaceus Günther, 1870: 206; Chen, 1935: 18.

Hippocampus spinosissimus, Weber and de Beaufort, 1922:109.

Materials: 1 specimen, 104 mm BL, and 4 specimens 66.0–77.2 mm BL, March 1965 and April 1978, respectively; catches of trawlers operated in the vicinity off Tungkang, Pingtung County.

Diagnosis: Snout slightly shorter than the rest of head, and 1.21–1.44 times the postorbital length of head. Two distinct acute spines behind the coronet. Spines on keels acute, enlarged at intervals. Generally greyish brown.

Remarks: This species differs from *H. histrix*, in having shorter snout (1.21–1.44 times the postorbital length *vs* 2.01 in *H. histrix*), and in having shorter spines on keels.

Fig. 17. *Hippocampus erinaceus* (Günther), 66 mm BL.

21. *Hippocampus trimaculatus* (Leach, 1814)

Fig. 18

Hippocampus trimaculatus, Weber and de Beaufort, 1922: 112; Chen, 1935: 20; Fowler, 1935: 67; Smith, 1963: 518.

Hippocampus takakurai Tanaka, 1916: 423; Chen, 1935: 20; Matsubara, 1955: 430; Chen, 1969: 264; Masuda *et al.*, 1980: 187.

Materials: 1 specimen, 117 mm BL, April 1978; 1 specimen, 99 mm BL, June 1980; catches of trawlers operated in the vicinities off Kaohsiung and Tachi, Ilan County, respectively.

Diagnosis: Snout much shorter than the rest of head but slightly longer than postorbital length. Coronet low, with 5 tubercles; occiptal keel behind the coronet with two low blunt ridges. Tubercles on the keels of shields not

Fig. 18. *Hippocampus trimaculatus* Leach, 117 mm BL.

Fig. 19. *Hippocampus trimaculatus* Leach, 98 mm BL.

developed into long slender spines. Generally pale brown to dark brown with three black spots on the dorsal profile of the trunk before dorsal fin.

Remarks: Presence of black blotches on superior keel of trunk in this species seems subject to variation. A specimen in the Museum of National Taiwan University was identified as *H. kelloggi* (=*H. kuda*; see below) (Fig. 19). The specimen has 21 dorsal rays and 11+40 body rings, but lacks the black blotches. It is probably a *H. trimaculatus.*

22. *Hippocampus kuda* (Bleeker, 1852)

Fig. 20

Hippocampus kuda, Weber and de Beaufort, 1922: 110; Chen, 1935: 19; Fowler, 1935: 67; Matsubara, 1955: 430; Smith, 1963: 518; Munro, 1967: 154; Chen, 1969: 264; Jones and Kumaran, 1980: 167; Masuda *et al.*, 1980: 187.

Hippocampus kelloggi Jordan and Snyder, 1901: 14; Matsubara, 1955: 430; Lindberg and Legeza, 1965: 273; Chen, 1969: 264.

Hippocampus atterimus Jordan and Snyder, 1901: 14; Matsubara, 1955: 430; Lindberg and Legeza, 1965: 273; Chen, 1969: 264.

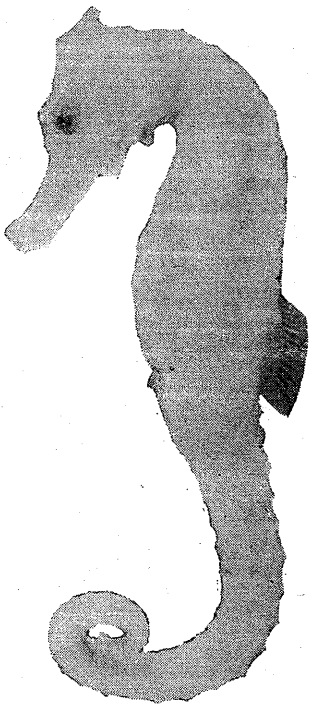

Fig. 20. *Hippocampus kuda* Bleeker, 114 mm BL.

Materials: 1 specimen, 114 mm BL, June 1977, sandy sediments among rocky littoral zone off Chengkong, Taitung County.

Diagnosis: Snout much longer than post-orbital part of head and nearly equal to the rest of head. Occiptal keel behind the coronet without acute spines but instead of two low rough ridges. Tubercles on keels rudimentary, enlarged at intervals. Generally pale brown, sometimes speckled.

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臺灣之海龍科魚類

李信徽

本文爲 22 種臺灣及隣近島嶼所產海龍科魚類相之系統整理結果，其中之 *Dunckerocampus dactyliophorus*, *Coelonotus liaspis*, *Halicampus koilomatodon*, *Microphis manadensis*, *Hippichthys heptagonus*, *H. spicifer*, *Syngnathus pelagicus*, *Corythoichthus flavofasciatus*, *Solegnathus hardwickii*, *Haliichthys taeniophorous* 及 *Hippocampus erinaceus* 等 11 種爲臺灣新記錄種。有關海龍科之共同特徵，屬種之分類檢索表，及每種魚之同物異名及種之特徵均一一記述於本文中，並附插圖以供參考。