



A Review of the Muraenid Eels (Family Muraenidae) from Taiwan with Descriptions of Twelve New Records¹

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Hong-Ming Chen, Kwang-Tsao Shao and Che-Tsung Chen (1994) A review of the muraenid eels (Family Muraenidae) from Taiwan with descriptions of twelve new records. *Zoological Studies* 33(1): 44-64. A total of 42 species belonging to 9 genera and 2 subfamilies of the family Muraenidae are indigenous to Taiwan. The 12 species: *Enchelycore bikiniensis*, *Gymnothorax brunneus*, *G. javanicus*, *G. margaritophorus*, *G. melatremus*, *G. nudivomer*, *G. reevesii*, *G. zonipectis*, *Strophidon sathete*, *Uropterygius macrocephalus*, *U. micropterus*, and *U. tigrinus* are first reported in this paper. The 7 species: *Enchelycore lichenosa*, *E. schismatorhynchus*, *Gymnothorax buroensis*, *G. hepaticus*, *G. meleagris*, *G. richardsoni* and *Siderea thyrsioidea* whose Taiwan existence was doubted or lacked specimens in the past are also recorded. Additionally, many species misidentifications or improper use of junior synonyms in previously literature stand corrected in this paper. Two previously recorded species *Gymnothorax monostigmus* and *G. polyuranodon* are, lacking Taiwan specimens, excluded. Color photographs, dentition patterns, synopsis, key, diagnosis, and remarks for all 42 species are provided in this paper.

Key words: Moray eels, Fish taxonomy, Fish fauna, Anguilliformes.

The Muraenidae fishes, commonly called moray eels, are shallow-water reef and crevice-dwelling eels. There are about 110 species of morays in the world which belong to the 12 genera of the 2 subfamilies: Uropterygiinae and Muraeninae (Nelson 1984). This group of fishes is distinguished from other eel families by their larger mouth, smaller gill openings, and pectoral and pelvic fin absence. Most species have a stout muscular body and dark skin pigmentation.

In Taiwan, the earliest moray record is the 1870 Günther listing of *Muraena nubila*; actually a misdesignation of *Gymnothorax chilospilus*, Bleeker 1864. Later, Jordan and Evermann (1902) added a new species, *Gymnothorax pescadoris*, and a new record of *Thyrsoidea macrura*. The former specification, as per our description in the present paper is a misdesignation of *Gymnothorax favagineus*. Jordan and Richardson (1909) added

the *Gymnothorax leucostigma* species. In 1967 Chen and Weng reviewed Taiwan specimens of muraenids and assigned a total of 6 genera and 24 species. But among their designations, the two species of *Thyrsoidea macrura* and *Strophidon ui* were *Strophidon sathete* synonyms; the *Gymnomuraena concolor* specimen was actually *S. sathete*; the *Gymnothorax punctatofasciatus* identification was also a mistake, it should be an undescribed species; their *Gymnothorax meleagris* specimen was actually *G. eurostus*; both *G. melanospilus* and *G. pescadoris* should be junior synonyms of *G. favagineus*; the *G. polyuranodon* specimen could not be located. Later, a *Gymnothorax pindae* specimen was collected in Taiwan by Randall and McCosker (1975). Shen (1974) recorded *Rhinomuraena quaesita* in southern Taiwan and rectified the synonym problem between *R. quaesita* and *R. ambonensis* (Shen et al. 1979). Three new

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records which appeared in Dr. Shen's illustrated books were *Strophidon brummeri* (Shen 1984a), *Gymnothorax monostigmus*, and *Gymnomuraena marmorata* (Shen 1984b). However, his specimens of the former two species have not yet been located and the last species, per its specimen photo, was misidentified. As for the two new records of morays added by Lee (1980): *Anarchias allardicei* and *Enchelynassa canina*, the specimen photo of the former species should be identified as *Gymnothorax chilospilus*, its existence was confirmed by E. Holm (pers. comm.); the latter identification should be *Enchelycore schismatorhynchus*.

The Lee and Tzeng (1985) new record of *G. chlamydatum* from Yen-Liao is valid. Chen and Yu (1986) added the nine moray species of: *Echidna delicatula*, *Gymnothorax schismatorhynchus*, *G. petelli*, *G. ruppelli*, *G. richardsoni*, *G. buroensis*, *G. hepatica*, *Aemasia lichenosa*, and *Enchelynassa canina* in their synopsis, all questionable since no specimens were offered or literature cited. Recently, Sasaki and Amaoka (1991) described a new moray species, *Gymnothorax prolatus*, collected from Su-ao, also invalid because their single specimen is a *Strophidon sathete* Youth (Chen and Shao, in preparation). Table 1 summarizes the taxonomic history and corrections of moray species used in several major Taiwan publications.

In sum, 8 genera and 40 species have been previously reported; but, only 4 genera and 23 species are valid. The remaining 17 species were misidentified, synonymous, or lacked specimens. In this paper we catalogue 9 genera and 42 moray species. Among which, 12 species are the first Taiwan records and the specimens of 7 other previously reported species are the first collected from Taiwan.

MATERIALS AND METHODS

Most specimens were collected by long-lining, hand-lining, trapping, or bottom trawling from the Taiwan area sea bottom; several species, especially young fishes, living in the coral reef area were collected from tidal pools by hand-net or from subtidal zones by SCUBA diving. Specimens were photographed when fresh and preserved in 10% formalin for further observations. All counts and measurements were done in accordance with those used by Böhlke et al. (1989). The following abbreviations are used in the text: TL, total length; HL, head length; DGO, depth of gill opening; TR, trunk length; Vert, number of vertebrae. Dentition

pattern of each species are provided in figures Fig. II-1 to II-42. Coloration was observed mostly on fresh specimens, formalin preserved specimens were used in supplementarity. All specimens are now deposited at the Museum of the Institute of Zoology, Academia Sinica (ASIZP), and the National Marine Science Museum (NMSMP). The authors have also examined the specimens deposited in the Museum of the Department of Zoology, National Taiwan University (NTUM), the Museum of the Department of Biology, Tunghai University (THUP), the Taiwan Fisheries Research Institute (TFRI), and the Taiwan Museum (TMF).

RESULTS AND DISCUSSION

Key to the subfamilies and genera of Muraenidae in Taiwan

- 1a. Dorsal and anal fin origin restricted to tail tip; hypobranchial 1 and 2 present (subfamily Uropterygiinae) 2
- 1b. Dorsal fin origin before or near gill opening; anal fin origin just behind anus; hypobranchial absent (subfamily Muraeninae) 3
- 2a. A lateral line pore near each posterior nostril, the pore and nostril separated only by a septum *Anarchias*
- 2b. No pore near posterior nostril *Uropterygius*
- 3a. Body elongate, TL greater than 30 4
- 3b. Body stout, TL less than 30 5
- 4a. Anterior nostrils not simple tubes, modified with flaps or leaflike enlargements except juvenile *Rhinomuraena*
- 4b. Anterior nostril simple tubes *Strophidon*
- 5a. Snout blunt, teeth shorter or conical 6
- 5b. Snout longer, fang-like teeth, never molariform 8
- 6a. Anus notably behind middle of body *Gymnomuraena*
- 6b. Anus close to middle or before middle of body 7
- 7a. Molariform teeth, more than 2 rows of teeth on vomer (adult) *Echidna*
- 7b. Conical teeth, 2 rows of low, conical teeth on vomer *Sidereia*
- 8a. Jaws elongate and significantly curved, cannot close completely, most jaw teeth protrude from the side *Enchelycore*
- 8b. Jaws slightly or not curved, can close completely; most jaw teeth do not protrude from the side *Gymnothorax*

Subfamily Muraeninae Genus *Echidna* Forster 1777

Echidna Forster 1777: 81 (not seen). Type: *E. variegata* Forster in Lichtenstein 1844 (not seen).

Key to species of Genus *Echidna*

- 1a. Body ground whitish with 25-30 wide black rings as youth; adults mottled with little black or dark brown spots between rings *E. polyzona*
- 1b. Body milky yellow with numerous small black spots or lines; 2 separate series of large starlike patches on the back and lower half of the body *E. nebulosa*

Table 1. Taxonomic history of all species of moray eels in Taiwan with the corrections of some species names which were used mistakenly in several major taxonomic literatures of Taiwan

Genus	No.	Species names	Chinese name	Chen & Weng, 1967	Shen, 1984b	Chen & Yu, 1986	Other publications
<i>Echidna</i>	1	<i>E. nebulosa</i>	星帶蜆鯪	+	+; × <i>E. polyzona</i>	+	
	2	<i>E. polyzona</i>	多環蜆鯪	+	× <i>Gymnothorax chilospilus</i>	+	
<i>Enchelycore</i>	*3	<i>E. bikiniensis</i>	比吉尼勾吻鯪				
	4	<i>E. lichenosa</i>	苔斑勾吻鯪			@? (<i>Aemasia lichenosa</i>)	
	5	<i>E. pardalis</i>	豹紋勾吻鯪	+ (<i>Muraena pardalis</i>)	+ (<i>Muraena pardalis</i>)	+ (<i>Muraena pardalis</i>)	
	6	<i>E. schismatorhynchus</i>	裂吻勾吻鯪			@? <i>Enchelynassa canina</i>	× Lee, 1980: <i>Enchelynassa canina</i>
<i>Gymnomuraena</i>	7	<i>G. zebra</i>	斑馬裸鯪	(<i>Echidna zebra</i>)	+	(<i>Echidna zebra</i>)	
<i>Gymnothorax</i>	8	<i>G. berndti</i>	班第氏裸胸鯪	+		+	
	*9	<i>G. brunneus</i>	褐裸胸鯪				
	10	<i>G. buroensis</i>	伯恩斯裸胸鯪			@?	
	11	<i>G. chilospilus</i>	雲紋裸胸鯪	+		+	+ Gunther, 1870
	12	<i>G. chlamydatus</i>	黑環裸胸鯪				+ Lee & Tzeng, 1985
	13	<i>G. eurostus</i>	截身裸胸鯪		+; × <i>Gymnothorax leucostigmus</i>		
	14	<i>G. favagineus</i>	黑斑裸胸鯪	+; (<i>G. melanospilus</i>)		+; (<i>G. melanospilus</i>)	Jordan & Evermann, 1902:(<i>G. pescadoris</i>)
		<i>G. favagineus</i>	黑斑裸胸鯪	(<i>G. pescadoris</i>)		(<i>G. pescadoris</i>)	
	15	<i>G. fimbriatus</i>	花鰭裸胸鯪	+	+	+	
	16	<i>G. flavimarginatus</i>	黃邊鰭裸胸鯪	+	× <i>Uropterygius marmoratus</i>	+	
	17	<i>G. hepaticus</i>	白邊裸胸鯪		× <i>Enchelycore bikiniensis</i>	@?	
	*18	<i>G. javanicus</i>	爪哇裸胸鯪				
	19	<i>G. kidako</i>	蝠紋裸胸鯪	+		+	
	20	<i>G. leucostigmus</i>	白斑裸胸鯪	+		+	+ Jordan & Richardson, 1909
	*21	<i>G. margaritophorus</i>	斑頸裸胸鯪				
	*22	<i>G. melatremus</i>	黃身裸胸鯪				
	23	<i>G. meleagris</i>	白口裸胸鯪	× <i>G. eurostus</i>	× <i>G. neglectus</i>	@?	
	24	<i>G. neglectus</i>	花斑裸胸鯪	+		+	
	*25	<i>G. nudivomer</i>	裸鋤裸胸鯪				
	26	<i>G. pindae</i>	平邊裸胸鯪				+ Randall & McCosker, 1975
	27	<i>G. pseudothysoideus</i>	淡網紋裸胸鯪	+		+	
	*28	<i>G. reevesii</i>	雷福氏裸胸鯪				
	29	<i>G. reticularis</i>	疏條紋裸胸鯪	+	+	+	
	30	<i>G. richardsoni</i>	李氏裸胸鯪			@?	
	31	<i>G. rueppelliae</i>	寬帶裸胸鯪		+	+; (<i>G. petelli</i>)	
	32	<i>G. undulatus</i>	疏斑裸胸鯪	+	+	+	
	*33	<i>G. zonipectis</i>	帶尾裸胸鯪				
<i>Rhinomuraena</i>	34	<i>R. quaesita</i>	黑身管鼻鯪		+	+	Shen, 1974; +; (<i>R. ambonensis</i>)
<i>Siderea</i>	35	<i>S. picta</i>	花斑星斑鯪	+	× <i>Gymnothorax pseudothysoideus</i>	+	
		<i>S. picta</i>	花斑星斑鯪		× <i>S. thyrsoidea</i>		
	36	<i>S. thyrsoidea</i>	密點星斑鯪			@ × <i>Echidna delicatula</i>	
<i>Strophidon</i>	37	<i>S. brummeri</i>	布氏長鯪		+	+	
	*38	<i>S. sathete</i>	長鯪	× <i>U. concolor</i>	× not a moray eel	× <i>U. concolor</i>	Jordan & Evermann, 1902:(<i>Thyrsoidea macrura</i>)
		<i>S. sathete</i>	長鯪	(<i>Thyrsoidea macrura</i>)		? (<i>Thyrsoidea macrura</i>)	× Sasaki & Amaoka, 1991: <i>Gymnothorax prolatus</i>
		<i>S. sathete</i>	長鯪	(<i>Strophidon ui</i>)		? (<i>Strophidon ui</i>)	
<i>Anarchias</i>	39	<i>A. allardicei</i>	褐襖鰭鯪			? <i>Uropterygius concolor</i>	@ Lee, 1980: <i>Gymnothorax chilospilus</i>
<i>Uropterygius</i>	*40	<i>U. macrocephalus</i>	巨頭鰭尾鯪				
	*41	<i>U. micropterus</i>	小鰭鰭尾鯪			? <i>U. marmoratus</i>	
	*42	<i>U. tigrinus</i>	虎斑鰭尾鯪				
<i>Gymnothorax</i>		<i>G. monostigmus</i>	單眼斑裸胸鯪		# +	?	
		<i>G. polyuranodon</i>	豹紋裸胸鯪	#		?	
		<i>G. punctatofasciatus</i>	密條紋裸胸鯪	×		×	

* new record in present paper;
specimen lost;

+ species reported correctly;
× misidentified;

@ should be recorded first in present paper;
? without citations or specimens.

() synonym

1. *Echidna nebulosa* (Ahl 1789)

(Fig. I-1; Fig. II-1)

Muraena nebulosa Ahl 1789: 7 (East India)*Echidna variegata*: Bleeker 1864: 80.*Echidna nebulosa*: Smith 1962: 423; Chen and Weng 1967: 13.

Specimens: NMSMP 168, 25 cm TL, May 20, 1986, Hsiaoliuchiu; ASIZP 056643, 4 specimens, 12.8-31.3 cm TL, Sept. 21, 1987, Maoao.

Diagnosis: HL 8.6-8.9, DGO 19.1-26.5, TR 2.6-2.7 in TL; Vert 120-125. Yellowish anterior nostrils and iris. Yellowish or whitish body with numerous fine vermiculated lines or small spots. Two series of large, reticulated black spots sometimes reduced to star-like patterns on the body; one series along back, another series along the lower half of body.

2. *Echidna polyzona* (Richardson 1844)

(Fig. I-2a,b; Fig. II-2)

Muraena polyzona Richardson 1844: 112 (no locality given)*Echidna polyzona*: Bleeker 1864: 81; Schultz 1953:104; Chen and Weng 1967: 11.

Specimens: ASIZP 056634, 18 specimens, 9-49 cm TL, Jul. 16, 1975, Maopitou; ASIZP 056354, 18 cm TL, Jan. 14, 1975, Maopitou; NMSMP 296, 22 cm TL, Jan. 13, 1990, Howan.

Diagnosis: HL 6.5-7.5, DGO 12-17.8, TR 2.8-3.0 in TL; Vert 121-124. Yellowish anterior nostrils. Rows and number of teeth increase with age. Body coloration of young fish: whitish with 25-30 wide black rings. While maturing, body will be mottled with little black spots between rings until becoming uniformly brown. A dark patch at the corner of mouth.

Genus *Enchelycore* Kaup 1856*Enchelycore* Kaup 1856: 60. Type: *Muraena nigricans* Bonaterre 1788 (not seen).**Key to species of Genus *Enchelycore***

- 1a. Posterior nostril long tubular-like, longer than anterior ... *E. pardalis*
- 1b. Posterior nostril not long tubular-like, far shorter than the anterior, or an oval opening 2
- 2a. Body not uniformly brownish with many moss colored spots *E. lichenosa*
- 2b. Body uniformly brownish 3
- 3a. With white or yellow fin margin ... *E. schismatorhynchus*
- 3b. Without white or yellow fin margin *E. bikiniensis*

3. *Enchelycore bikiniensis* (Schultz 1953)

(Fig. I-3; Fig. II-3)

Gymnothorax bikiniensis Schultz 1953: 116 (Bikini Atoll).*Enchelycore bikiniensis*: Myers 1989:42.

Specimens: ASIZP 055636, 3 specimens, 56.2-69.7 cm TL, Oct. 18, 1980 Gengluh; NMSMP 933, 79.5 cm TL, Jan. 10, 1991, Aoti.

Diagnosis: HL 7.0-8.0, DGO 14.5-17.1, TR 2.7-2.8 in TL; Vert 146-148. Uniformly brownish body; lower jaws, belly to the anus, paler. Median fins slightly darker than body without yellow or white margin. Sometimes a slightly speckled region between eye and gill opening.

Remark: This species is very similar to *Enchelycore schismatorhynchus* in both body coloration and jaw shape, differing mainly in fin margin color and dentition. Whether they are the same or different species is still in debate.

4. *Enchelycore lichenosa***(Jordan and Snyder 1901)**

(Fig. I-4; Fig. II-4)

Aemasia lichenosa Jordan and Snyder 1901: 883. (Wakanoura, Japan); Chen and Yu 1986:249.*Enchelycore lichenosa*: Hatooka 1984: 23.

Specimens: ASIZP 056525; 3 specimens, 61.5-70.1 cm TL, Oct., 1987, Yenliao; NMSMP 631, 2 specimens, 50.8-75 cm TL, Jan. 10, 1991, Aoti.

Diagnosis: HL 6.8-7.5, DGO 13.6-17.5, TR 3.2-3.5 in TL, Vert 148-152. Ground color dark brownish body with 3 rows of moss-like golden-yellowish spots on both sides of the body. Numerous little spots about the head, lower abdomen and the space between large moss-like spots. Pale yellowish abdomen.

5. *Enchelycore pardalis***(Temminck and Schlegel 1847)**

(Fig. I-5; Fig. II-5)

Muraena pardalis Temminck and Schlegel 1847: 268 (Nagasaki); Chen and Weng 1967:15.*Enchelycore pardalis*: Böhlke et al. 1989:135; Miller 1989: 662.

Specimens: ASIZP 054938, 35.2 cm TL, Oct. 22, 1977, Hopingtao; ASIZP 056509, 21 cm TL, Feb. 25, 1975, Maopitou.

Diagnosis: HL 6.2-7.0, DGO 13.1-15.2, TR 3.3-3.5 in TL, Vert 125-129. Posterior nostrils thick, upward tubes, longer than anterior nostrils. Color in formalin: brownish, body covered with numerous round, whitish and dark-margin spots; spots of lower trunk larger or fused with many white confluent crossbars on abdomen. Orange-reddish when fresh snout, lower part of head, and abdomen. Bluish cornea.

Remarks: This species was previously placed in the Atlantic and Mediterranean genus *Muraena*. Since, no other *Muraena* species has been found

in the Indo-Pacific regions except the "*Muraena pardalis*" and many other characteristics of this species including: head, jaw shape, gill opening coloration and dentition are so similar to the Genus *Enchelycore* rather than *Muraena*, we reassign the genus status of this species.

6. *Enchelycore schismatorhynchus* (Bleeker 1853)

(Fig. I-6a,b; Fig. II-6)

Muraena schismatorhyncha Bleeker 1853: 301 (Sumatra)
Enchelycore schismatorhynchus: Hatooka 1984: 23.

Specimens: ASIZP 055101, 56.6 cm TL, Aug. 17, 1978, Lantao; NMSMP 632, 17.8 cm TL, Jun. 2, 1979, Wanlitung.

Diagnosis: HL 6.6-7.2, DGO 16.1-22.5, TR 2.8-3.7 in TL, Vert 143-147. Body coloration: uniformly brownish, paler at head, lower jaw and abdomen. Dark brownish with bright yellow to white median fins.

Remarks: In 1953, Schultz recorded two new species: *Gymnothorax bikiniensis* and *G. bayeri* from his "*G. schismatorhynchus*" (Schultz 1943) based on their different dentition patterns (Actually these three species now belong to the genus *Enchelycore*). The *E. bayeri* should be a junior synonym of *E. schismatorhynchus* because both species have a yellow-whitish fin margin, and dentition differences might be due to different body size, age, and sex.

Genus *Gymnomuraena* Lacépède 1803

Gymnomuraena Lacépède 1803: 648. Type: *G. doliata* Lacépède 1803.

7. *Gymnomuraena zebra* (Shaw 1797) (Fig. I-7; Fig. II-7)

Gymnothorax zebra Shaw 1797: pl.322 (Sumatra)
Echidna zebra: Bleeker 1864: 81; Chen and Weng 1967: 10.
Gymnomuraena zebra Kaup 1856: 104; Hatooka 1984: 25.

Specimens: ASIZP 056630, 88 cm TL, Oct. 28, 1969, Maopitou; NMSMP 107, 100 cm TL, Feb. 28, 1985, Nanwan.

Diagnosis: HL 12.2-15.0, DGO 18-20, TR 1.76 in TL; Vert 132-137. Body elongate, trunk longer, tail shorter than head and trunk, wrinkled skin. Snout short, lower jaw slightly shorter than upper. Vertical fins unclear and hidden below the tough skin. Brown to blackish body, encircled with 43-76 creamy-white narrow rings. Some rings incomplete.

Remark: This species was occasionally placed in the genus of *Echidna* because of molariform

teeth and short snout.

Genus *Gymnothorax* Bloch 1795

Gymnothorax Bloch 1795: 83. Type: *G. reticularis* Bloch 1795.

Key to species of Genus *Gymnothorax*

- 1a. Body color uniform without any blotches, spots or bands 2
- 1b. Body color not uniform with some blotches, spots or bands 5
- 2a. Body color yellowish *G. melatremus*
- 2b. Body color brownish 3
- 3a. Maxillary teeth 2-3 rows *G. brunneus*
- 3b. Maxillary teeth 1 row 4
- 4a. Fins without whitish margin *G. pindae*
- 4b. Fins with whitish margin *G. hepaticus*
- 5a. Maxillary teeth 2-3 rows on each side, inner row at least 10 canine teeth 6
- 5b. Maxillary teeth only one row on each side, or with some canine teeth inside the maxillary teeth, generally not exceeding 5 teeth 8
- 6a. Margin of fins yellowish *G. buroensis*
- 6b. Margin of fins not yellowish 7
- 7a. Body brownish with numerous dark-edged white spots *G. meleagris*
- 7b. Body dark brownish with numerous yellow-whitish dots and some rows of black dots on body side *G. eurostus*
- 8a. Gill opening blackish 9
- 8b. Gill opening not blackish 11
- 9a. Margin of fins yellow-greenish *G. flavimarginatus*
- 9b. Margin of fins not yellow-greenish 10
- 10a. Body brownish with numerous irregularly large dark-brownish spots *G. javanicus*
- 10b. Body yellowish, gradually turning dark-brownish toward the tail tip, with many dark-edged white spots *G. nudivomer*
- 11a. Body with some dark-colored rings 12
- 11b. Body without dark-colored rings 14
- 12a. Body rings composed of numerous brownish blotches *G. reticularis*
- 12b. Body rings complete, not composed of numerous brownish blotches 13
- 13a. Body rings blackish, head and ring interspaces have some blackish rounded dots *G. chlamydatus*
- 13b. Body whitish to brownish, with some dark-brownish abdominal rings discontinuous *G. rueppelliae*
- 14a. Body with many cross-linked, wavy lines or bands 15
- 14b. Body without cross-linked, wavy lines or bands 19
- 15a. Body lines or bands whitish 16
- 15b. Body lines or bands dark-brownish 17
- 16a. Body lines thin and net-like, sometimes not obvious *G. pseudothyrosideus*
- 16b. Body with wavy, thick, whitish bands *G. undulatus*
- 17a. Body whitish *G. berndti*
- 17b. Body not whitish 18
- 18a. Body brown to grey, with some wavy dark brownish lines, trunk with some little green dots; biserial vomer teeth; jaw pores within white spots *G. richardsoni*
- 18b. Body yellowish to brownish, with numerous irregularly dark-brownish dendritic bands and lines; jaw pores not within white spots *G. kidako*
- 19a. Tail with comb-like bands 20

- 19b. Tail without comb-like bands 23
 20a. Head with some whitish spots 21
 20b. Head without whitish spots 22
 21a. Tail fin comb-like bands not dark, jaw pores with obvious whitish spots *G. chilospilus*
 21b. Tail fin comb-like bands particularly dark; jaws and face with some streaking whitish bands *G. zonipectis*
 22a. Snout pointed and elongated *G. fimbriatus*
 22b. Snout blunt *G. reevesii*
 23a. Body with some whitish spots 24
 23b. Body with some blackish, round spots .. *G. favagineus*
 24a. With a row of blackish spots behind eye
 *G. margaritophorus*
 24b. Without a row of blackish spots behind eye 25
 25a. Body with many large, round, obscure, whitish spots; snout pointed and elongated *G. leucostigmus*
 25b. Body with numerous small white-yellowish spots; snout shorter *G. neglectus*

8. *Gymnothorax berndti* Snyder 1904

(Fig. I-8; II-8)

Gymnothorax berndti Snyder 1904: 518 (Hawaiian Is.); Chen and Weng 1967: 29.

Specimens: ASIZP 056649, 56.3 cm TL, Jul. 18, 1992, Hopingtao; NMSMP 945, 65 cm TL, Mar. 20, 1992, Nanfangao.

Diagnosis: HL 6.6-7.7, DGO 12.1-14.6, TR 2.9-3.0 in TL, Vert 136-140. Ground color body with numerous wavy, thick, blackish or blackish brown bars; head and thick bar interspaces covered with thin blackish brown network. Blackish corner of mouth inner mouth skin coloration similar to body coloration. Anal fin has a broad blackish base and whitish margin; yellowish iris when alive.

9. *Gymnothorax brunneus* Herre 1923

(Fig. I-9; Fig. II-9)

Gymnothorax brunneus Herre 1923: 212 (Puerto Galera, Mindoro); Hatooka 1984:25

Gymnothorax herrei: Beebe and Tee-Van 1933; Ferraris 1985: 518-520.

Specimen: NMSMP 95, 13.4 cm TL, Jul. 5, 1982, Wanlitung.

Diagnosis: HL 8.3; DGO 26.6, TR 2.8 in TL, Vert 114. Uniformly brownish body, with a paler head, abdomen, fins and posterior part of tail. Body size smaller, generally not exceeding 20 cm TL.

Remarks: In 1933, Beebe and Tee-Van noticed the homonymy relationship between this species and a Caribbean species and rectified the specification by substituting the name of *G. herrei* for Herre's species; since the Caribbean species seems invalid, we have chosen the original specification.

10. *Gymnothorax buroensis* (Bleeker 1857)

(Fig. I-10; Fig. II-10)

Muraena buroensis Bleeker 1857: 79 (Buro; Amboina; Indonesia).

Gymnothorax buroensis: Bleeker 1864: 90; Randall et al. 1990: 35.

Specimens: ASIZP 056495, 11.0 cm TL, Dec. 3, 1985, Wanlitung; NMSMP 532, 15.6 cm TL, Aug. 30, 1990, Lungtung.

Diagnosis: HL 7.1-7.5, DGO 12.7-17.1, TR 2.9-3.2 in TL, Vert 111-120. Body size small, rarely exceeding 33 cm TL. Brownish body, lower jaw and abdomen paler, with several rows of longitudinal dark-brownish dots, whitish interspaces diminish toward the tail tip. Caudal fin margin, yellow-greenish posteriorly. Black-brownish ocular posterior area, supraorbital pores, and median fins.

11. *Gymnothorax chilospilus* Bleeker 1864

(Fig. I-11a,b; II-11)

Gymnothorax chilospilus Bleeker 1864: 103 (Indonesia:Benkulen); Chen and Weng 1967: 36.

Specimens: ASIZP 056651, 2 specimens, 38.5-49.6 cm TL, Nov. 19, 1991, Yenliao; NMSMP 633, 6 specimens, 38.0-47.2 cm TL, May 7, 1992, Aoti.

Diagnosis: HL 7.0-8.3, DGO 12.9-17.0, TR 2.9-3.4 in TL, Vert 124-128. Body size medium, rarely exceeding 52 cm. Very variable body color, ground color from pale yellowish to brownish; with numerous irregular dark-brownish bars across the body, some bars connected and some separate. Each jaw pore within a whitish spot; posterior part of each side of lower jaw has a large white spot; blackish mouth corner.

12. *Gymnothorax chlamydatus* Snyder 1908

(Fig. I-12; II-12)

Gymnothorax chlamydatus Snyder 1908: 94 (Okinawa); Lee and Tzeng 1985: 295-296.

Specimens: ASIZP 055786, 50.6 cm TL, Jun. 30, 1981, Yenliao; NMSMP 1012, 43.5 cm TL, Sept. 17, 1990, Tahsi.

Diagnosis: HL 8.9-9.9, DGO 25.6-26.3, TR 3.0-3.2 in TL, Vert 132-135. Jaws blunt, tail thin. Ground color yellow-brownish body, with 12-13 complete blackish cross bands which have paler whitish edges. Many round blackish spots of different size scattered in cross band interspaces and head; chin has thick blackish band; yellowish iris with blackish cross-spots.

13. *Gymnothorax eurostus* (Abbott 1861)
(Fig. I-13; Fig. II-13)

Thyrsoidea eurosta Abbott 1861: 478-479 (Hawaiian Islands) (not seen).

Gymnothorax eurostus: Randall et al. 1990: 36; Hatooka 1984: 23.

Specimens: ASIZP 056645, 2 specimens, 52.5-60.2 cm TL, May 7, 1992, Aoti; NMSMP 169, 16 cm TL, May 20, 1986, Hsiaoliuchiu.

Diagnosis: HL 7.1-8.8, DGO 10.4-17.3, TR 2.9-3.4 in TL, Vert 124-127. Jaws slightly curved. Dark-brownish body, with numerous yellow-whitish dots, density increases with proximity to head; several rows of black-brownish dots on body side. Orange iris; whitish anterior nostril root, jaw pores and tail tip margin.

14. *Gymnothorax favagineus* Bloch and Schneider 1801
(Fig. I-14a,b; II-14)

Gymnothorax favagineus Bloch and Schneider 1801: 525 (Tranquebar India); Chen and Weng 1967: 33; Randall et al. 1990: 36.

Gymnothorax melanospilus: Bleeker 1864: 90; Chen and Weng 1967: 30; Hatooka 1984: 24.

Gymnothorax pescadoris: Jordan and Evermann 1902: 326; Chen and Weng 1967: 31.

Specimens: ASIZP 056631, 44.5 cm TL, May 20, 1975, Yehliu; ASIZP 056637, 37.2 cm TL, Aug., 1975, Wanli; NMSMP 816, 72 cm TL, Jun. 18, 1991, Aoti.

Diagnosis: HL 7.2-7.5, DGO 10.8-15.9, TR 2.7-3.1 in TL, Vert 139-141. May attain approximately 175 cm TL. Ground color whitish or pale to light brownish with numerous rounded or polygonal blackish spots about the body. Spot pattern very variable; spots of jaws and head less regular in shape and very numerous, more sparse on belly, frequently with light whitish margin around the spot; spot number increases with age but spot size remains almost constant.

Remarks: Both *G. melanospilus* and *G. pescadoris* are junior synonyms of this species because descriptions of their body proportion, dentition, skin coloration pattern, vertebrae count range, even the largest body length value are so similar. *G. favagineus* is a common moray throughout the Indo-Pacific Ocean region, the species names *G. melanospilus* and *G. pescadoris* were often locally used.

15. *Gymnothorax fimbriatus* (Bennett 1832)
(Fig. I-15; II-15)

Muraena fimbriata Bennett 1832: 168 (Mauritius) (not seen).
Gymnothorax fimbriatus: Schultz 1953: 131; Chen and Weng 1967: 32.

Specimens: ASIZP 056652, 2 specimens, 17.1-19.5 cm TL, Aug. 10, 1990, Wanlitung; NMSMP 216, 12.1 cm TL, Nov. 28, 1988, Nanwan.

Diagnosis: HL 6.7-7.1, DGO 14.0-20.0, TR 2.9-3.4 in TL, Vert 131-133. Jaws pointed, elongated and slightly curved. Ground color body from yellowish white to brownish; each body side with numerous, blackish brown spots in 3-4 longitudinal rows; head and abdomen speckled with many small blackish dots in large individuals. Posterior fin has blackish brown comb-like bands. Body spot variations occur in some individuals, large spots may link vertically forming several wavy bars.

16. *Gymnothorax flavimarginatus* (Rüppell 1830)
(Fig. I-16; II-16)

Muraena flavimarginata Rüppell 1830: 119 (Red Sea).

Gymnothorax flavimarginatus: Bleeker 1864: 95; Chen and Weng 1967: 22.

Specimens: ASIZP 056501, 19.2 cm TL, Mar. 26, 1975, Maopitou; NMSMP 944, 25.0 cm TL, Jan. 25, 1981, Taipingtao.

Diagnosis: HL 7.5-7.8, DGO 15.0-17.2, TR 2.9-3.2 in TL, Vert 129-137. Brownish body, covered with numerous dark-brownish spots; gill opening in a blackish patch; blackish corner of mouth; bright yellow-greenish margin median fins.

17. *Gymnothorax hepaticus* (Rüppell 1828)
(Fig. I-17; Fig. II-17)

Muraena hepatica Rüppell 1828: 120 (Red Sea).

Gymnothorax albimarginatus: Bleeker 1864: 107; Hatooka 1984: 25.

Gymnothorax hepaticus: Schultz 1953: 127.

Specimens: ASIZP 056644, 106.4 cm TL, May 24, 1992, Penghu; NMSMP 1011, 88.8 cm TL, Jun. 6, 1992, Taitung.

Diagnosis: HL 8.5-8.6, DGO 13.6-14.8, TR 2.3-2.4 in TL, Vert 185-189. Body elongated; head and trunk are longer than the tail. Uniformly light brownish body, black-brownish median fin outer layers, bright whitish fin margin; paler snout and abdomen; yellowish iris; jaw pores, whitish snout tip; yellowish posterior nostrils.

18. *Gymnothorax javanicus* (Bleeker 1859)
(Fig. I-18; Fig. II-18)

Muraena javanica Bleeker 1859: 347 (Java).

Gymnothorax javanicus: Bleeker, 1864: 95

Specimens: ASIZP 054921, 24.8 cm TL, Apr. 3, 1977, Wanlitung; ASIZP 056526, 72.2 cm TL, Feb. 16, 1989, Chinsan.

Diagnosis: HL 7.5-7.8, DGO 14.4-17.7, TR 2.9-3.0 in TL, Vert 140-143. Body can attain great lengths. Brownish body, with many large irregular dark-brownish splotches, separated from each other by a paler net-like pattern; lower jaw and abdomen paler; blackish corners of mouth and gill openings.

**19. *Gymnothorax kidako*
(Temminck and Schlegel 1846)**

(Fig. I-19; II-19)

Muraena kidako Temminck and Schlegel 1846: 266 (Nagasaki, Japan).

Gymnothorax kidako: Chen and Weng 1967: 25; Hatooka 1984: 23.

Specimens: ASIZP 056650, 63.9 cm TL, Aug. 8, 1991, Hopingtao; NMSMP 634, 3 specimens, 67.1-72.5 cm TL, Jan. 10, 1991, Aoti.

Diagnosis: HL 7.6-7.7, DGO 11.0-13.9, TR 2.9-3.3 in TL, Vert 139-141. Body camouflaging yellowish to brownish color, with numerous irregular, dendritic dark brownish bars across the body. Blackish mouth corner; anal fin has whitish margin.

20. *Gymnothorax leucostigmus* Jordan and Richardson 1909

(Fig. I-20; II-20)

Gymnothorax leucostigma Jordan and Richardson 1909: 174 (Takao, Taiwan); Chen and Weng 1967: 346; Hatooka 1984: 23.

Specimens: ASIZP 055026, 45.1 cm TL, Apr., 1978, Yehliu; NMSMP 815, 52 cm TL, Jun. 18, 1991, Aoti.

Diagnosis: HL 7.1-8.3, DGO 15.8-18.3, TR 3.0-3.2 in TL, Vert 135-138. Jaws pointed and elongated. Ground color reddish brown, with numerous obscure large pale spots which, closer to the tail, get smaller and more distinct; the spots on top of head denser and smaller; chin and breast pale without spots. Slightly blackish gill opening; corner of mouth and thoracic creases blackish. Yellowish iris when alive.

**21. *Gymnothorax margaritophorus*
Bleeker 1864**

(Fig. I-21; II-21)

Gymnothorax margaritophorus Bleeker 1864: 97 (Amboina, Indonesia); Randall et al. 1990: 38.

Lycodontis margaritophorus: Smith 1962: 434.

Specimens: ASIZP 056656, 8.3 cm TL, Jul. 10,

1989, Wanlitung; NMSMP 175, 12.4 cm TL, Jun. 10, 1987, Wanlitung.

Diagnosis: HL 7.2-7.4, DGO 24.4-27.0, TR 3.1-3.5 in TL, Vert 128-132. Jaws pointed and elongated. Ground color brownish body, with numerous yellowish white, star shaped spots in 3-5 vertical rows along the body; 5-8 large blackish brown spots behind ocular area and a whitish band just behind the eye; bright whitish cross-lines through the the upper head axis. Blackish anterior nostril. The lower jaw, chin, thorax and perhaps abdomen are all whitish in smaller individuals.

22. *Gymnothorax melatremus* Schultz 1953

(Fig. I-22; Fig. II-22)

Gymnothorax melatremus Schultz 1953: 120 (Bikini Atoll, Marshall Ids.); Myers 1989: 44; Randall et al. 1990: 39.

Specimens: ASIZP 056520, 14.6 cm TL, May 30, 1979, Wanlitung; NMSMP 176, 13.7 cm TL, Oct. 21, 1987, Wanlitung.

Diagnosis: HL 6.8-9.1, DGO 13-15.2, TR 2.8-3.1 in TL. Body smaller, uniformly yellowish when fresh. Body turns white-brownish quickly in formalin or alcohol. Vertical blackish band iris. Blackish gill openings. Lower part of head, abdomen and fin are all paler in alcohol.

**23. *Gymnothorax meleagris*
(Shaw and Nodder 1795)**

(Fig. I-23; Fig. II-23)

Muraena meleagris Shaw and Nodder 1795: 229, ("Southern Ocean") (not seen).

Gymnothorax meleagris: Schultz 1953: 114; Randall et al. 1990: 39.

Specimens: ASIZP 056632, 23.5 cm TL, Aug. 31, 1977, Wanlitung.

Diagnosis: HL 7.4-8.1, DGO 11.4-13.9, TR 3.2-3.5 in TL, Vert 126-128. Dark red-brownish body, with numerous round, dark-edged, white spots; blackish anterior nostril and gill openings; whitish inner mouth skin and tail terminus.

Remarks: The specimens previously reported as *G. meleagris* in Taiwan (Chen and Weng 1967) are actually *G. eurostus*.

24. *Gymnothorax neglectus* Tanaka 1911

(Fig. I-24; II-24)

Gymnothorax neglectus Tanaka 1911: 28 (Keelung, Taiwan); Chen and Weng 1969: 35; Hatooka 1984: 25.

Specimens: ASIZP 056655, 69.9 cm TL, Dec. 4, 1991, Hopingtao; NMSMP 956, 68.0 cm TL, Dec. 4, 1991, Hopingtao.

Diagnosis: HL 8.4-9.2, DGO 10.6-13.3, TR 2.5-2.6 in TL, Vert 142. Snout short and blunt; swollen thorax; slender tail. Reddish brown body with numerous small yellowish-white spots, even the inner mouth skin; spots on head more dense and yellowish when fresh; near the tail tip the spots decrease and nearly disappear. Fins darker but with a slight whitish margin; slightly blackish gill opening.

**25. *Gymnothorax nudivomer*
(Playfair and Günther 1866)**

(Fig. I-25; II-25)

Muraena nudivomer Playfair and Günther in Playfair 1866: 127 (Zanzibar).

Gymnothorax nudivomer: Hatooka 1984: 24; Randall et al. 1990: 39.

Specimens: ASIZP 056646, 63.8 cm TL, Dec. 8, 1991, Nanfangao; ASIZP 056647, 66.0 cm TL, Dec. 8, 1991, Nanfangao; NMSMP 989, 58.4 cm TL, Dec. 8, 1991, Nanfangao.

Diagnosis: HL 8.2-8.8, DGO 8.8-11.0, TR 2.9-3.0 in TL, Vert 133-139. Snout blunt, lower jaw extruded, thorax skin and abdomen loose and swollen. Yellowish body anteriorly, gradually becoming dark-brownish posteriorly; with numerous, round, dark-edged whitish spots which are smaller and denser anteriorly. Gill opening in a blackish spot; brightly yellowish inner mouth skin.

26. *Gymnothorax pindae* Smith 1962

(Fig. I-26; Fig. II-26)

Gymnothorax pindae Smith 1962: 430 (Mozambique, Pinda); Randall and McCosker 1975: 17-18; Hatooka 1988: 87-89.

Specimens: ASIZP 054896, 25.4 cm TL, Aug. 30, 1977, Wanlitung; NMSMP 297, 18.4 cm TL, Jan. 13, 1990, Wanlitung.

Diagnosis: HL 6.6-6.9, DGO 14.1-14.2, TR 3.3-3.6 in TL, Vert 120. Teeth with serrated edges.

Uniformly brownish body, with blackish fin margins. Dark-brownish ocular region. Slightly blackish anterior and posterior nostrils, pores of jaws, and gill opening. Lateral line pores more or less whitish. Uniformly whitish inner mouth skin.

Remarks: The species specimens deposited at the ASIZ museum were previously misidentified as *G. hepaticus*. It differs from *G. hepaticus* by lack of white fin margin and white jaw pores.

**27. *Gymnothorax pseudothyrsoides*
(Bleeker 1852b)**

(Fig. I-27; II-27)

Muraena pseudothyrsoides Bleeker 1852b: 778 (Macassar).

Gymnothorax pseudothyrsoides: Bleeker 1864: 104; Chen and Weng 1967: 28.

Specimens: ASIZP 056669, 56 cm TL, Oct. 12, Penghu; NMSMP 635, 2 specimens, 45.5-60.0 cm TL, Jan. 10, 1991, Aoti.

Diagnosis: HL 7.0-7.6, DGO 12.5-16.7, TR 2.9-3.1 in TL, Vert 128-131. Very variable body color; ground color from pale, greenish, brown yellowish to brownish. Obscure dark-brownish spots separated by many thin incomplet networks form several rows along the body. These network lines will grow more unclear with age. The head is a little reddish when alive; dorsal fin has thin whitish margin, lower jaw generally paler in adults.

28. *Gymnothorax reevesii* (Richardson 1845)

(Fig. I-28; II-28)

Muraena reevesii Richardson 1845: 109 (China Seas).

Gymnothorax reevesii: Hatooka 1984: 24.

Specimens: ASIZP 056653, 65.0 cm TL, Oct. 26, 1991, Hopingtao; NMSMP 941, 69.8 cm TL, Oct. 26, 1991, Hopingtao.

Diagnosis: HL 6.8-8.1, DGO 10.0-10.1, TR 2.6-2.8 in TL, Vert 125-128. Upper jaw slightly curved downward. Ground color yellowish brown to brownish body; with numerous large obscure dark brownish spots in 3-5 rows along the body side; many small brownish dots speckled about the body. Fin has posterior dark margin, caudal fin has comb-like dark brownish bands.

29. *Gymnothorax reticularis* Bloch 1795

(Fig I-29; II-29)

Gymnothorax reticularis Bloch 1795: 85 (Indian Ocean) (not seen); Chen and Weng 1967: 23.

Specimens: ASIZP 056648, 2 specimen, 45.4-48.0 cm TL, Jan. 28, 1992, Yungan; NMSMP 342, 40 cm TL, Mar. 9, 1990, Tahsi.

Diagnosis: HL 7.1-7.3, DGO 17.8-18.4, TR 3.1-3.3 in TL, Vert 137-138. Tail thin and slender; upper jaw parrot-like; swollen thorax. Ground color white to yellow body; with 17-20 incomplete brownish crossbands composed of numerous little brownish dots, denser at abdomen. Space between bands covered with some brownish dots notably on the upper part of body.

30. *Gymnothorax richardsoni* (Bleeker 1852a)

(Fig. I-30; II-30)

Muraena richardsoni Bleeker 1852a: 296 (Ceram; Sumatra)

Gymnothorax richardsoni: Bleeker 1864: 100; Hatooka 1984: 25.

Specimens: ASIZP 056638, 20.1 cm TL, Jun. 20, 1975, Maopitou; NMSMP 117, 26.6 cm TL, May 7, 1990, Tungsha.

Diagnosis: HL 7.4, DGO 15.5-16.6, TR 2.7-3.0 in TL, Vert 114-116. Vomer teeth biserial. Body size smaller, rarely exceeding 35 cm. Ground color greenish brown body when alive and light brown or grayish in alcohol; many irregular dark brownish bands; jaw pores in white spots; fins, abdomen, lower jaw and chin speckled with many white spots.

31. *Gymnothorax rueppelliae*
(McClelland 1845)
(Fig. I-31a,b; II-31)

Dolphis rueppelliae McClelland 1845: 213 (Bengal, India).

Gymnothorax petelli: Schultz 1953: 133.

Gymnothorax rueppelliae: McCosker and Randall 1982: 19.

Specimens: ASIZP 056508, 2 specimens, 15.6-22.7 cm TL, Sep., 1975, Maopitou; ASIZP 056635, 2 specimens, 12.2-47.3 cm TL, Jul., 1975, Maopitou; NMSMP 886, 12.2 cm TL, Aug. 17, 1991, Tungchi.

Diagnosis: HL 7.6-7.7, DGO 17.4-17.5, TR 3.2 in TL, Vert 132-135. The body is translucent or whitish yellow when young, dark brownish as adult. Body has 16-18 dark brownish cross bands which disconnect at abdomen. In large size individuals, the space between two cross bands has one obscure brownish spot near the dorsal and anal fin margin. Dorsal and anal fin margin paler. Blackish anterior nostrils, mouth corners and inner mouth skin, Yellowish top of adult head.

32. *Gymnothorax undulatus* (Lacépède 1803)
(Fig. I-32; II-32)

Muraenopsis undulatus Lacépède 1803: 629, 644 (locality not given).

Gymnothorax undulatus: Schultz 1953: 137-138; Chen and Weng 1967: 27.

Specimens: ASIZP 056636, 3 specimens, 26.0-27.1 cm TL, Aug., 1975, Wanli; NMSMP 636, 70 cm TL, Jan. 10, 1991, Aoti.

Diagnosis: HL 6.8-8.1, DGO 13.9-16.5, TR 3.0-3.5 in TL, Vert 131-133. Ground color blackish brown to greenish brown body with numerous wavy, net-like whitish lines across the body. Darker snout; Yellowish green top of head when alive; darker mouth corner in some individuals.

33. *Gymnothorax zonipectis* Seale 1906
(Fig. I-33; II-33)

Gymnothorax zonipectis Seale 1906: 7 (Tahiti, South Pacific); Randall et al. 1990:41.

Specimens: ASIZP 056521, 17.3 cm TL, Mar. 18, 1985, Wanlitung; NMSMP 551, 33 cm TL, Sep. 17, 1990, Tahsi.

Diagnosis: HL 6.4-7.2, DGO 15.7-19.0, TR 3.3-3.4 in TL, Vert 122-126. Body smaller, rarely exceeding 40 cm TL. Jaws pointed and elongated, slightly curved. Ground color light brownish body, with many vertical irregular dark brownish bars on body side; tail with oblique, thick, comb-like, dark-brownish bands; each jaw pore within a whitish bar, a broad blackish brown bar extends backward from eye; face has several extend whitish bars.

Genus *Rhinomuraena* Garman 1888

Rhinomuraena Garman 1888: 114. Type: *R. quaesita* Garman 1888.

34. *Rhinomuraena quaesita* Garman 1888
(Fig. I-34a,b; Fig. II-34)

Rhinomuraena quaesita Garman 1888: 114 (Ebon, Marshall Islands); Shen et al. 1979: 79-87.

Rhinomuraena ambonensis: Barbour 1908: 30; Shen 1974: 181-190.

Specimens: ASIZP 056641, 71 cm TL, Sept. 3, 1991, Lanyu; NMSMP 998, 88 cm TL, Jan. 20, 1992, Langtao.

Diagnosis: HL 15.4-17.7, DGO 71-86, TR 3.3-3.8 in TL; Vert 250-270. Body very slender, the pointed snout with a barbel-like appendage and 3 similar ones on the symphysis of the lower jaw. Black juveniles, blue male adults, yellow female adults; dorsal fin is always yellow with white margin; frequently blackish anal fin with white margin; a yellowish stripe on mandible in juvenile, yellow jaws and gill-openings in adult.

Remark: Shen et al. (1979) first reported that the *Rhinomuraena quaesita* is a protandrous hermaphroditic moray eel, and described their different color phase in different life stages. The name of *R. ambonensis* is only its junior synonym and male type.

Genus *Siderea* Kaup 1856

Siderea Kaup 1856: 58. Type: *S. pfeifferi* Bleeker 1853.

Key to species of Genus *Siderea*

- 1a. Color whitish, with round-hollow black spots *S. picta*
1b. Color cream-brownish, with many dark brown spots
..... *S. thyrsoidea*

35. *Siderea picta* (Ahl 1789)
(Fig. I-35a,b; Fig. II-35)

Muraena picta Ahl 1789: 8 (Indonesia)

Gymnothorax pictus Bleeker 1864: 87; Chen and Weng 1967: 19.

Siderea picta: Smith 1962: 440; Randall et al. 1990: 42

Specimens: ASIZP 056642, 11.8 cm TL, Mar. 25, 1975, Maopitou; NMSMP 413, 54.0 cm TL, Apr. 8, 1992, Nanwan.

Diagnosis: HL 7.3-7.6, DGO 15.0-17.7, TR 2.8-3.0 in TL, Vert 127-133. Whitish body, with round-hollow black spots about the body; spots fewer and clearer when young but obscured by addition of many little dots between large spots in adult. Iris has black cross spots.

36. *Siderea thyrsoides* (Richardson 1844)

(Fig. I-36; Fig. II-36)

Muraena thyrsoides Richardson 1844: 111, (China Sea).

Gymnothorax thyrsoides: Schultz 1953: 121; Hatooka 1984: 25

Siderea thyrsoides Randall et al. 1990: 42

Specimens: ASIZP 054826, 3 specimens, 30.6-38.7 cm TL, May 13, 1977, Wanli; ASIZP 055253, 58.2 cm TL, Mar. 10, 1979, Yehliu; NMSMP 1006, 61.2 cm TL, Jan. 30, 1992, Yenliao.

Diagnosis: HL 9.1-9.9, DGO 16.5-17.4, TR 2.6-3.4 in TL, Vert 129-134. Whitish iris. Cream-brownish body, has many dark brown spots, anterior half of head is uniformly dark brown without any spots. White median fin margins on small specimens, small specimen snout usually pale. Some preserved specimens have absorbed copper ions causing the mucus to turn green.

Genus *Strophidon* McClelland 1845

Strophidon McClelland 1845: 187. Type: *Lycodontis longicaudata* McClelland 1845

Key to species of Genus *Strophidon*

- 1a. Body uniformly creamy-white, cephalic lateral-line pores blackish *S. brummeri*
 2a. Body uniformly brownish, cephalic lateral-line pores not blackish *S. sathete*

37. *Strophidon brummeri* (Bleeker 1858-59)

(Fig. I-37; Fig. II-37)

Muraena brummeri Bleeker 1858-59: 137 (Indonesia)

Strophidon brummeri: Bleeker 1864: 109; Hatooka 1984:22;

Specimen: ASIZP 056685, 73 cm TL, Sept. 5, 1991, Lanyu.

Diagnosis: HL 16.2, DGO 52, TR 3.3 in TL; Vert 210. Body very elongated, and ribbon-like. Uniformly creamy-white body has bright white fin margins. Depth of dorsal fin higher. Anterior third of head has numerous small black dots, black

cephalic lateral-line pores and branchial pores.

38. *Strophidon sathete* (Hamilton 1822)

(Fig. I-38; Fig. II-38)

Muraenophis sathete Hamilton 1822: 17, 363 (near Calcutta, India)

Thyrsoidea macrura Bleeker 1864: 111; Chen and Weng 1967: 14-15.

Strophidon ui: Tanaka 1918: 52; Chen and Weng 1967: 37.

Strophidon sathete: Bleeker 1864: 110; Randall et al. 1990: 42.

Gymnothorax prolatus Sasaki and Amaoka 1991: 7-10.

Specimens: ASIZP 055652, 31 cm TL, Jan. 15, 1981, Tungkan; NMSMP 645, 3 specimens, 83-120 cm TL, Jan. 17, 1991, Chungchou.

Diagnosis: HL 8.9-11.5, DGO 31-46, TR 2.6-3.5 in TL; Vert 183-191. Body very elongated, probably the longest moray. Gap of mouth deep; blood capillaries under the skin visible when alive. Uniformly brown body, upper head, dorsal area and the posterior fin edges darker. Frequently caught by trawlers from muddy Taiwan ocean bottoms.

Remark: Recently, Sasaki and Amaoka (1991) reported a new moray based on the single Taiwan specimen, *Gymnothorax prolatus*. But we consider that it should be the young fish of this species, because characteristics are so similar to those of *S. sathete* and this kind of specimen is very common in Taiwan (Chen and Shao, in preparation).

Subfamily Uropterygiinae

Genus *Anarchias* Jordan and Starks 1906

Anarchias Jordan and Starks 1906: 204. Type: *A. allardicei* Jordan and Starks 1906.

39. *Anarchias allardicei* Jordan and Starks 1906

(Fig. I-39; Fig. II-39)

Anarchias allardicei Jordan and Stark in Jordan and Seale 1906: 204. (Pago Pago, Samoa); Schultz 1953: 143.

Specimens: NMSMP 885, 1 female specimen, 12.5 cm TL, Aug. 17, 1991, Tungchi; NMSMP 013, 11.6 cm TL, Aug. 7, 1992, Wanlitung.

Diagnosis: HL 7-8, DGO 18-22, TR 2.7-2.8 in TL; Vert 96-100. Posterior nostril consists of two pores. Uniformly brown when fresh, darker dorsal area; pale brown head and abdomen. Yellowish tail tip when alive, turning white after death. Whitish oral cavity, cephalic lateral-line pores, posterior nostril and anus are whitish.

Remark: Although the specimen photo of this species in Lee (1980) was misdesignated as *Gym-*



Fig. I-1. *Eclidna nebulosa*,
54.2 cm TL.



Fig. I-2a. *Eclidna polyzona*,
17.8 cm TL.



Fig. I-2b. *Eclidna polyzona*,
62.4 cm TL.



Fig. I-3. *Enchelycore bikiniensis*,
125.0 cm TL.

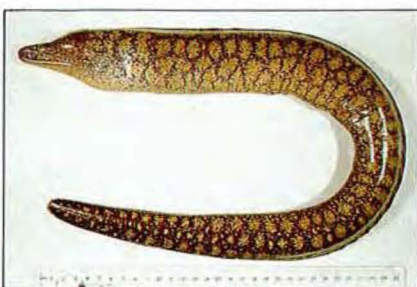


Fig. I-4. *Enchelycore lichenosa*,
67.5 cm TL.



Fig. I-5. *Enchelycore pardalis*,
61.3 cm TL.



Fig. I-6. *Enchelycore schismatorhynchus*,
17.8 cm TL.

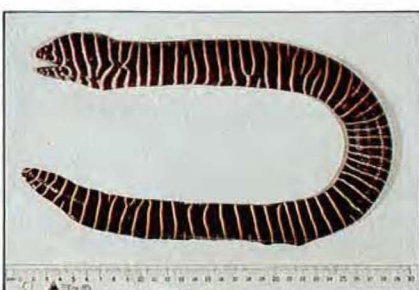


Fig. I-7. *Gymnomuraena zebra*,
62.0 cm TL.

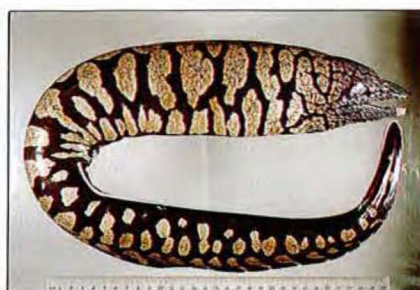


Fig. I-8. *Gymnothorax berndti*,
65.6 cm TL.



Fig. I-9. *Gymnothorax brunneus*,
13.4 cm TL.

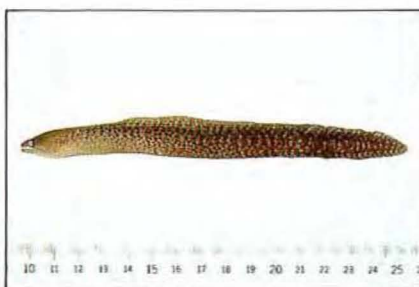


Fig. I-10. *Gymnothorax buroensis*,
15.6 cm TL.



Fig. I-11a. *Gymnothorax chilospilus*,
18.0 cm TL.

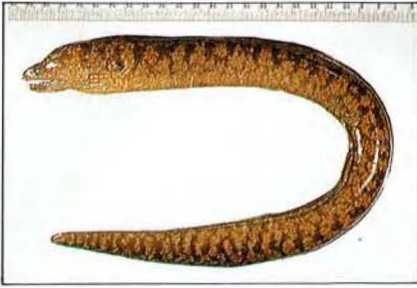


Fig. I-11b. *Gymnothorax chilospilus*, 46.6 cm TL.



Fig. I-12. *Gymnothorax chlamydatus*, 43.5 cm TL.



Fig. I-13. *Gymnothorax eurostus*, 60.2 cm TL.



Fig. I-14a. *Gymnothorax favagineus*, 44.5 cm TL.

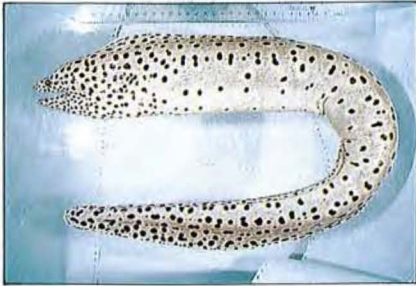


Fig. I-14b. *Gymnothorax favagineus*, 83.5 cm TL.



Fig. I-15. *Gymnothorax fimbriatus*, 67.1 cm TL.



Fig. I-16. *Gymnothorax flavimarginatus*, 72.0 cm TL.



Fig. I-17. *Gymnothorax hepaticus*, 106.4 cm TL.

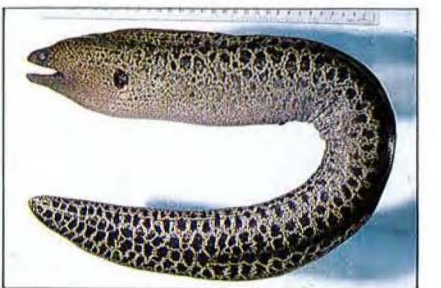


Fig. I-18. *Gymnothorax javanicus*, 74.0 cm TL.

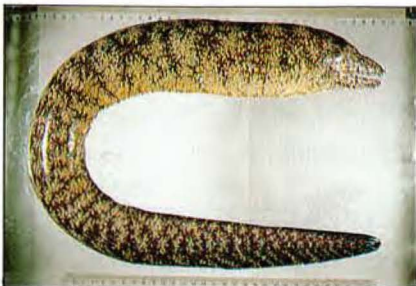


Fig. I-19. *Gymnothorax kidako*, 72.5 cm TL.

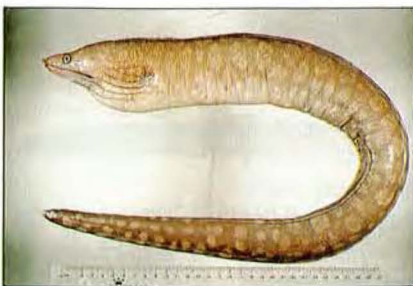


Fig. I-20. *Gymnothorax leucostigmus*, 64.7 cm TL.

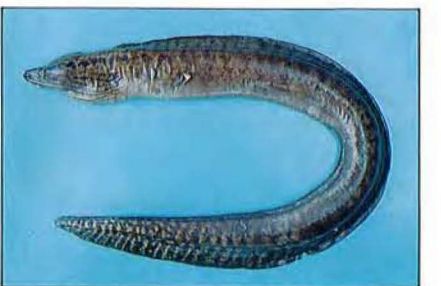


Fig. I-21. *Gymnothorax margaritophorus*, 49.0 cm TL.



Fig. I-22. *Gymnothorax melatremus*, 14.6 cm TL.



Fig. I-23. *Gymnothorax meleagris*, 38.0 cm TL.

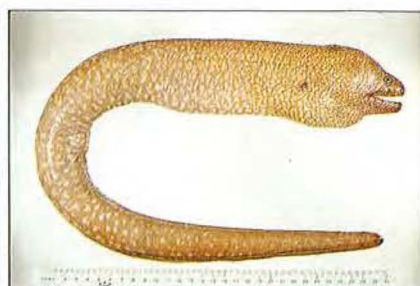


Fig. I-24. *Gymnothorax neglectus*, 71.0 cm TL.

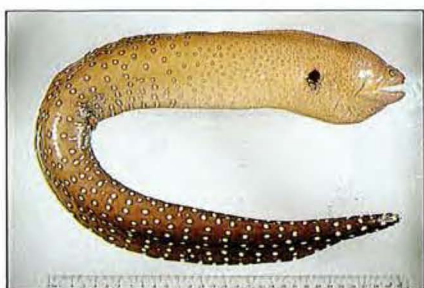


Fig. I-25. *Gymnothorax nudivomer*, 66.0 cm TL.



Fig. I-26. *Gymnothorax pindae*, 9.9 cm TL.

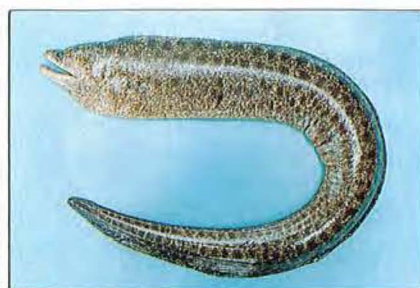


Fig. I-27. *Gymnothorax pseudothysoideus*, 60.0 cm TL.



Fig. I-28. *Gymnothorax reevesii*, 69.8 cm TL.



Fig. I-29. *Gymnothorax reticularis*, 40.0 cm TL.

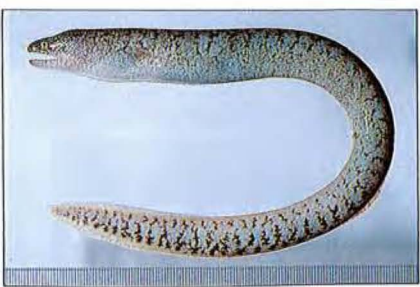


Fig. I-30. *Gymnothorax richardsoni*, 26.6 cm TL.



Fig. I-31a. *Gymnothorax rueppelliae*, 12.2 cm TL.



Fig. I-31b. *Gymnothorax rueppelliae*, 56.0 cm TL.

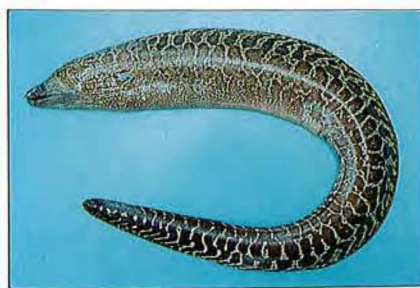


Fig. I-32. *Gymnothorax undulatus*, 54.6 cm TL.

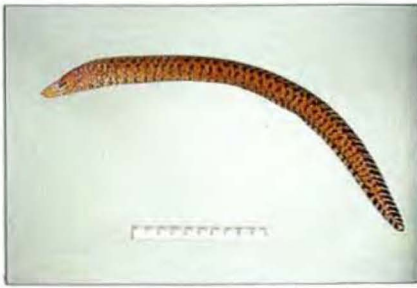


Fig. I-33. *Gymnothorax zonipectis*, 33.0 cm TL.



Fig. I-34a. *Rhinomuraena quaesita*, 43.0 cm TL.

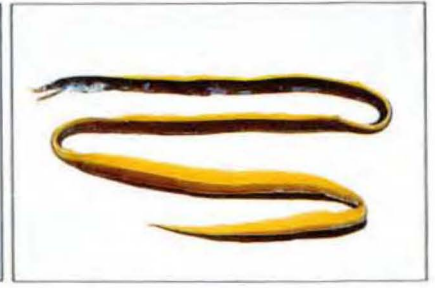


Fig. I-34b. *Rhinomuraena quaesita*, 88.0 cm TL.

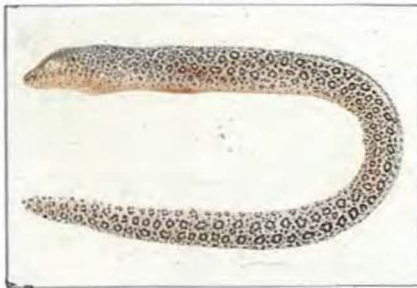


Fig. I-35a. *Siderea picta*, 28.1 cm TL.

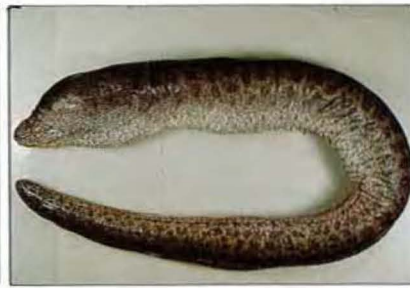


Fig. I-35b. *Siderea picta*, 52.0 cm TL.

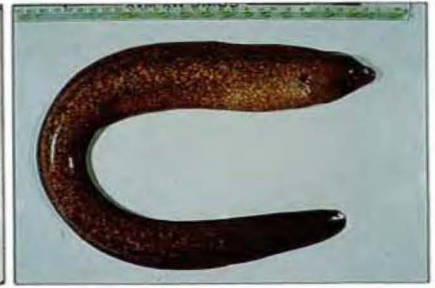


Fig. I-36. *Siderea thyrsoides*, 55.9 cm TL.

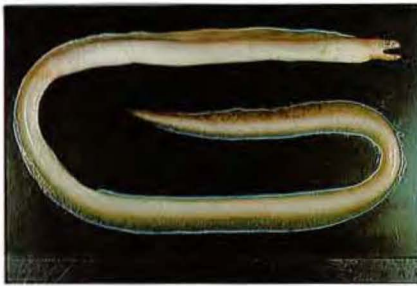


Fig. I-37. *Strophidon brummeri*, 66.3 cm TL.



Fig. I-38. *Strophidon sathete*, 130.4 cm TL.



Fig. I-39. *Anarchias allardicei*, 12.5 cm TL.



Fig. I-40. *Uropterygius macrocephalus*, 29.7 cm TL.



Fig. I-41. *Uropterygius micropterus*, 18.1 cm TL.



Fig. I-42. *Uropterygius tigrinus*, 87.0 cm TL.

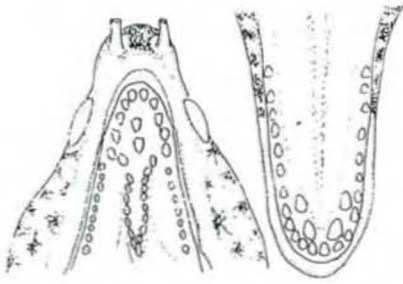


Fig. II-1. *Echidna nebulosa*,
34.4 cm TL.

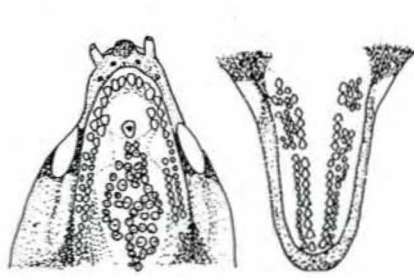


Fig. II-2. *Echidna polyzona*,
62.4 cm TL.

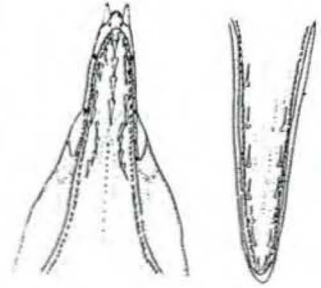


Fig. II-3. *Enchelycore bikiniensis*,
56.2 cm TL.

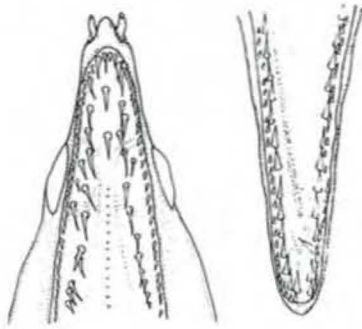


Fig. II-4. *Enchelycore lichenosa*,
62.3 cm TL.

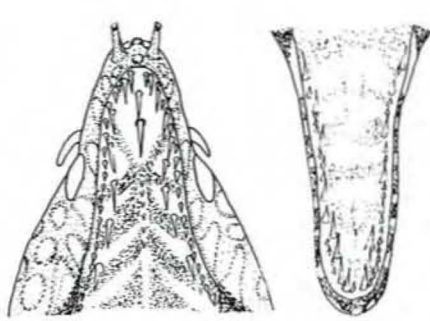


Fig. II-5. *Enchelycore pardalis*,
35.2 cm TL.

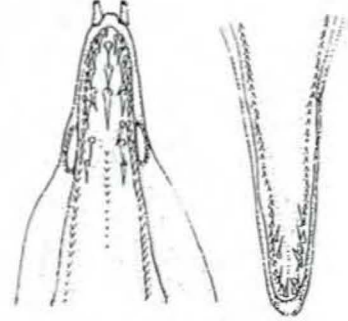


Fig. II-6. *Enchelycore schismatorhynchus*,
56.6 cm TL.

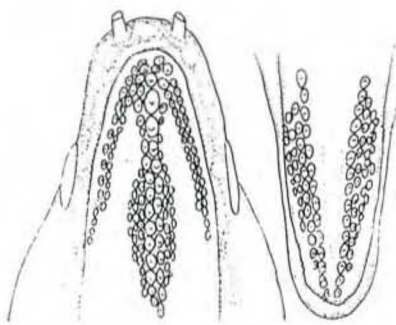


Fig. II-7. *Gymnomuraena zebra*,
88.0 cm TL.

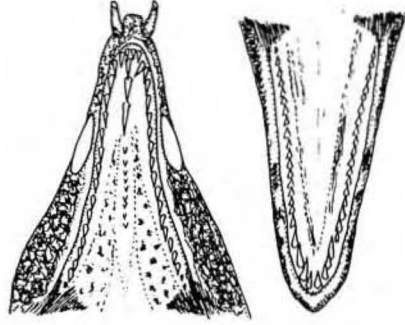


Fig. II-8. *Gymnothorax berndti*,
65.6 cm TL.

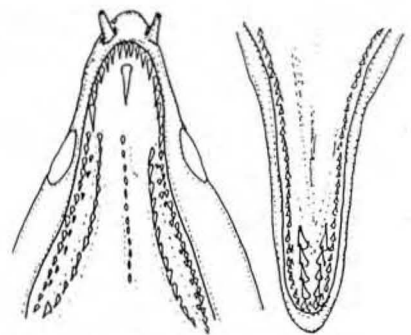


Fig. II-9. *Gymnothorax brunneus*,
13.4 cm TL.

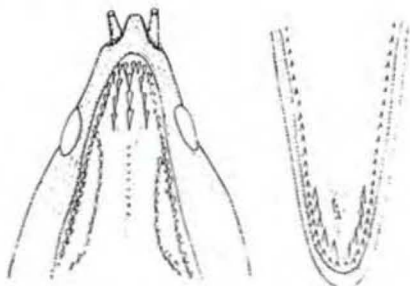


Fig. II-10. *Gymnothorax buroensis*,
12.7 cm TL.

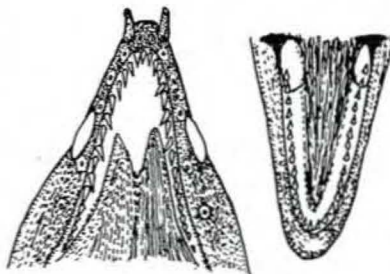


Fig. II-11. *Gymnothorax chilospilus*,
46.6 cm TL.

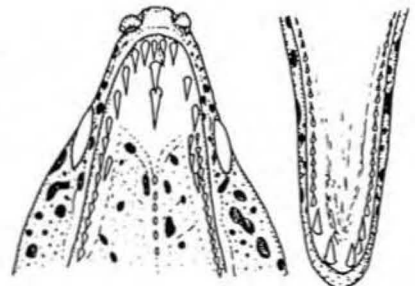


Fig. II-12. *Gymnothorax chlamydatus*,
50.6 cm TL.

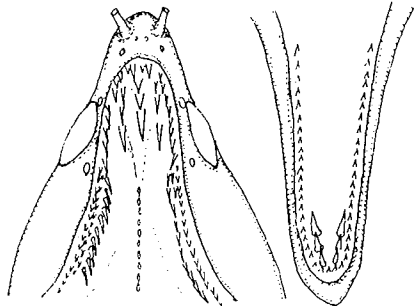


Fig. II-13. *Gymnothorax eurostus*,
52.5 cm TL.



Fig. II-14. *Gymnothorax favagineus*,
83.5 cm TL.

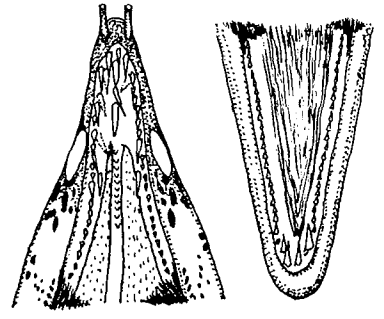


Fig. II-15. *Gymnothorax fimbriatus*,
67.1 cm TL.

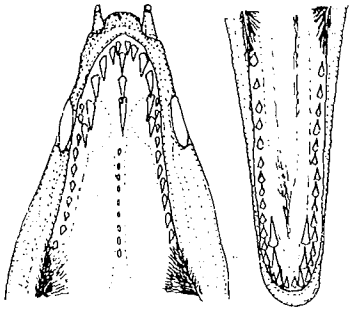


Fig. II-16. *Gymnothorax flavimarginatus*,
19.2 cm TL.

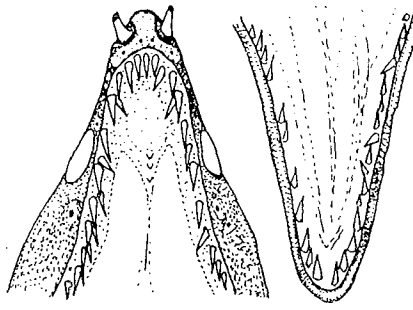


Fig. II-17. *Gymnothorax hepaticus*,
88.8 cm TL.

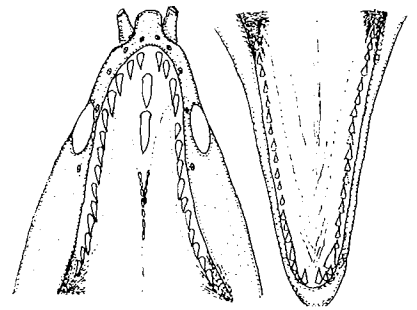


Fig. II-18. *Gymnothorax javanicus*,
72.2 cm TL.

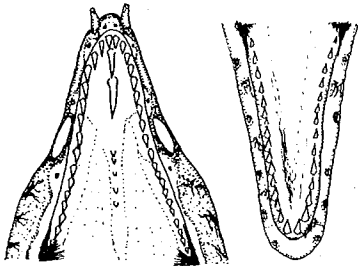


Fig. II-19. *Gymnothorax kidako*,
62.7 cm TL.

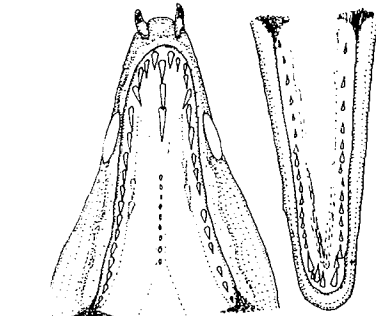


Fig. II-20. *Gymnothorax leucostigmus*,
64.7 cm TL.

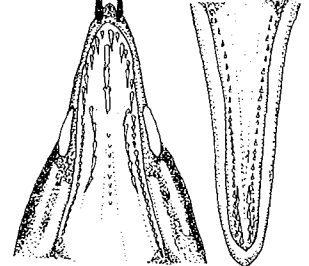


Fig. II-21. *Gymnothorax margaritophorus*,
12.4 cm TL.

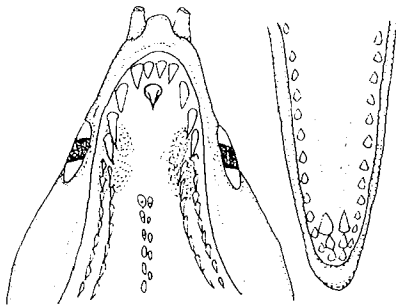


Fig. II-22. *Gymnothorax melatremus*,
13.7 cm TL.

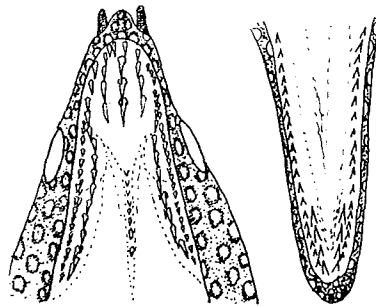


Fig. II-23. *Gymnothorax meleagris*,
23.7 cm TL.

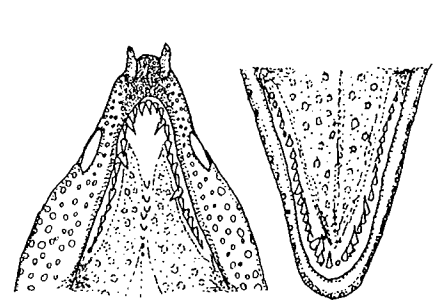


Fig. II-24. *Gymnothorax neglectus*,
69.9 cm TL.

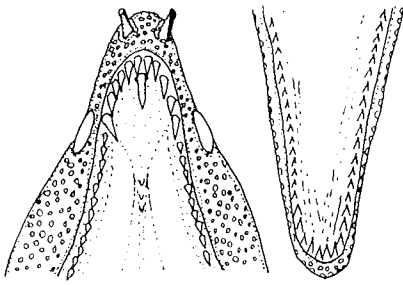


Fig. II-25. *Gymnothorax nudivomer*, 63.8 cm TL.

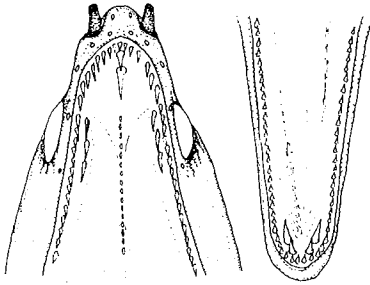


Fig. II-26. *Gymnothorax pindae*, 18.4 cm TL.

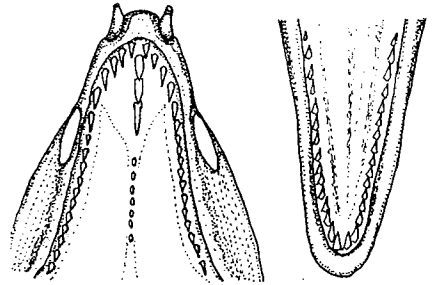


Fig. II-27. *Gymnothorax pseudothysioideus*, 56.0 cm TL.

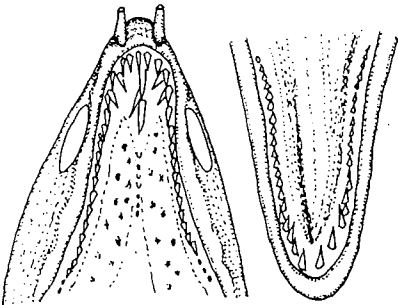


Fig. II-28. *Gymnothorax reevesii*, 69.8 cm TL.

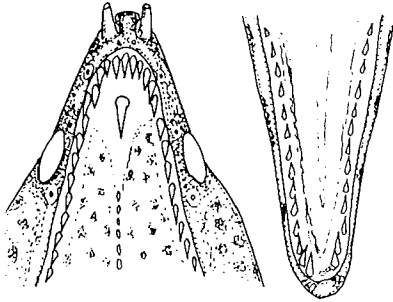


Fig. II-29. *Gymnothorax reticularis*, 44.5 cm TL.

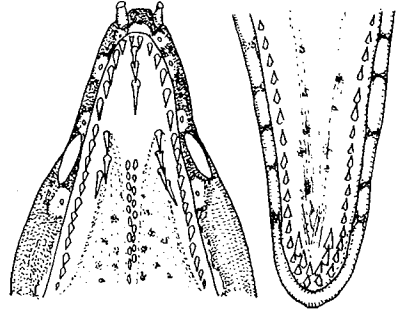


Fig. II-30. *Gymnothorax richardsoni*, 20.1 cm TL.

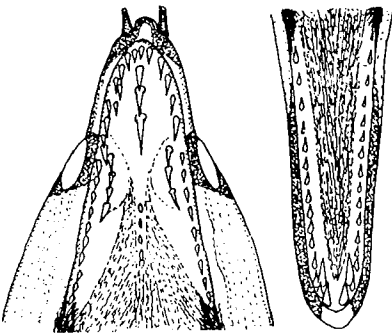


Fig. II-31. *Gymnothorax ruppelliae*, 24.5 cm TL.

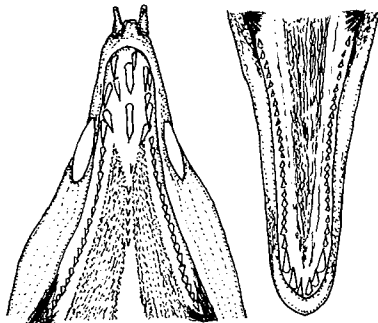


Fig. II-32. *Gymnothorax undulatus*, 54.6 cm TL.

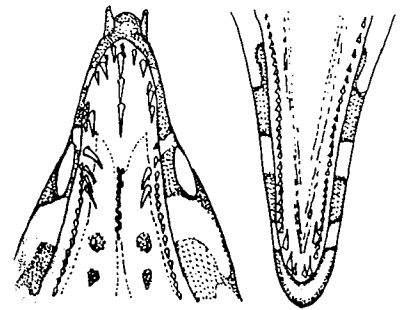


Fig. II-33. *Gymnothorax zonipectis*, 33.0 cm TL.

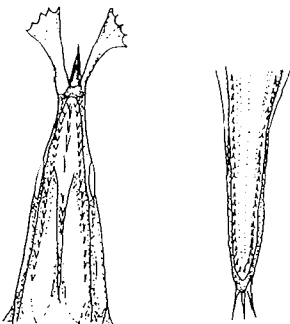


Fig. II-34. *Rhinomuraena quaesita*, 71.9 cm TL.

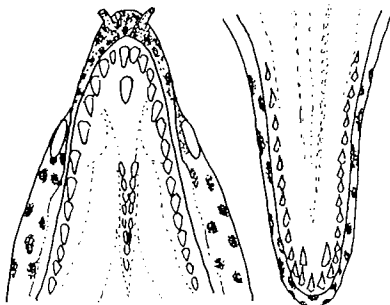


Fig. II-35. *Siderea picta*, 31.4 cm TL.

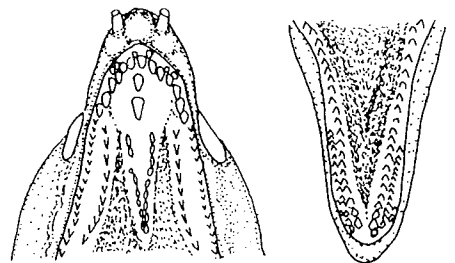


Fig. II-36. *Siderea thyrsoidea*, 61.2 cm TL.

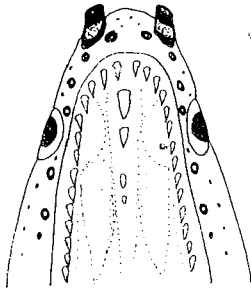


Fig. II-37. *Strophidon brummeri*, 73.0 cm TL.

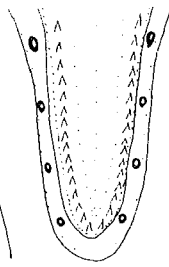


Fig. II-38. *Strophidon sathete*, 113.1 cm TL.

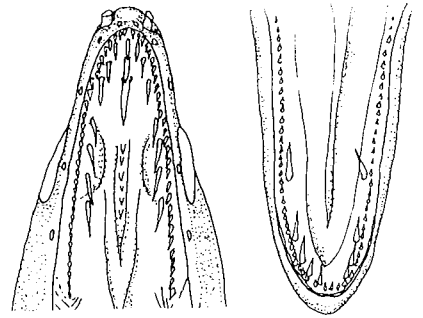
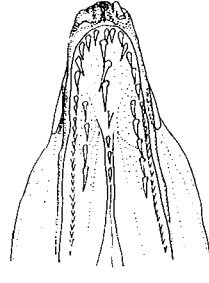


Fig. II-39. *Anarchias allardicei*, 12.5 cm TL.

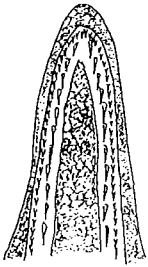


Fig. II-40. *Uropterygius macrocephalus*, 28.9 cm TL.

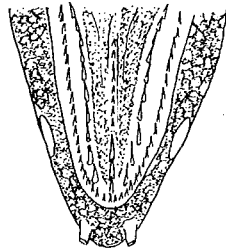


Fig. II-41. *Uropterygius micropterus*, 20.6 cm TL.

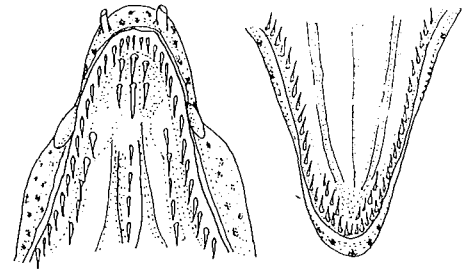
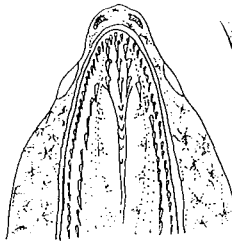


Fig. II-42. *Uropterygius tigrinus*, 87.0 cm TL.

nothorax chilospilus, E. Holm (personal communication) confirmed the correct identification of this species after he reexamined Dr. Lee's specimen.

Genus *Uropterygius* Rüppell 1838

Uropterygius Rüppell 1838: 83. Type: *U. concolor* Rüppell 1838 (not seen).

Key to species of Genus *Uropterygius*

- 1a. Tail length about 3 in TL *U. tigrinus*
 1b. Tail length about 2 or less in TL 2
 2a. Body grey, mottled with thin dark line web-like network *U. micropterus*
 2b. Body blackish with thin brown network *U. macrocephalus*

40. *Uropterygius macrocephalus* (Bleeker 1864)

(Fig. I-40; Fig. II-40)

Gymnomuraena macrocephalus Bleeker 1864: 114 (Amboina).
Uropterygius macrocephalus: Hatooka 1984: 26; McCosker et al. 1984: 263-265.

Specimens: ASIZP 056629, 2 specimens, 25-28 cm TL, Aug. 9, 1978, Lanyu; ASIZP 054937, 38 cm TL, Aug. 28, 1977, Tiaoshih; NMSMP 25, 36.4 cm TL, Aug. 9, 1978, Lanyu.

Diagnosis: HL 7.0-7.7, DGO 16.9-18.1, TR 2.8-2.9 in TL; Vert 115-120. Posterior nostrils short tubular-like. Swollen nasal cavity. Black or black-brown body, sometimes black-green when alive, with many brown snowflake blotches all over the body. Whitish cephalic lateral line pores.

41. *Uropterygius micropterus* (Bleeker 1852a) (Fig. I-41; Fig. II-41)

Muraena micropterus Bleeker 1852a: 298 (Indonesian Island).
Uropterygius micropterus: Hatooka 1984: 26; McCosker et al. 1984: 265.

Specimens: ASIZP 055103, 21 cm TL, Aug. 16, 1978, Yehyu; ASIZP 056633, 4 specimens, 15-25 cm TL, Jun. 20, 1975, Maopitou; NMSMP 918, 18 cm TL, Aug. 25, 1991, Maopitou.

Diagnosis: HL 7.6-8.5, DGO 17.2-22.5, TR 2.2-3.0 in TL; Vert 115-120. Pale lower head and body parts, gray-brown with a network of web-like brownish thin lines.

Remark: Many specimens of this species in Taiwan were misidentified as "*U. marmoratus*". In fact, skin coloration differs between these two species. *U. marmoratus* has round dots about the body against the netted coloration in *U. micropterus*.

During our studies *U. marmoratus* had not yet been found in Taiwan.

42. *Uropterygius tigrinus* (Lesson 1829) (Fig. I-42; Fig. II-42)

Ichthyophis tigrinus Lesson 1829: 399 (Indonesia) (not seen)
Scuticaria tigrina: Jordan and Snyder 1901: 886; Böhlke et al. 1989:117.

Uropterygius tigrinus: Smith 1962: 426; Myers 1989: 50

Specimen: ASIZP 056524, 87 cm TL, May 27, 1986, Wanlitung.

Diagnosis: HL 13, DGO 29, TR 1.7 in TL; Vert 116. Posterior nostrils tubular, equal to anterior nostril in length, all are whitish. Body elongated. Tail length about 3 in total length. Generally yellow to orange body, blotched with roundish dark-brown spots. Jaws speckled with many small dark-brown spots.

Remark: Böhlke et al. (1989) adopted the junior synonym *Scuticaria tigrina* for this species because it could reach 105 cm TL and most species of *Uropterygius* did not exceed 40 cm TL. Nevertheless, we believe that this species still belongs to *Uropterygius* because many of its as snout, eye, nostril, dentition, and fin type characteristics are similar to those of *Uropterygius*.

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臺灣海域產鯨科魚類兼記其十二新記錄種

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本研究報導臺灣產的鯨科魚類，共分爲Uropterygiinae及Muraeninae二亞科九屬四十二種。其中*Enchelycore bikiniensis*, *Gymnothorax brunneus*, *G. javanicus*, *G. margaritophorus*, *G. melatremus*, *G. nudivomer*, *G. reevesii*, *G. zonipectis*, *Strophidon sathete*, *U. macrocephalus*, *U. micropterus*及*Uropterygius tigrinus*等共12種爲臺灣之新記錄。此外*Enchelycore lichenosa*, *E. schismatorhynchus*, *Gymnothorax buroensis*, *G. hepaticus*, *G. meleagris*, *G. richardsoni*和*Siderea thyrsoides*等共7種鯨類，爲過去曾有記載但仍欠缺標本者，如今在本報告中亦因已採獲標本而獲證實。臺灣過去文獻中亦有甚多鯨類種名鑑定錯誤或採用無效異名，在本文中已獲訂正。兩種過去曾記錄的鯨類*Gymnothorax polyuranodon*及*G. monostigmus*在本文中未描述，因標本現已難尋。本文中除備有鯨類亞科、屬及各種之檢索表、異名錄、特徵描述、備註外，並附各種之齒式圖及彩色標本照以利學者參考。

關鍵詞：海鰻，魚類分類，魚類相，鰻目。