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Introduction to the systematics and biodiversity of eels (orders Anguilliformes and Saccopharyngiformes) of Taiwan

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Abstract

The eel fauna (orders Anguilliformes and Saccopharyngiformes) of Taiwan is one of the richest in the world. Recent genetic and morphological studies have improved the taxonomic resolution and increased the known diversity of the eels of Taiwan, and the overall diversity is comparable to that of adjacent marine zoogeographic regions with rich biodiversity, such as Australia and the Philippines. In this special issue, we verified the historical records and examined numerous recently collected specimens, and conclude that the eel fauna of Taiwan is represented by 207 species in 75 genera and 14 families, with several undescribed species still likely to be discovered. The Muraenidae (71 species), Ophichthidae (60), Congridae (29) and Synaphobranchidae (17) are the most abundant and species-rich in Taiwanese waters. We add 42 species to the Taiwanese fish fauna, including one new genus and 13 new species. Two further species are newly described, one from the Philippines and one from Indonesia.

Key words: Biodiversity, Pisces, Anguilliformes, systematics, Taiwan

The diversity of fishes of Taiwan

Taiwan lies in the western North Pacific Ocean, surrounded by the Pacific Ocean (east), the Okinawa trough (north), the Taiwan Straits (west), the South China and the Philippine seas (south). The diversity of its geographic features and various current systems (mainly Kuroshio Current) has resulted in a high diversity of marine fishes. Moreover, the small geographic area of Taiwan makes it even more significant in terms of marine fish diversity in the world.

The Taiwan Fish Database (Shao, 2015) lists about 3,100 species of fishes, representing 10% of the world fish species (about 31,000 species according to Eschmeyer, 2015). Allen (1979) recorded the diversity of butterfly fishes (family Chaetodontidae) and angelfishes (family Pomacanthidae) and the number of species of both families in Taiwan would rank them at the top in terms of species-richness. Shao *et al*. (2008) provided a checklist of fishes from southern Taiwan (northern South China Sea), which included 2,133 species of fishes, more than half of the known species from this region. Ebert *et al*. (2013) recorded the high diversity of chondrichthyes, making Taiwan one of the five most species-rich regions in the world.

Historical perspective on eel studies

Günther (1870) was the first to catalogue fishes from Taiwan (mostly collected by Robert Swinhoe), which included five eel species. Jordan & Evermann (1902) reported 186 fish species from Taiwan, including nine eel species (one as a leptocephalus). Two of them, *Anguilla remifera* (= *Anguilla japonica*) and *Gymnothorax*

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pescadoris (= *Gymnothorax isingteena*) were described as new. Jordan & Richardson (1909) reported 286 fish species from Taiwan, including 17 eel species. Three of them, *Ophichthys evermanni* (= *Ophichthus lithinus*), *Gymnothorax leucostigma* (= *Gymnothorax prionodon*) and *Leptocephalus ectenurus* (= *Rhynchoconger ectenurus*), were described as new.

In a checklist of fishes of Taiwan, Chen (1954) listed five families and 20 species of eels. In his first edition of *Vertebrates of Taiwan*, the first comprehensive work of the fish fauna of Taiwan, Chen (1956) increased the count to seven families and 29 species of eels. Chen & Weng (1967) compiled the first review of the apodal fishes from Taiwan, in which they described four new species: *Rhynchoconger brevirostris* (= *Macrocephenchelys brevirostris*), *Myrophis cheni* (= *Neenchelys cheni*), *Chlopsis taiwanensis* (= *Gavialiceps taiwanensis*), and *Dysomma melanurum*, and brought the total number of eels to 10 families and 65 species. In the second edition of *Vertebrates of Taiwan*, Chen (1969) increased the number of eel species to 10 families with 69 species, and in the third edition of *Vertebrates of Taiwan*, Chen & Yu (1986) increased the number of eel species to 10 families with 87 species.

Shen (1984a) provided the keys and drawings of most known fishes in Taiwan, which included nine families and 73 species of eels, and *The Coastal Fishes* of Taiwan (Shen, 1984b) with color figures included three families and 25 species. In 1993, Shen *et al*. published the *Fishes of Taiwan*, with nine families and 108 species of eels.

In a checklist of the fishes of Penghu, Chen (2004) recorded six families and 82 species of eels, including one unidentified species. A checklist of fish fauna from the southern Taiwan (northern South China Sea) of Shao *et al.* (2008), listed 11 families and 108 species. Ho *et al*. (2010) studied the old fish collection transferred from the Tunghai University to the National Museum of Marine Biology & Aquarium, and identified nine families with 59 species, including four new records.

Tanaka (1911) described *Gymnothorax neglectus* and Sasaki & Amaoka (1991) described *Gymnothorax prolatus* from Taiwan. Chen *et al*. (1994) reviewed the moray eels (family Muraenidae) and recognized 42 species in 9 genera. Chen & Shao (1995) described a new genus and new species of moray eel, *Cirrimaxilla formosa*. Chen *et al*. (1996), Chen & Loh (2007), Chen *et al*. (2008), Loh *et al*. (2008, 2011) described five new species of moray eels. Loh *et al*. (In press) summarized family the Muraenidae, recognizing 68 species.

TABLE 1. Selected references to history of description of species of eels of Taiwan

References	Diversity	Note
Jordan & Evermann (1902)	3 families, 9 species	2 new species
Jordan & Richardson (1909)	4 families, 17 species	3 new species
Chen (1954)	5 families, 20 species	
Chen (1956)	7 families, 29 species	
Chen & Wang (1967)	10 families, 65 species	4 new species
Chen (1969)	10 families, 69 species	
Shen (1984a)	9 families, 73 species	
Chen & Yu (1986)	10 families, 87 species	
Shen *et al.* (1993)	9 families, 108 species	
Chen *et al*. (1994)	42 species	Family Muraenidae
Ho *et al*. (2010)	9 families, 59 species	Based on THUP collection
Chen (2004)	6 families, 82 species	Penghu Island only
Shao *et al.* (2008)	11 families, 108 species	Southern Taiwan only
Loh *et al*. (2014)	68 species	Family Muraenidae

Meadia roseni was described by from southern Taiwan by Mok *et al.* (1991), and Chen & Mok (1995, 2001) described two new species, *Dysomma opisthoproctus* and *Dysomma longirostrum*. Shao (1990) described *Gorgasia taiwanensis* from southern Taiwan, and McCosker & Randall (1993, 2001) reviewed the genera *Cirricaecula* and *Brachysomophis*, describing two new species. McCosker & Chen (2000) described *Ophichthus aphotistos* and

added another record, *Neenchelys retropinna* (= *Neenchelys cheni*), to the fauna from Taiwan. McCosker *et al*. (2009) reviewed the species of *Xyrias* and described a new species from southeastern Taiwan. McCosker *et al*. (2012) described a new genus, *Pylorobranchus*, and its type species *Pylorobranchus hoi*, collected from eastern Taiwan, and Ho *et al*. (2013) reviewed the genus *Neenchelys* and described three new species (also see Ho *et al*., 2015b).

One new genus and 13 new species are newly described in this volume, and 26 species are reported for the first time from Taiwanese waters. Two further new species are described from specimens collected from the Philippines and Indonesia.

Table 1 summarizes the overall diversity of eels of Taiwan in a historical perspective.

The diversity of eels of Taiwan

The eel fauna of Taiwan includes 13 of the 20 known families in the world, with 207 of ca. 943 species of the orders Anguilliformes and Saccopharyngiformes (Eschmeyer & Fong, 2015), which makes it one of the highest-diversity regions in the world. At present, the number is slightly greater than Japan (163), the Philippines (166), Indonesia (179) and Australia (198) (Nakabo, 2013; Froese & Pauly, 2015), although these countries may outrank Taiwan when their faunas have been fully recorded.

The ratio of new species described from Taiwan is also very high. Forty-two of 207 species (20.3%) were described from at least one type specimen collected from Taiwan. Of these, 36 species are recognized as valid and of these 23 species are found only in Taiwan (Ho *et al*., 2015a). As noted above, one genus and 13 species are described as new to science, and one family and 29 nominal species are added to the Taiwanese eel fauna. Table 2 lists the genera and species that have been described from Taiwan and their current status, and Table 3 lists all currently known species, including these described in this issue, together with their selected historical records.

TABLE 2. List of eel genera and species described from Taiwan and their current status, including those described in present volume.

Original name	Current status
Family Anguillidae	
Anguilla remifera Jordan & Evermann, 1902	= *Anguilla japonica*
Family Chlopsidae	
Chlopsis nanhaiensis Tighe *et al*., this volume	Valid, Taiwan only
Family Muraenidae	
Cirrimaxilla Chen & Shao, 1995	Valid
Cirrimaxilla formosa Chen & Shao, 1995	Valid
Gymnothorax leucostigma Jordan & Richardson, 1909	= *Gymnothorax prionodon*
Gymnothorax melanosomatus Loh *et al*., 2011	Valid, Taiwan only
Gymnothorax neglectus Tanaka, 1911	Valid
Gymnothorax niphostigmus Chen *et al.*, 1996	Valid, Taiwan only
Gymnothorax pescadoris Jordan & Evermann, 1902	= *Gymnothorax isingteena*
Gymnothorax prolatus Sasaki & Amaoka, 1991	Valid
Gymnothorax pseudomelanosomatus Loh *et al*., this volume	Valid, Taiwan only
Gymnothorax shaoi Chen & Loh, 2007	Valid, Taiwan only
Gymnothorax taiwanensis Chen *et al*., 2008	Valid, Taiwan only
Uropterygius oligospondylus Chen *et al*., 2008	Valid
Family Synaphobranchidae	
Dysomma longirostrum Chen & Mok, 2001	Valid
Dysomma melanurum Chen & Weng, 1967	Valid, Taiwan only

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TABLE 2. (Continued)

Original name	Current status
Dysomma opisthoproctus Chen & Mok, 1995	Valid, Taiwan only
Dysomma taiwanensis Ho et al., this volume	Valid, Taiwan only
Meadia roseni Mok *et al.*, 1991	Valid, Taiwan only
Family Ophichthidae	
Pylorobranchus McCosker & Chen 2012	Valid
Sympenchelys Hibino *et al*., this volume	Valid, Taiwan only
Brachysomophis longipinnis McCosker & Randall, 2001	Valid, Taiwan only
Cirricaecula macdowelli McCosker & Randall, 1993	Valid, Taiwan only
Echelus polyspondylus McCosker & Ho, this volume	Valid, Taiwan only
Myrophis cheni Chen & Weng, 1967	Valid as *Neenchelys cheni*
Neenchelys diaphora Ho *et al*., this volume	Valid, Taiwan only
Neenchelys gracilis Ho & Loh, this volume	Valid, Taiwan only
Neenchelys mccoskeri Hibino *et al*., 2012	Valid
Neenchelys pelagica Ho *et al*., this volume	Valid, Taiwan only
Neenchelys similis Ho *et al*., this volume	Valid
Ophichthus aphotistos McCosker & Chen, 2000	Valid, Taiwan only
Ophichthus bicolor McCosker & Ho, this volume	Valid, Taiwan only
Ophichthus evermanni Jordan & Richardson, 1909	= *Ophichthus lithinus*
Ophichthus shaoi McCosker & Ho, this volume	Valid, Taiwan only
Pylorobranchus hoi McCosker *et al*., 2012	Valid, Taiwan only
Sympenchelys taiwanensis Hibino *et al*., this volume	Valid, Taiwan only
Xyrias chioui McCosker *et al.*, 2009	Valid, Taiwan only
Family Congridae	
Ariosoma nancyae Shen, 1998	= *Ariosoma fasciatum*
Gorgasia taiwanensis Shao, 1990	Valid
Leptocephalus ectenurus Jordan & Richardson, 1909	Valid as *Rhynchoconger ectenurus*
Rhynchoconger brachuata Chu & Chen, 1958	= *Rhynchoconger ectenurus*
Rhynchoconger brevirostris Chen & Weng, 1967	Valid as *Macrocephenchelys brevirostris*
Family Muraenesocidae	
Chlopsis taiwanensis Chen & Weng, 1967	Valid as *Gavialiceps taiwanensis*
Family Nettastomatidae	
Nettenchelys proxima Smith *et al*., this volume	Valid
Saurenchelys gigas Lin *et al*., this volume	Valid

Methods of recording the morphology used in this volume

Methods for taking counts and measurements and terminology generally follow those of Böhlke (1989). Total length (TL) and head length (HL) are used throughout.

Vertebral counts are given as predorsal, preanal and total. Other than vertebral counts, the number of lateral-line sensory pores have also been found to be useful in most of the species, and are correlated with the numbers of vertebral counts. The lateral-line pores were recorded where possible as prepectoral (or pre-gill opening), predorsal, preanal and total. Prepectoral pores are counted to a perpendicular line at the upper base of the pectoral

fin; pre-gill opening pores are counted to level with the upper end of gill slit; predorsal pores are counted to the origin of dorsal fin; preanal pores are counted to the level of anus, and total pores are counted to the end of the lateral line. Note that many species, such as ophichthids, may have an incomplete lateral-line which continues to about one head length before the rear end of body, and some species of *Dysomma* may have a incomplete lateral line. For the slender species of Congridae, it is difficult to count the total number of pores because the tail is easily broken off.

Head pores are denoted as follows: infraorbital (IO); supraorbital (SO); mandibular (M); preopercular (POP); supratemporal commissure (ST); frontal (F); adnasal (AD). Sometime the mandibular and preopercular pores are in a continuous series and they will be combined as the preoperculomandibular (POM).

Measurements taken are as follows: TL is measured from tip of snout to end of caudal fin or rear end of tail (*i.e.* Ophichthinae species); HL from tip of snout to upper end of gill opening; body depth at the head, the vertical distance of body at gill opening; trunk length, from base of pectoral fin (or upper end of gill opening, when pectoral fin is absent) to origin of anal fin; predorsal length, from tip of snout to origin of dorsal fin; preanal length, from tip of snout to origin of anal fin; snout length, from tip of snout to anterior margin of orbit; orbital diameter, the broadest horizontal distance of the orbit; interorbital width, distance between upper margins of both eyes; snout-rictus, from tip of snout to end of rictus; pectoral-fin length, from upper base of pectoral fin to fin tip.

Other terms used are: dorsal-fin origin (DFO), the insertion of dorsal fin, and anal-fin origin (AFO), the insertion of anal fin.

TABLE 3. List of species of eel orders Anguilliformes & Eurypharyngiformes recorded from Taiwanese waters with their selected records in Taiwan.

		Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
	Order Anguilliformes								
	Family 1. Anguillidae								
1.	*Anguilla bicolor pacifica* Schmidt, 1928				x	x			
2.	*A. celebesensis* Kaup, 1856								Tseng, 1982
3.	*A. japonica* Temminck & Schlegel, 1846	x	x	x	x	x	x		
4.	*A. luzonensis* Watanabe *et al.*, 2009								Chen *et al.*, 2012
5.	*A. marmorata* Quoy & Gaimard, 1824	x	x	x	x	x	x		
	Family 2. Chlopsidae								
6.	*Chlopsis nanhaiensis* Tighe *et al.*, this volume								New species
7.	*Chilorhinus platyrhynchus* (Norman, 1922)							x	
8.	*Kaupichthys japonicus* Matsubara & Asano, 1959					?		?	New record
	Family 3. Colocongridae								
9.	*Coloconger japonicus* Machida, 1984							x	
10.	*C. raniceps* Alcock, 1889								New record
	Family 4. Congridae								
11.	*Ariosoma anago* (Temminck & Schlegel, 1846)	?	?	?	?	?	?		Misidentified as *A. meeki*
12.	*A. fasciatum* (Günther, 1872)								Shen, 1998
13.	*A. major* (Asano, 1958)		x	x	x	x		x	

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TABLE 3. (Continued)

		Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
14.	*A. meeki* (Jordan & Snyder, 1900)							x	
15.	*A. shiroanago* (Asano, 1958)								New record
16.	*Bathycongrus guttulatus* (Günther, 1887)								New record
17.	*B. retrotinctus* (Jordan & Snyder, 1901)		x	x	x	x			
18.	*B. wallacei* (Castle, 1968)								New record
19.	*Bathymyrus simus* Smith, 1965		x	x	x	x	x	x	
20.	*Bathyuroconger parvibranchialis* (Fowler, 1934)								New record
21.	*B. vicinus* (Vaillant, 1888)							x	
22.	*Blachea xenobranchialis* Karrer & Smith, 1980								Ho & Shao, 2010
23.	*Conger cinereus* Rüppell, 1828		x	x	x	x	x	x	
24.	*C. jordani* Kanazawa, 1958								New record
25.	*C. macrocephalus* Kanazawa, 1958		?	?	?	?	?	?	New record
26.	*C. myriaster* (Brevoort, 1856)		x	x	x	x	x	x	
27.	*Congrhynchus talabonoides* Fowler, 1934					x			
28.	*Congriscus megastomus* (Günther, 1877)								Ho *et al.*, 2010
29.	*Gnathophis asanoi* Karmovskaya, 2004								New record
30.	*G. heterognathos* (Bleeker, 1858)		x	x	x	x		x	
31.	*Gorgasia japonica* Abe *et al.*, 1977								Shao, 1990
32.	*G. taiwanensis* Shao, 1990							x	
33.	*Heteroconger hassi* (Klausewitz & Eibl-Eibesfeldt, 1959)							x	
34.	*Japonoconger sivicolus* (Matsubara & Ochiai, 1951)							x	
35.	*Macrocephenchelys brachialis* Fowler, 1934								New record
36.	*M. brevirostris* (Chen & Weng, 1967)		x	x	x	x	x	x	
37.	*Parabathymyrus brachyrhynchus* (Fowler, 1934)								New record
38.	*P. macrophthalmus* Kamohara, 1938			x	x	x	x	x	
39.	*Rhynchoconger ectenurus* (Jordan & Snyder, 1901)	x		x	x	x	x	x	
40.	*Uroconger lepturus* (Richardson, 1845)			x	x	x	x	x	
	Family 5. Derichthyidae								New record
41.	*Nessorhamphus danae* Schmidt, 1931								New record
	Family 6. Moringuidae								
42.	*Moringua abbreviata* (Bleeker, 1863)			x	x	x	x	x	
43.	*M. macrocephalus* (Bleeker, 1863)			x	x	x	x	x	
	Family 7. Muraenesocidae								
44.	*Congersox talabon* (Cuvier, 1829)			x	x	x	x	x	

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TABLE 3. (Continued)

		Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
45.	*Gavialiceps taiwanensis* (Chen & Weng, 1967)			x	x	x	x	x	
46.	*Muraenesox bagio* (Hamilton, 1822)			x	x	x	x	x	
47.	*M. cinereus* (Forsskål, 1775)	x		x	x	x	x	x	
48.	*Oxyconger leptognathus* (Bleeker, 1858)			x	x	x	x	x	
	Family 8. Muraenidae								
49.	*Anarchias allardicei* Jordan & Starks, 1906						x	x	
50.	*A. cantonensis* (Schultz, 1943)								Loh *et al.*, 2014
51.	*Channomuraena vittata* (Richardson, 1845)								Loh *et al.*, 2014
52.	*Cirrimaxilla formosa* Chen & Shao, 1995							x	
53.	*Echidna nebulosa* (Ahl, 1789)		x	x	x	x	x	x	
54.	*E. polyzona* (Richardson, 1845)	x	x	x	x	x	x	x	
55.	*E. xanthospilos* (Bleeker, 1859)								Loh *et al.*, 2014
56.	*Enchelycore bayeri* (Schultz, 1953)								Loh *et al.*, 2014
57.	*E. bikiniensis* (Schultz, 1953)						x		
58.	*E. lichenosa* (Jordan & Snyder, 1901)					x	x		
59.	*E. pardalis* (Temminck & Schlegel, 1846)			x	x	x	x	x	
60.	*E. schismatorhynchus* (Bleeker, 1853)					x	x		
61.	*Enchelynassa canina* (Quoy & Gaimard, 1824)					x			
62.	*Gymnomuraena zebra* (Shaw, 1797)		x	x	x	x	x	x	
63.	*Gymnothorax albimarginatus* (Temminck & Schlegel, 1846)					x	x		
64.	*G. berndti* Snyder, 1904		x	x	x	x	x	x	
65.	*G. buroensis* (Bleeker, 1857)					x	x	x	
66.	*G. chilospilus* Bleeker, 1864	x	x	x	x	x	x	x	
67.	*G. chlamydatus* Snyder, 1908						x		
68.	*G. elegans* Bliss, 1883								Loh *et al.*, 2014
69.	*G. eurostus* (Abbott, 1860)		x				x	x	
70.	*G. favagineus* Bloch & Schneider, 1801	x	x	x		x	x	x	
71.	*G. fimbriatus* (Bennett, 1832)		x	x		x	x	x	
72.	*G. flavimarginatus* (Rüppell, 1830)	x	x	x	x	x	x	x	
73.	*G. formosus* Bleeker, 1864								Loh *et al.*, 2014
74.	*G. fuscomaculatus* (Schultz, 1953)								Loh *et al.*, 2014
75.	*G. gracilicauda* Jenkins, 1903								Loh *et al.*, 2014
76.	*G. herrei* Beebe & Tee Van, 1933						x	x	

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TABLE 3. (Continued)

		Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
77.	*G. intesi* Fourmanoir & Rivaton, 1979								Loh *et al.*, 2014
78.	*G. isingteena* (Richardson, 1845)	x	x	x	x	x	x	x	
79.	*G. javanicus* (Bleeker, 1859)						x	x	
80.	*G. kidako* (Temminck & Schlegel, 1846)	x	x	x	x	x	x	x	
81.	*G. margaritophorus* Bleeker, 1864						x	x	
82.	*G. melanosomatus* Loh *et al.*, 2011								Loh *et al.*, 2014
83.	*G. melatremus* Schultz, 1953						x		
84.	*G. meleagris* (Shaw, 1795)	x	x		x	x	x	x	
85.	*G. minor* (Temminck & Schlegel, 1846)	x	x	x	x	x	x	x	
86.	*G. monostigma* (Regan, 1909)					x	x	x	
87.	*G. neglectus* Tanaka, 1911	x	x	x	x	x	x	x	
88.	*G. niphostigmus* Chen *et al.*, 1996								Chen *et al.*, 1996
89.	*G. nudivomer* (Günther, 1867)						x		
90.	*G. phasmatodes* (Smith, 1962)								Loh *et al.*, 2014
91.	*G. pictus* (Ahl, 1789)		x	x	x	x	x	x	
92.	*G. pindae* Smith, 1962						x	x	
93.	*G. polyuranodon* (Bleeker, 1854)	x	x	x	x	x		x	
94.	*G. prionodon* Ogilby, 1895	x	x	x		x	x		
95.	*G. prolatus* Sasaki & Amaoka, 1991							x	
96.	*G. pseudomelanosomatus* Loh *et al.*, this volume								new species
97.	*G. pseudothyrsoideus* (Bleeker, 1853)	x	x	x	x	x	x	x	
98.	*G. reevesii* (Richardson, 1845)						x		
99.	*G. richardsonii* (Bleeker, 1852)					x	x	x	
100.	*G. rueppelliae* (McClelland, 1844)					x	x		
101.	*G. sagmacephalus* Böhlke, 1997								Loh *et al.*, 2014
102.	*G. shaoi* Chen & Loh, 2007								Chen & Loh, 2007
103.	*G. taiwanensis* Chen *et al.*, 2008								Chen *et al.*, 2008
104.	*G. thyrsoideus* (Richardson, 1845)					x	x	x	
105.	*G. undulatus* (Lacepède, 1803)	x	x	x	x	x	x	x	
106.	*G. ypsilon* Hatooka, & Randall, 1992	x	x	x	x	x			
107.	*G. zonipectis* Seale, 1906						x	x	
108.	*Pseudechidna brummeri* (Bleeker, 1858)				x	x	x		
109.	*Rhinomuraena quaesita* Garman, 1888				x	x	x	x	
110.	*Scuticaria tigrina* (Lesson, 1828)						x	x	

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TABLE 3. (Continued)

	Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
111. *Strophidon dorsalis* (Seale, 1917)								Loh *et al.*, 2014
112. *S. sathete* (Hamilton, 1822)	x	x	x	x	x	x	x	
113. *Uropterygius alboguttatus* Smith, 1962								New record
114. *U. macrocephalus* (Bleeker, 1964)						x	x	
115. *U. marmorata* (Lacepède, 1803)								Loh *et al.*, 2014
116. *U. micropterus* (Bleeker, 1852)						x	x	
117. *U. nagoensis* Hatooka, 1984								Chen, 2004
118. *U. oligospondylus* Chen *et al.*, 2008								Chen *et al.*, 2008
119. *U. xanthopterus* Bleeker, 1859								Ho *et al.*, this volume
Family 9. Nemichthyidae								
120. *Avocettina infans* (Günther, 1878)					x		x	
121. *Nemichthys scolopaceus* Richardson, 1848		x		x	x	x	x	
Family 10. Nettastomidae								
122. *Nettastoma parviceps* Günther, 1877							x	
123. *N. solitarium* Castle & Smith, 1981							x	
124. *Nettenchelys gephyra* Castle & Smith 1981								Smith *et al.*, this volume
125. *N. proxima* Smith *et al.*, this volume								New species
126. *Saurenchelys fierasfer* (Jordan & Snyder, 1901)	x	x	x	x	x	x		
127. *S. taiwanensis* Karmovskaya, 2004								New record
128. *S. gigas* Lin *et al.*, this volume								New species
Family 11. Ophichthidae								
129. *Bascanichthys kirkii* (Günther, 1870)		x	x	x	x	x	x	
130. *Brachysomophis cirrocheilos* (Bleeker, 1857)	x	x	x	x	x	x	x	
131. *B. crocodilinus* (Bennett, 1833)								New record
132. *B. henshawi* Jordan & Snyder, 1904								New record
133. *B. longipinnis* McCosker & Randall, 2001								McCosker & Randall, 2001
134. *B. porphyreus* (Temminck & Schlegel, 1846)								New record
135. *Callechelys kuro* (Kuroda, 1947)							x	
136. *C. marmorata* (Bleeker, 1854)							x	
137. *Cirrhimuraena chinensis* Kaup, 1856		x	x	x	x	x	x	
138. *Cirricaecula macdowelli* McCosker & Randall, 1993								McCosker & Randall, 1993
139. *Echelus polyspondylus* McCosker & Ho, this volume								new species
140. *E. uropterus* (Temminck & Schlegel, 1846)							x	

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TABLE 3. (Continued)

	Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
141. *Lamnostoma mindora* (Jordan & Richardson, 1908)								Hatooka & Yoshino, 1998
142. *Leiuranus semicinctus* (Lay & Bennett, 1839)		x	x	x	x	x	x	
143. *Muraenichthys gymnopterus* (Bleeker, 1853)					x			
144. *M. hattae* Jordan & Snyder, 1901								New record
145. *M. schultzei* Bleeker, 1857								New record
146. *M. thompsoni* Jordan & Richardson, 1908								New record
147. *M. velinasalis* Hibino & Kimura, this volume								New species
148. *Myrichthys colubrinus* (Boddaert, 1781)		x	x	x	x	x	x	
149. *M. maculosus* (Cuvier, 1816)					x	x	x	
150. *Neenchelys diaphora* Ho *et al.*, this volume								New species
151. *N. cheni* (Chen & Weng, 1967)		x	x	x	x	x	x	
152. *N. gracilis* Ho & Loh, this volume								New species
153. *N. mccoskeri* Hibino *et al.*, 2012								Hibino *et al.*, 2012
154. *N. parvipectoralis* Chu *et al.*, 1981								Ho *et al.*, 2010
155. *N. pelagica* Ho *et al.*, this volume								New species
156. *N. similis* Ho *et al.*, this volume								New species
157. *Ophichthus altipennis* (Kaup, 1856)								Chen *et al.*, 2010
158. *O. aphotistos* McCosker & Chen, 2000							x	
159. *O. apicalis* (Bennett, 1830)		?	?	?	?		?	McCosker & Ho, this volume
160. *O. asakusae* Jordan & Snyder, 1901								Chiu *et al.*, 2013
161. *O. bicolor* McCosker & Ho, this volume								New species
162. *O. bonaparti* (Kaup, 1856)								Chen, 2003
163. *O. cephalozona* (Bleeker, 1864)	?	?	?	?	?	?		Ho *et al.*, this volume
164. *O. erabo* (Jordan & Snyder, 1901)		x	x		x	x		
165. *O. fasciatus* (Chu *et al.*, 1981)								Chen, 1993
166. *O. lithinus* (Jordan & Richardson, 1908)	x	x	x	x	x	x		
167. *O. machidai* McCosker *et al.*, 2012								Chiu *et al.*, 2013
168. *O. macrochir* (Bleeker, 1852)		x	x	x	x	x	x	
169. *O. megalops* Asano, 1987								Ho *et al.*, this volume
170. *O. obtusus* McCosker *et al.*, 2012								Chiu *et al.*, 2013
171. *O. polyophthalmus* (Bleeker, 1864)	x	x	x		x	x		
172. *O. shaoi* McCosker & Ho, this volume								New species
173. *O. urolophus* (Temminck & Schlegel, 1846)	x	x	x	x	x	x	x	
174. *Ophisurus macrorhynchos* Bleeker, 1852								New record

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TABLE 3. (Continued)

	Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
175. *Phyllophichthus xenodontus* Gosline, 1951								Ho *et al.*, 2010
176. *Pisodonophis boro* (Hamilton, 1822)	x	x	x	x	x	x	x	
177. *P. cancrivorus* (Richardson, 1848)	x	x	x	x	x	x	x	
178. *Pylorobranchus hoi* McCosker *et al.*, 2012								McCosker *et al.*, 2012
179. *Schultzidia johnstonensis* (Schultz & Woods, 1949)								New record
180. *Scolecenchelys fuscapenis* McCosker *et al.*, 012								New record
181. *S. iredalei* (Whitley, 1927)								New record
182. *S. laticaudata* (Ogilby, 1897)								New record
183. *S. macroptera* (Bleeker, 1857)								New record
184. *Skythrenchelys zabra* Castle & McCosker, 1999								Chiu *et al.*, 2013
185. *Sympenchelys taiwanensis* Hibino *et al.*, this volume								New species
186. *Xyrias chioui* McCosker *et al.*, 2009								McCosker *et al.*, 2009
187. *X. revulsus* Jordan & Snyder, 1901								New record
188. *Yirrkala misolensis* (Günther, 1872)								New record
Family 12. Serrivomeridae								
189. *Serrivomer sector* Garman, 1899							x	
Family 13. Synaphobranchidae								
190. *Dysomma anguillare* Barnard, 1923	x	x	x	x	x	x	x	
191. *D. dolichosomatum* Karrer, 1982						x	x	
192. *D. goslinei* Robins & Robins, 1976						x		
193. *D. longirostrum* Chen & Mok, 2001								Chen & Mok, 2001
194. *D. melanurum* Chen & Weng, 1967		x	x	x	x	x	x	
195. *D. opisthoproctus* Chen & Mok, 1995								Chen & Mok, 1995
196. *D. polycatodon* Karrer, 1982								Chen & Mok, 2001
197. *D. taiwanensis* Ho *et al.*, this volume								New species
198. *Dysommina rugosa* Ginsburg, 1951								Chen & Mok, 2001
199. *Histiobranchus bathybius* Günther, 1887								New record
200. *Ilyophis brunneus* Gilbert, 1891								Chen & Mok, 2001
201. *Meadia abyssalis* (Kamohara, 1938)								Chen & Mok, 2001
202. *M. roseni* Mok *et al.*, 1991						x	x	
203. *Simenchelys parasitica* Gill, 1879						x		
204. *Synaphobranchus affinis* Günther, 1887							x	
205. *S. brevidorsalis* Günther, 1877							x	
206. *S. kaupii* Johnson, 1862							x	

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TABLE 3. (Continued)

	Chen, 1956	Chen & Weng, 1967	Chen, 1969	Shen, 1984a	Chen & Yu, 1986	Shen *et al.*, 1993	Shao, 2008	Note/other references
Order Eurypharyngiformes								
Family 14. Eurypharyngidae								
207. *Eurypharynx pelecanoides* Vaillant, 1882								New record

The content of present volume

This special issue comprises 14 papers that deal with the validity of Taiwanese eel species, their nomenclature, and the description of new records and new species from Taiwan and adjacent regions. Hibino *et al*. (2015) describe a new genus and new species in the subfamily Myrophinae, family Ophichthidae. Ho *et al*. (2015b) formally described three new *Neenchelys* species that were proposed by Ho *et al*. (2013) but were considered as unavailable names.

Loh *et al*. (2015) studied the molecular features of the unpatterned moray eels and gives a detailed view of their phylogenetic relationship and their new generic status. A new cryptic species of moray eel is described from eastern Taiwan as well.

The remaining papers review the genera *Nettenchelys, Parabathymyrus,* and *Dysomma,* and describe new species of *Chlopsis, Echelus*, *Ophichthus*, *Muraenichthys*, *Neenchelys*, and *Saurenchelys*.

Finally, Ho *et al*. (2015a) provides an annotated checklist based on recent studies which covers/includes all historical records of known eel species from Taiwan, and bring the total number of eel species in Taiwan to 207.

Although the known diversity of eels of Taiwan has been considerably increased, there are still taxonomic problems that await resolution. We hope that this issue will provide a foundation for a better understanding of biodiversity of the Taiwanese eel fauna and its conservation.

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