The Anguilliform Eels (Pisces: Anguilliformes) of Bago River and Adjacent Waters in Negros Occidental, Philippines

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The Eels (Order Anguilliformes) occurring in Bago River and adjacent waters in Negros Occidental, Philippines are briefly annotated. A total of 21 species in six families are included in this paper. Snake-eels (Ophichthidae) consist of 11 species, moray Eels (Muraenidae) are represented by four species, Conger Eels (Congridae) are represented by three species, while only two species belong to the family Muraenesocidae and the Freshwater Eels (Anguillidae) and Spaghetti Eels (Moringuidae) are each represented by a single species.

KEYWORDS: eels, river, brackish water, freshwater, Negros Occidental

INTRODUCTION

Anguilliform eels are characterized by having elongate, snake-like or worm-like bodies (Smith & McCosker, 1999) and all have leptocephalic larval stage (Smith, 1979; Smith & Castle, 1972; Castle, 1966, 1968; Miller & Tsukamoto, 2004).

The eels in the Philippines have been studied by several authors including Bleeker (1864), and Herre (1923, 1924). Smith (2004)

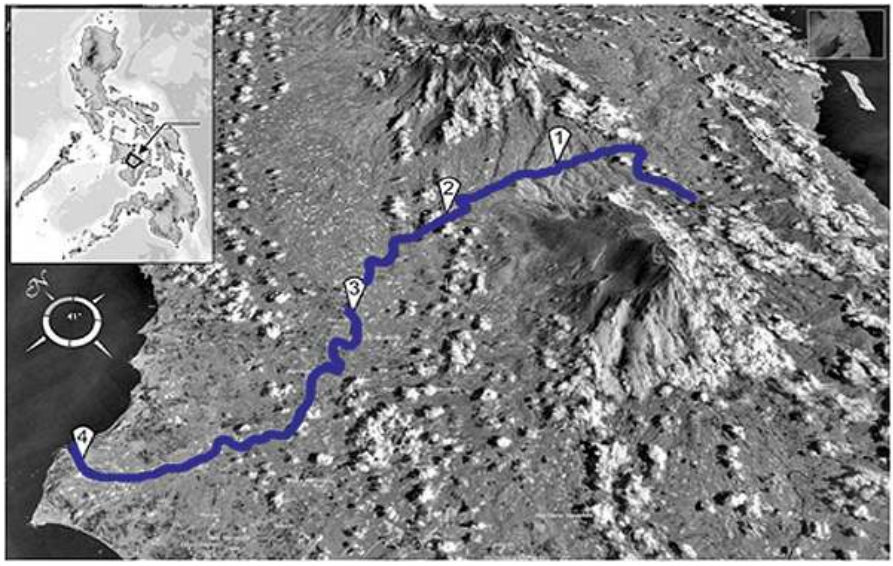

Figure 1. Map showing the Bago River in Negros Occidental.

reported on the type materials of eels derived from the extensive collection made by the Albatross Expedition from 1907 to 1910 (Smith & Williams, 1999).

Beginning in the late 1990s, several new species of eels have been added to the fish fauna of the Philippines (McCosker, 1998, 2010; Castle & Smith, 1999; Böhlke, 2000; Böhlke & Smith, 2002; Smith & Karmovskaya, 2003). Several unknown species that have been discovered recently still await formal description while certain groups such as moringuids and ophichthids need a thorough taxonomic revision (D.G. Smith & J.E. McCosker, pers. comm.). For example, the recently described *Anguilla huangi* (*A. luzonensis*) from Taiwan and the northern Philippines was confused with *A. celebesensis* for a long period of time (Teng, Lin & Tzeng, 2009).

It is the purpose of this paper to present the species of eels thus far known from Bago River, Negros Occidental and adjacent waters.

MATERIALS AND METHODS

We collected samples of eels mainly from the four collecting stations in Bago River, Negros Occidental (Figure 1) using a variety of gear such as *garab* (an indigenous gear), spears, fine-nets and bamboo

traps. Additional samples purchased directly from local fishers and local fish markets in neighboring localities were also included in this study.

Samples were immediately fixed in 10% formalin and then in 70% ethanol after at least a week in formalin and deposited at the R.B. Gonzales Museum of Natural History at Silliman University, Dumaguete City.

In addition, specimens from the adjacent waters such as those collected in Guimaras Strait and in Iloilo province that are presently housed in the Philippine National Museum (PNM) and were examined by the senior author on 30 September 2009 were also included. Certain species known in the adjacent waters listed in published literature were also included in the species list.

For verification, photographs were obtained for each species, and then sent to eel specialists (D.G. Smith in the Division of Fishes, United States National Museum of Natural History, Smithsonian Institution and McCosker, J.E. of the California Academy of Sciences, USA). Duplicate samples were later donated to the USNM through Dr. Jeff Williams. Aside from the identification provided to us by specialists on eels, we have also utilized the following sources: Smith and McCosker (1999) and McCosker (2010) for ophichthids; Böhlke, McCosker & Smith (1999) for muraenids, and Smith (1999) for moringuids and congrids.

RESULTS AND DISCUSSION

List of species

The research generated an annotated list of 21 anguilliform eel species collected from Bago River and the adjacent waters of Ilog River and Guimaras Strait. Majority are known burrowers inhabiting estuarine areas that belong to Ophichthidae (10 species) and Moringuidae (four species) families. Some of the eel species need further taxonomic attention; some of these aspects are briefly discussed.

ORDER ANGUILLIFORMES

FAMILY ANGUILLIDAE (Freshwater Eels)

Anguilla marmorata Quoy and Gaimard 1824 (Figure 2)

Figure 2. Giant Mottled Eel *Anguilla marmorata* from Bago River (weight = 14 Kg).

Specimens: SURBG 10051-10052
Remarks: Distinguished easily from other *Anguilla* by its mottled color and long dorsal fin which originates closer to the gill opening than the anus (Smith 1999a). The largest individual that we caught (Station 1 in Don Salvador Benedicto) measures ca 2m and weighs 14 kg.

Figure 3. The worm eel *Moringua raitaborua* from Bago River estuary.

FAMILY MORINGUIDAE (Spaghetti Eels)

Moringua raitaborua Hamilton 1822 (Figure 3)
Specimens: SURBG 10030-50; Bago River Estuary; Coll: A. Bucol, C. Menes, J. Linaugo, and A. Dales; Oct. 15, 2009.
Remarks: Ontogenetic and sexual variations (Smith & Castle, 1972; Smith, 1999) have caused taxonomic confusion within the genus *Moringua*. Some of the species have been assigned erroneously to different families and genera. The immature forms of *Moringua* were described many times in the literature as *Apthalmichthys, Stilbiscus,* and *Anguillichthys* (Gosline & Strasburg, 1956; Gordon, 1954; Castle, 1968; Castle & Smith, 1972).

The actual number of species of *Moringua* has not yet been determined. Numerous names (about 38) have been published in the literature (see Castle, 1968), but the actual number of species is probably small (Smith, 1999, 2010 pers. comm). Herre (1924) published nominal names such as *Moringua cagayana* and *M. robusta*. It appears that *M. robusta* might be a maturing female of *M. raitaborua*. However, the entire genus needs revision and variations within the genus will be discussed later. Careful examination of the body proportions, vertebral counts, developmental stages and sexual dimorphism suggest the samples we obtained are *Moringua raitaborua*.

Several specimens of *Moringua* are presently deposited in the USNM, but the researchers were unable to examine them. Among these are specimens collected by J. Williams et al. in 1995 at Guimaras (USNM 343988) and San Joaquin, Iloilo province (USNM 343987), by H. Kellers in 1929 during the U.S. Navy Eclipse Expedition at Victorias, Negros Occidental (USNM 112773), by the Albatross Philippine Expedition (1907-1910) in 1908 at Naso Pt., Panay (USNM 135104) and in Iloilo Market in 1909 (USNM 135108). An immature *Moringua* deposited in PNM measuring 170 mm (TL) collected by Villoso et al. in February 1975 from Nogas Island, Anini-y, Antique, was found among *Gymnothorax* specimens (PNM 10750).

Herre (1923) reported *Apthalmichthys macrocephalus* Bleeker, probably an immature specimen of *Moringua raitaborua*, from Luboc Beach, Iloilo.

FAMILY CONGRIDAE (Conger Eels)

Bathymyrus sp.
Specimen: SURBG 10065; Kabankalan Fish Market; J. Pacalioga

Uroconger lepturus (Richardson, 1845)
Specimens: SURBG 10053; Kabankalan Fish Market, Negros Occidental; coll: J. Pacalioga.
Remarks: A. Bucol obtained a single specimen from Bogo Fish Market in Oct. 2009. Herre (1923) reported samples collected from Luboc Beach, Iloilo.

Conger cinereus Rüppell, 1828
Specimens: Four unlabeled specimens at PNM (10666) collected from Nogas Island, Anini-y, Antique, Panay in February 1975.
Remarks: Probably common in Guimaras Strait.

FAMILY MURAENESOCIDAE (Pike Congers)

Muraenesox cinereus (Forsskål, 1775) (Figure 4)
Specimens: Commonly sold as by-catch in fish markets.
Remarks: Sometimes caught by fishers near the mouths of Ilog and Bago rivers.

Muraenesox bagio (Hamilton, 1822) (Figure 5)
Specimens: SURBG 10054 (Two samples); Ilog River Estuary

Figure 4. Head region of the Pike-conger eel *Muraenesox cinereus*.

Figure 5. Muraenesox bagio (dorso-lateral view).

Figure 6. Muraenichthys cf thompsoni.

FAMILY OPHICHTHIDAE (Snake or Worm Eels)

Subfamily Myrophinae

Neenchelys sp.
Specimens: SURBG 10055
Remarks: Specimens were found in the estuarine area of Bago River. Because the genus is taxonomically confusing, identification is limited to the generic level.

Muraenichthys thompsoni Jordan and Richardson, 1908 (Figure 6)

Specimens: SURBG 10056
Remarks: A few samples were obtained from the estuarine area with the use of a local gear called *garab*. McCosker (1970) considered *M. malabonensis* as a synonym of *M. thompsoni*.

Benthenchelys cartieri Fowler, 1934
Remarks: The following data were taken from Smith (1994). Holotype: USNM 92356 (115 mm, vertebrae 46/50/167). Pacific, Philippine Is.; between Panay and Negros, Lusaram Lt, N 23° E, 25.50 mi (41 km); 10°05'45"N, 122°18'30"E; 638 fm (1168 m); 30 Mar 1908; *Albatross* 5185; 1726 hr. Paratypes: USNM 93349 (4, 97-105 mm).

Scolecenchelys Ogilby, 1867 (Figure 7)
Specimen: 1 specimen sent to the USNM
Remarks: Distinguished from the genus *Muraenichthys* by the presence of teeth on vomer, maxilla and dentary (McCosker, 1970). Because only a single specimen is available and the number of vertebrae cannot be determined at this time, we limit our identification up to the genus level.

Figure 7. The worm eel *Scolecenchelys* from Bago River.

Skythrenchelys zabra Castle and McCosker, 1999
Specimens: USNM 148574; H.C. Kellers, 20 March 1929
Remarks: Described as a new genus and species by Castle and McCosker (1999), including a single specimen (USNM 148574) collected off Iloilo, Panay

Figure 8. Cirrhimuraena cf chinensis.

Cirrhimuraena chinensis Kaup, 1856 (Figure 8)
Specimens: SURBG 10057
Remarks: Identification provisionary given that the genus needs revision (McCosker, J. pers. comm.).

Bascanichthys sp. (Figure 9)
Specimens: SURBG 10058; A single specimen collected from the sandy estuary of Ilog River presently deposited in USNM; coll: A. Bucol and party.

Figure 9. Bascanicthys sp., an uncommon estuarine eel in Negros Occidental.

Figure 10. The worm eel (*Yirrkala misolensis*) from Bago River.

Yirrkala misolensis Gunther, 1872 (Figure 10)
Specimens: SURBG 10059
Remarks: Coloration similar to *Lamnostoma* (Hatooka & Yoshino, 1998; Smith & McCosker, 1999; Chang & Tsai, 2003) but careful examination of the specimens revealed that they belong to *Yirrkala* in having higher vertebral count 160-162. Little is known on the biology of the 12 species under the genus. A single specimen in PNM labeled *Caecula misolensis* (identified by P.C. Gonzales) collected by "S.F. BAIRD" in the northern end of Tagubohan Island, Apitan Pass, Panay at 10 fathom on August 3, 1948.

Ophichthus grandoculis (Cantor)
Specimens: SURBG 10060; Ilog River Estuary; J. Pacalioga and party.

Remarks: The only known specimen is being verified at the USNM.

Pisodonophis boro (Hamilton, 1822)
Specimens: A single specimen collected from Bago River in 2009.

FAMILY MURAENIDAE (Morays)

Strophidon sathete Hamilton, 1822 (Figure 11)
Specimens: SURBG 10061
Remarks: Juvenile samples were found in the muddy estuary while the single adult specimen was captured from the mouth of the Bago River. Herre (1923) reported this species as *Evenchelys macrurus* (Bleeker) from Iloilo.

According to a brief historical background of the species provided Bohlke (1995), Bleeker (1863) erroneously considered that *sathete* was similar to *brummeri*, even though Hamilton and McClelland gave diagnostic characters (the position of the anus, the number of dorsal- and anal-fin rays).

Figure 11. The moray eel *Strophidon sathete* from Bago River estuary.

Figure 12. The moray eel *Gymnothorax polyuranodon*.

Gymnothorax polyuranodon (Bleeker, 1853) (Figure 12)
Specimen: 1 specimen (temporarily stored in La Consolacion College-Bacolod); coll: J. Linaugo and party.
Remarks: Herre (1923) included this species in his list of rare eels in the Philippines, which we concur.

Gymnothorax tile (Hamilton, 1822)
Specimens: Often caught by fishers in river mouths. Recent samples are presently being catalogued at the USNM.

Gymnothorax pictus (Ahl, 1789)
Specimens: 12 specimens in PNM collected by Villoso et al. in February 1975 at Nogas Island, Anini-y, Antique.
Remarks: Round blotches visible in specimens.

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