Fishes and Macroinvertebrates of Señora River, Siquijor Island, Philippines with New Records of the Genus *Puntius* (Cyprinidae) in the Visayas

Abner A. Bucol
Silliman University Angelo King Center for Research and Environmental Management

Rosalina Catid
Siquijor State College
Larena

An assessment on the fishes and macroinvertebrates of Señora River in Siquijor Island was conducted from February-May, 2011 using a combination of fishing gears. The icthyofauna (fishes) consist of 33 species in 22 Families while macroinvertebrates included four species of shrimps, nine species of crabs, and six species of mollusks. The Spotted Barb (*Puntius binotatus*) of the Family Cyprinidae was documented in Señora River and this is the first record of the genus in the Visayas.

KEYWORDS: fishes, macroinvertebrates, river, Siquijor, Visayas

INTRODUCTION

Rivers are running water bodies (lotic) that provide food (fishes and macroinvertebrates) and other consumer processes for humans, from provision for drinking water to their use as important conduit for industrial, domestic, and agricultural sources (Giller & Malmqvist, 1998). Contrasting with a common view of rivers as continuous, longitudinal gradients in physical conditions,Thorp et al. (2006) in their riverine ecosystem sysnthesis (RES) portrayed rivers as downstream arrays of large hydrogeomorphic patches

(e.g. constricted, braided and floodplain channel areas) formed by catchment geomorphology and climate.

Rivers are generally understudied (Ward & Tockner, 2001) but among the most threatened ecosystems, especially in the tropics (Dudgeon et al., 2006).

Tropical Asian rivers, particularly in Southeast Asia, support a rich but incompletely known array of fishes (Allen, 1991; Zakaria-Ismail, 1994; Kottelat & Whitten, 1996; Fu et al., 2003; Davies 1999; Bhakta and Bandyopadhyay, 2008), benthic invertebrates (Chase & Bruce, 1993), and vertebrates adapted to riverine wetlands (Dudgeon, 2000). Despite their importance, Asian rivers, including those in the Philippines, remained poorly studied (Kottelat & Whitten, 1996).

Philippine rivers have been studied in the past decades but were mainly focused on the taxonomy of fishes (Herre, 1923, 1924, 1927, 1953; Roxas & Ablan, 1940) and crustaceans (Chase & Bruce, 1993; Ng and Takeda, 1993a, 1993b). Recent studies on river fishes include Carumbana (2002), Chavez et al. (2006) and Hubilla, Kis, and Primavera (2007).

This study aimed to present a comprehensive listing of the fishes

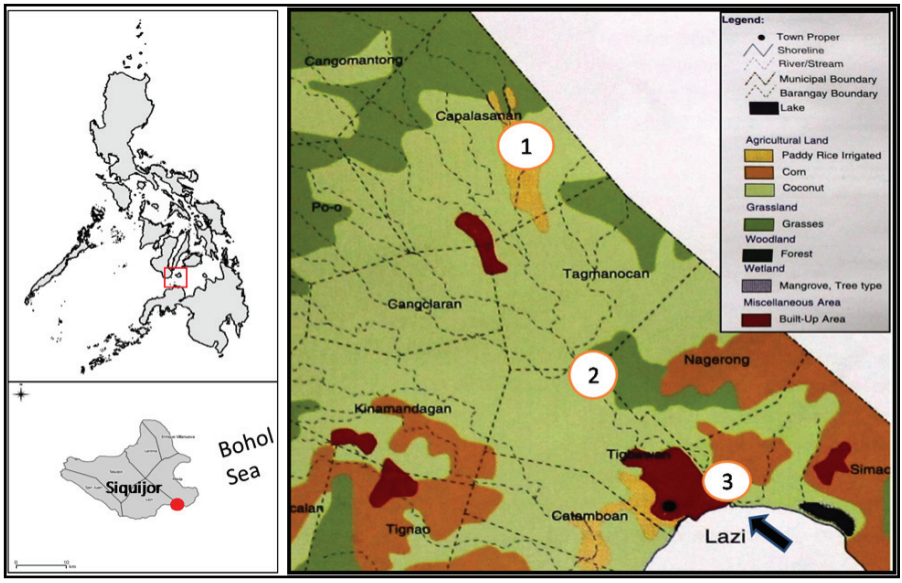

Figure 1. **Map showing the location of the sampling stations in Señora River relative to the Land Use Classification of the Municipality of Lazi, Province of Siquijor, Philippines (Map courtesy of Geographic Atlas of Siquijor, 2000).**

and macroinvertebrates found in Señora River on Siquijor Island. In this river, fishes and crustaceans are harvested intermittently by the locals, often with the aid of noxious chemicals and other gears such as small-mesh gillnets. However, there has been no published account on these organisms including their distribution in Señora River.

METHODS AND MATERIALS

Survey Stations

Señora River is located in the municipality of Lazi, Siquijor (Figure 1). Three survey locations were established, in the head waters (Capalasanan), middle segment (Cambugahay), and estuarine portion (Simacolong) of the river. These were designated as stations 1, 2, and 3, respectively.

Station 1 (Figure 2) is one of the tributaries of Señora River located in Barangay Capalasanan (9°10'37.6" N; 123°36'55.3" E). It has a generally shallow (ca. 0.5m) and has a narrow (ca. 1m) channel, originating from a subterranean (underground) stream. The stream probably originated in the upper barangays as springs or streams and is the source of small-scale irrigation system in the area. Water velocity was strongest in this station with 0.27 m/s during the wet months and 0.11 m/s during the dry months. However, average water discharge appears very minimal (below 0.5 cu.m/sec) throughout the year. The substrate is composed

Figure 2. **Small streams in Station 1 (Capalasanan), near the cave entrance (left photo); near coconut plantation (right). Photo by E. Basa.**

Figure 3. **Small waterfalls (Cambugahay) in (Station 2) of Señora River. Photos by A. Bucol.**

mainly of limestone with sand and silt. Patches of smaller forests can be seen in the vicinity but in most areas are rice paddies as well as corn and cassava farms.

Station 2 (Figure 3) is located at Barangay Canclaran, near the junction of the main channel and the tributary which drains water from Capalasanan (9°08′48.3″ N; 123°37′24.4″ E; 50m above sea level). Width ranged from about 10m (dry season) to about 20m (wet season). Depth (0.32-0.73m) is irregular following the contour of the channel. Because of the abrupt slope of the channel, three small "falls" are visible, the highest of which is about 5m. Several boulder-sized rocks can be found flanking the main channel. Average water discharge was observed highest in this station (3-5 cu.m/sec). The adjacent banks are steep with karst forests and bamboo grooves.

Station 3 (Figure 4) is the estuarine portion of the river (9°07′50.8″ N; 123°38′15.7″ E, sea level), located in between the barangays of Tigbauan and Nagerong. Width ranged from 15m to 20m while depth ranged from 0.48 to 0.75m. It is located about 300m away from Lazi

Figure 4. **Station 3 (estuarine) near the Nagerong Bridge.**

town. Average water discharge was measured between 1-2 3-5 cu.m/ sec. The substrate is muddy to silty in the middle and a combination of limestone and silt in the shallower (littoral) portion. The immediate banks are covered by nipa (*Nypa fruticans*), bamboo (*Bambusa blumea*) thickets and other plant species including cultivated trees (e.g. mango *Mangifera indica*), and several grasses and shrubs.

Collecting Techniques

Fishes and crustaceans were captured by means of gillnets, hook-and-line, and fine-mesh nets. Mollusks were collected primarily by bare hands. In addition, one of us (A. Bucol) made underwater observations with the aid of an underwater camera to document certain fishes and macroinvertebrates.

All samples were immediately preserved in 10% formalin then brought to the Research Laboratory of Siquijor State College (SSC) for further processing and taxonomic identification. A few samples were also deposited at the Silliman University Rodolfo B. Gonzales Museum of Natural History (SURBG). Gobioid fishes that need further confirmation by specialists (ichthyologists) were deposited at the Division of Fishes of the Smithsonian Institution, Maryland, USA thru Dr. Jeffrey Williams, the collections manager. These samples were verified by Dr. Edward Murdy, a specialist on gobies. Dr. Ronald Watson of Florida Museum of Natural History and Dr. Helen Larson of the Museum and Art Gallery of the Northern Territory, Australia confirmed the identity of gobioid fishes while Dr. Gerald Allen of Western Australian Museum confirmed the identification of the brackish water damselfish based on photographs. Dr. Hiroshi Senou of Kanagawa Prefectural Museum of Natural History, Japan identified the mullets. The Spotted Barb *Puntius binotatus* was confirmed by Bonifacio V. Labatos of UPLB, an authority on Philippine cyprinids.

Species identification was based on available taxonomic references: Allen (1991, 1999), Harrison and Senou (1999), and Larson and Murdy (2001) for fishes, Chase and Bruce (1993) for shrimps, and Serène and Soh (1970), Ng, Guinot, and Davie (2008), Bouchard et al. (In Press) for crabs.

Fishes are classified ecologically based on Froese and Pauly (2011) and Nelson (2006): (D)-diadromous: regularly living part of their lives in lakes and rivers and part in the oceans; (C)-catadromous: spawns in the ocean but returns to freshwater; (M)-marine species

Table 1.

List of Fishes Sampled From Señora River. Nelson (2006): (D)—diadromous: regularly living part of their lives in lakes and rivers and part in the oceans; (C)—catadromous: spawns in the ocean but returns to freshwater; (M)—marine species that sporadically enters freshwater; (E)—euryhaline: species regularly entering brackish water from either the oceans or rivers or both; (CF)—confined to freshwater

Family	Species	Classification*	Herre (1953)	Station 1	Station 2	Station 3
Muraenidae	*Gymnothorax tile*	M				X
Elopidae	*Elops machnata*	E/M				X
Megalopidae	*Megalops cyprinoides*	E/M				X
Carangidae	*Carangoides ferdau*	M				X
Chanidae	*Chanos chanos*	E				X
Clariidae	*Clarias batrachus*	CF		X		
Hemirhamphidae	*Zenarchopterus dispar*	E/M				X
Mugilidae	*Chelon subviridis*	D				X
	Chelon macrolepis	D				X
	Mugil cephalus	D	X			X
	Moolgarda? seheli	D	X			X
Kuhliidae	*Kuhlia rupestris*	E/D			X	
	Kuhlia marginata	E/D			X	X
Apogonidae	*Apogon hyalosoma*	E/D				X
Lutjanidae	*Lutjanus argentimaculatus*	E/D				X
	Lutjanus russelli	M				X
Sparidae	*Acanthopagrus berda*	M				
Toxotidae	*Toxotes jaculatrix*	E/D			X	X
Chandidae	*Ambassis interrupta*	D				X
Gobiidae	*Periopthalmus argentilineatus*	E				X
	Awaous ocellaris	D	X	X	X	
	Stiphodon atropurpureus	D		X	X	
	Exyrias puntang	E				X
	Glossogobius celebius	E	X			
	Glossogobius giuris	E	X			
Eleotridae	*Eleotris fusca*	D		X	X	
	Ophiocara porocephala	D				X
	Ophieleotris aporos	D			X	X
	Butis amboinensis	D				X
	Oxyeleotris gyrinoides	D			X	X
Tetraodontidae	*Arothron reticularis*	E/M		X		
Cichlidae	*Oreochromis niloticus*	D		X	X	
Cyprinidae	*Puntius binotatus*	CF		X	X	
Poeciliidae	*Poecilia reticulata*	CF		X		
Pomacentridae	*Pomacentrus taeniometopon*	D				X
Syngnathidae	*Microphis leiaspis*	E				X
Number of species = 33 species			**5**	**8**	**10**	**23**

Table 2.

List of Macroinvertebrates From Señora River.

Family	Species	Station 1	2	3
SHRIMPS				
Palaemonidae	*Macrobrachium mamillodactylus*	X		
	Macrobrachium equidens			X
	Macrobrachium australe	X		
Atyidae	*Caridina endehensis*	X	X	
Number of species = 4		**3**	**1**	**1**
CRABS				
Varunidae	*Varuna litterata*	X		
Portunidae	*Scylla serrata*			X
	Thalamita crenata			X
Sesarmidae	*Geosesarma hednon*			X
	Perisesarma sp.		X	X
	Uca dussumieri			X
	Uca vocans			X
	Macropthalmus sp.			X
Paguridae	Pagurus sp.			X
Number of species = 9		**1**	**1**	**7**
MOLLUSKS				
Gastropoda	*Melanoides granifera*	X	X	
	Thiara scabra		X	
	Littorina scabra			X
	Nerita polita			X
	Nerita pulligera		X	
	Clithon corona			X
Number of species = 6		**1**	**3**	**3**

Table 3.

Morphometrics of four representative specimens of Puntius cf binotatus *from Siquijor Island.*

Morphometric Characters (Measurements in mm)	**Specimen 1**	**2**	**3**	**4**	**Mean**	**S.D.**
Total Length	38.5	34.5	26	24.5	30.88	6.73
Standard Length	29.5	30.5	24.5	22	26.63	4.05
Fork Length	35	33	25.5	23	29.13	5.78
Pre-anal Length	21	22.5	17.5	17.5	19.63	2.53
Pre-dorsal Length	15.5	15.5	11.5	12.5	13.75	2.06
Pre-pelvic Length	15	16.5	11	11.5	13.50	2.68
Pre-pectoral Length	9	8.5	6.5	7	7.75	1.19
Body Depth	9.5	9	6.5	6	7.75	1.76
Head Length	8.5	7.5	6	6.5	7.13	1.11
Eye diameter	2.5	2.5	2	2	2.25	0.29
Pre-orbital Length	2.5	2	1.5	2	2.00	0.41
Meristic counts						
Dorsal	IV, 8	IV, 9	IV, 8	IV, 8	IV, 8.25	0.50
Anal	III, 5	III, 6	III, 5	III, 6	III, 5.5	0.58
Pectorals	I, 15	I, 16	I, 16	I, 16	I, 15.75	0.50
Ventral	I, 9	I, 8	I, 8	I, 8	I,8.25	0.50
Lateral line scales	24	ND	ND	22	23	1.41
Transverse scales	4.5/2.5	ND	ND	4.5/2.5	4.5/2.5	0.00
Scales from nape to dorsal	8	ND	ND	8	8	0.00
Scales from ventral and lateral line	2.5	ND	ND	2.5	2.5	0.00
Scales around caudal peduncle	12	ND	ND	12	12	0.00

ND—not determined, scales incomplete/detached

that sporadically enters freshwater; (E)-euryhaline: species regularly entering brackish water from either the oceans or rivers or both; (CF)-confined to freshwater.

RESULTS AND DISCUSSION

There were 34 fish species belonging to 22 Families identified in this study from Señora River (Table 1). Between stations, most of the

Figure 5. **Spotted Barb (*Puntius cf binotatus*) from Cambugahay Falls (Station 2).**

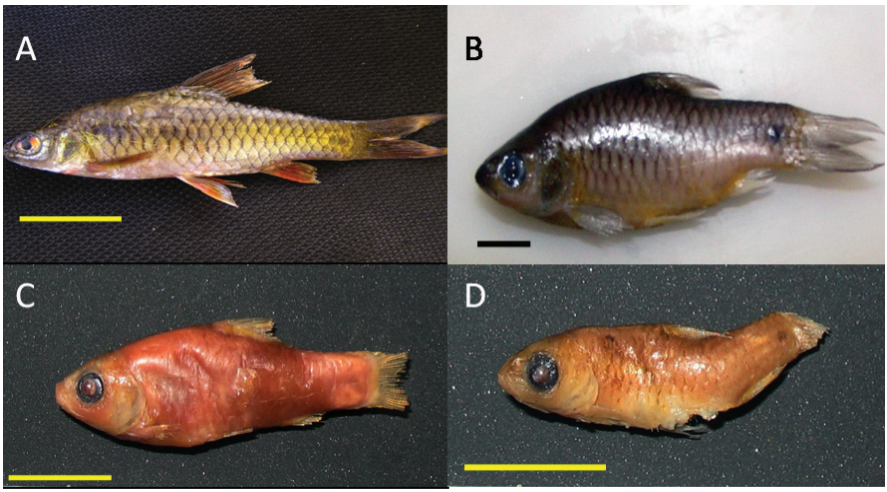

Figure 6. **Other specimens of *Puntius cf binotatus* obtained from various localities in Central Visayas: [A] Pagatban River, Cabigtian, Basay, Negros Oriental; [B] Forest Camp, Cuernos de Negros, Valencia, Negros Oriental; [C] Mabaho Cave, Mabinay, Negros Oriental; [D] Mt. Bandilaan Natural Park, Siquijor Is.**

fishes were collected in Station 3 (24 species), near the mouth of the river. In stations 1 and 2, only eight and 10 species were recorded, respectively.

The number of fish species in the Señora River is lower compared to the larger rivers in the country like the Ilog River with 87 species belonging to 44 families (see 2012 CHED unpublished report) and the Bago River with 56 species in 33 families (Pacalioga et al. 2010); both in Negros Occidental; Jalaur River, Iloilo with 51 species in 35

families (Alcala E. et al. 2010); the Agos River in Central Sierra Madre, Luzon with 53 species in 38 families (Carumbana 2002). However, the number of fishes in Señora River is much higher than the fish species reported in the Siaton River, Negros Oriental (Carumbana 2006 unpubl. manuscript) with 33 species in 28 families.

According to the ecological classification of fishes described by Nelson (2006), majority of the species (14) can be considered diadromous. Only three species can be classified as true freshwater fishes, two of which are introduced species (*Clarias batrachus* and *Poecilia reticulata*) while only the Spotted Barb (*Puntius binotatus*) can be considered as a primary freshwater fish which has a widespread distribution (Froese & Pauly, 2011). The rest of the species are classified as marine (four species), and a combination of euryhaline and marine species (four species) or euryhaline and diadromous species (five species). Anguillids (catadromous fishes) were not sampled in this study.

The aquatic macroinvertebrates consist of four species of shrimps, nine species of crabs, and six species of mollusks (Table 2). Most of the species listed are found in one or two sites only.

FIRST VISAYAN RECORD OF THE CYPRINID GENUS *PUNTIUS*

This study documented for the first time the presence of the freshwater cyprinid genus *Puntius* (Figure 5). Herre (1953) concluded that the genus has a limited distribution in the following Philippine islands: Mindanao, Palawan, and Mindoro. At least 10 specimens from the upper reaches of Señora River and three in small freshwater streams of the Bandilaan Natural Park were collected by the survey team. At present, these specimens are tentatively considered under the variable species *Puntius binotatus* Valenciennes, 1842. This highly variable species, especially in terms of coloration, has a wide distribution in Asia (Froese & Pauly, 2011). Herre (1940) suggested that the species might be the parental stock of all Philippine endemic members of the genus (see also Herre 1953). Table 3 provides detailed measurements of four representative specimens of *Puntius binotatus* from Siquijor.

During various visits in some river systems of Negros Island, one of us (A. Bucol) also collected specimens of this genus in small tributaries of Pagatban River in Basay, small streams in Mt. Talinis

(Cuernos de Negros), Valencia, and springs and streams in Mabinay, all in Negros Oriental province (Figure 6). It is remarkable that the species was never reported in Negros Island, being one of the most well explored islands of the country. The Mt. Talinis and Mabinay areas have been explored by Silliman University biologists since the 1940s up to the present. It is possible that the genus *Puntius* may have been confused as juveniles of the Common Carp *Cyprinus carpio* Linnaeus, 1758 but can be easily distinguished from the latter for having shorter dorsal fin base.

CONCLUSION AND RECOMMENDATIONS

This study documented 33 species of fish and macroinvertebrates composed of four species of shrimps, nine species of crabs, and six species of mollusks. The Spotted Barb (*Puntius binotatus*) of the Family Cyprinidae was documented in Señora River and this is the first record of the genus in the Visayas. Future investigations should aim to determine whether or not the genus is native to the Visayas.

Despite its small size, it has the number of species comparable to some of the larger rivers such as the Siaton River in Negros Oriental. However, fishing by means of noxious chemicals has been reported to us in the upper reaches of the river. Conservation plan should consider stopping the said activity of the locals.

ACKNOWLEDGMENTS

We thank the Commission on Higher Education (CHED) for funding the research project. Dr. A.C. Alcala (SU-AKCREM) provided initial comments on this manuscript. The following are also thanked for the identification of fishes and crustaceans listed in this study: Bonifacio V. Labatos (UPLB) for the cyprinids, Dr. Edward Murdy (National Science Foundation), Dr. Ronald Watson (Florida Museum of Natural History), Dr. Helen Larson (Museum and Art Gallery of the Northern Territory, Australia) for the gobies, Dr. Gerald Allen (Western Australian Museum) for the brackish water damselfish, and Dr. Hiroshi Senou (Kanagawa Prefectural Museum of Natural History, Japan) for the mullets.

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