

Freshwater and Semi-terrestrial Crab Fauna of Selected Areas in Southern Luzon, Philippines

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Abstract: Philippines is an archipelago known for its rich biodiversity. However, there is still inadequate knowledge regarding its biodiversity in the present times. With line to this, further survey and researches are the priority of this study. Crab faunal studies are usually deficient in terms of data and researches. The freshwater and semi-terrestrial crabs of southern Luzon are studied on the basis of field collections carried out from March to September 2004 in selected areas of Cavite, Batangas, Albay, Camarines Sur, Catanduanes and the Central Luzon (Nueva Ecija and Tarlac). A total of 116 crab samples were obtained, preserved and diagnosed in the laboratory for taxonomic characters. The identification of this samples were conducted using available descriptions of representative species of the varying families and genera of Philippine freshwater crabs. To support the research, other samples were examined by carcinologists to express the identity of the crab samples. Morphological approach is the primary method used in the study. The results manifested eight (8) taxa that were also reported, described and identified that belong to four (4) families namely Potamidae, Parathelphusidae, Grapsidae and Gecarcinidae. For future use and advancement there is a need for intensive systematic studies prior to genetic characters and the gonopodium of male crabs.

Keywords: Freshwater Crabs, Brachyurans, Family, Taxonomy

1. Introduction

According to the Protected Areas and Wildlife Bureau (PAWB) of the Department of Environment and Natural Resources (DENR), the present knowledge of biodiversity in the Philippines is relatively inadequate and acquired mostly from studies done by foreign biologists. Furthermore, the World and Wildlife Fund (WWF) noted that there is a great need for surveys of the freshwater habitats of the Philippines. With further surveys, it will be possible to highlight those areas most in need of conservation (<http://www.worldwildlife.org/wildworld/profiles/g200/g189.html>). Based on the existing literatures on the crab fauna of the archipelago, several areas in the Luzon Biogeographic Province (LBP) cry out for more crab faunal studies and deserve more intensive field surveys from Filipino biologists, thus this investigation.

Given the paramount importance of the biodiversity in freshwater systems of Southern Tagalog Region (STAR),

Central Luzon (CLUZ) and Bicol Region (BICR) to generate more information on the crab faunal diversity and the need to conserve the remaining natural populations of these groups of crustacean, this research project (*under the research program on the patterns of biodiversity in aquatic ecosystems*) was carried out. It is expected that the results of this project will fill in the wide gaps of the mostly the undescribed crab fauna of the Philippines.

Research on the Freshwater Crabs

Reports indicate that invertebrate biodiversity in Asian rivers has not been studied thoroughly ([9] Dudgeon, 2000). Among the freshwater forms, the true crabs (Arthropoda: Crustacea: Malacostraca: Eumalacostraca: Eucarida: Decapoda: Pleocyemata: Brachyura: Eubrachyura: Heterotremata) are astonishingly diverse, comprising six (6) families with more than 80 genera in Asia. In China alone, Dai et al. (1986) and [8] Dai & Yang (1991) described 228 species and subspecies in 35 genera from the Parathelphusidae ALCOCK, 1910 (*sensu* [17] NG, 1988) and the Potamidae ORTMANN, 1896 ([13] Ng 2000). Many

more species can be expected in the Southeast Asia (SEA) and the East Asian regions in the next 10 to 20 years.

The biodiversity group at the National University of Singapore (NUS) headed by Dr. Peter K. L. Ng (Director of the Raffles Museum of Biodiversity Research or RMBR) believes that this present number of identified freshwater crab fauna will increase due to the various collections being done in many parts of Thailand, Sumatra, Kalimantan, Sulawesi and the several islands of the Philippine archipelago. It is estimated that the actual number of freshwater crab species present in SEA reaches to about 200 species.

In 1993 for instance, only seven (7) species of freshwater crabs were known from Sri Lanka, but in 2003 there are about 35 endemic species of freshwater crabs already identified by Dr. Mohamed Bahir. This project involved the expert assistance of Dr. P. K. L. Ng and Francis Lim of NUS. In their report, the only rainforest tree climbing crab known in Asia, *Ceylonthelphusa scansor* was discovered in Sri Lanka. Many freshwater crabs have been living in rivers, but many of these species (e.g. *Sesarmops*) have migrated to the lakes and the land.

Studies on the freshwater crabs of the Philippines are very few compared to the marine dwelling forms such as Atienza-Filipina (1972) who described the macrurous and brachyurous decapod crustaceans from Dagat-dagatan, Laguna and Manuel (1995) on the decapod and stomatopod crustaceans of Aklan. The paper of [22] Ryan & Choy (1991) tackled on the mass upstream migration of megalopae of *Varuna literata* FABRICIUS 1798 (Grapsidae). Some papers like [3] Cabrera (1984) noted the freshwater crab, *Sundathelphusa philippina* as the host of the lung parasite, *Paragonimus*.

The work of Caraiso (1950) reported the swimming crabs of the Philippines and a volume of the Philippine Flora and Fauna included some crabs (Garcia 1986). Several papers published by non-Filipino workers are pertinent ones on the systematics of freshwater crabs. Drs. P. K. L. Ng and M. Takeda basically described the freshwater crabs of the Philippines, particularly the families Parathelphusidae ALCOCK, 1910 (*sensu* [17] NG, 1988), Potamidae ORTMANN, 1896 and Grapsidae MCLEAY, 1838 (PARTIM).

Dr. Neil Cumberlidge of the North Michigan University (NMU) has several papers on the freshwater crabs of Africa, notably Madagascar. There are three families of freshwater crabs found in Africa, namely: Potamonautidae, Deckeniidae and Platythelphusidae ([4] Cumberlidge 1999). The fourth family, Potamidae is Eurasian, with one African species found only in Morocco, Algeria and Tunisia. Cumberlidge had previously identified crab materials from Lake Mainit in Mindanao (personal comm., electronic mail).

2. Taxonomy of Freshwater Crabs

Ng & Takeda (1992) established three new genera (*Ovitamon*, *Insulamom* and *Mindoron*) of freshwater crabs of

the family Potamidae ORTMANN, 1896 from the Philippines on the basis a 2-month field collections. Five new species (*Ovitamon arcanum*, *O. tomaculum*, *Insulamom unicorn*, *Mindoron pala*, *Isolapotamon spatha*) were also described.

[28] Yeo and Naiyanetr (2000) established a new genus, *Stelomon* for *Potamon kanchanaburiense* NAIYANETR 1992 and *P. pruinosum* ALCOCK, 1909. The key diagnostic character in the new genus is on the form of the first pleopod or gonopod (G₁). Using the gonopodia, [2] Brandis, Storch & Turkay (1999) studied the reproductive processes of the genus *Potamon* based on histological examination of G₁ and G₂ and the gonoducts of the female. Gonopods of the genus are highly modified compared to other brachyurans. G₂ is unusually long and has a special morphology, ending in a long sclerotized tube.

The freshwater crabs can be classified as follows:

Phylum Arthropoda
 Subphylum Crustacea
 Class Malacostraca
 Subclass Eumalacostraca
 Superorder Eucarida
 Order Decapoda
 Suborder Pleocyemata
 Infraorder Brachyura
 Section Eubrachyura
 Subsection Heterotremata
 Superfamily Potamoidea
 Family Potamidae
 Family Isolapotamidae
 Family Sinopotamidae
 Family Deckeniidae
 Family Platythelphusidae
 Family Potamonautidae
 Superfamily Pseudothelphusoidea
 Family Pseudothelphusidae
 Superfamily Gecarcinocoidea
 Family Grapsidae
 Family Gecarcinucidae Rathbun, 1904
 Family Parathelphusidae
 Superfamily Portunoidea
 Family Trichodactylidae

[1] Brandis (2002) reported that recent investigations of Asian crabs of the superfamily Potamoidea ORTMANN, 1896 use the Potamidae ORTMANN, 1896 as the only valid family although three families (Potamidae ORTMANN, 1896; Isolapotamidae BOTT, 1970; and Sinopotamidae BOTT, 1970) have been described from South-East Asia. On the basis of the morphology of the sperm transfer tube of the second gonopod, the taxonomic status of the family Isolapotamidae is reconsidered. A new genus *Takpotamon* is erected for *Potamon maesotense* NAIYANETR, 1992 from Thailand, the genera *Dromothelphusa* NAIYANETR, 1992 and *Flabellamon* [18] NG, 1996 are recharacterized and the genus *Thaiphusa* NG AND NAIYANETR 1993 is synonymized with *Demanietta* BOTT, 1966.

Under the tutelage of Dr. JT Masagca, the master's thesis of [5] Cuevas (2002) dealt on the biometry of a potamid,

Ovitamon sp. from Mts. Palaypalay/Mataas na Gulod National Park in Luzon island, Philippines. This work described a fairly limited set of meristic (abdominal segments, anterolateral teeth, cheliped spines and spinnules) and morphometric characters (carapace length and width, cheliped length, maxilliped length, propodus length, frontal margin and eye diameters) of diagnosed specimens from Cavite. Two short papers were published in the Graduate Journal of De La Salle University System in Dasmariñas-Graduate School of Education, Arts and Sciences (GSEAS) that presented the preliminary identity of the said crab collections from the Palikpikan forest stream ([5] Cuevas 2002, [6] Cuevas & Masagca 2002) and a review of the potamid crab fauna including a tentative description of the gonopod ([12] Masagca & Cuevas 2003).

2.1. Family Parathelphusidae ALCOCK, 1910 (sensu [17] NG, 1988)

It was earlier reported that there are only two species of the freshwater crabs of the genus *Parathelphusa*, namely *Parathelphusa palawanensis* (BOTT, 1969) and *P. obtusa* (BOTT, 1960). From the Philippines. However, Ng & Takeda (1993) identified a total of eight *Parathelphusa* species from the archipelago that included *P. saginata*, *P. rasilis*, *P. nana*, *P. balabac*, *P. parma* and *P. mindoro*. Later, [18] Ng & Sket (1996) reported the collection of Parathelphusidae Alcock, 1910 (sensu [17] Ng, 1988) from the island of Bohol. In an earlier paper, [15] Ng (1991) described the two species of Archipelothelphusa Bott, 1969 (Sundathelphusidae) from Luzon, one of which is a new species. And later, Ng & Naiyanetr (1997) revised the genus *Siamthelphusa* BOTT, 1968 (Parathelphusidae) from Thailand and [16] Ng (1989) established a new genus and species for *Geithusa pulcher* (Parathelphusidae) from Terengganu, Malaysia ([16] Ng 1989).

2.2. Family Pseudothelphusidae

In southern Mexico, [27] Villalobos & Alvarez (2003) described two new species of a freshwater crab of the genus *Tehuana* (Brachyura: Pseudothelphusidae), namely *T. chontalpaensis* and *T. jacatepecensis*. The new species were distinguished by the first gonopod with elongated mesial process and large laminar lateral process with a strong lateral spine. The two species differs from other members of genus *Tehuana*, on its first gonopod which has reduced, spoon-like lateral process and an ax-shaped mesial process that projects beyond the marginal process. Moreover, [21] Rodriguez & Lopez (2003) described the four insular species [*Eudaniela garmani* (RATHBUN, 1898), *Microthelphusa odaelkae* (BOTH, 1970), *Potamocarcinus roatensis* (RATHBUN, 1896) and *Hypolobocena gorgonensis* VON PRAHL, 1983] of the family Pseudothelphusidae from Central and South America.

Recent papers on the marine crabs of the Philippines, [23] Takeda & Ng (2001) reported a new species of cavernicolous crab from Mindanao; two species of crabs from an anchialine

cave in Balicasag island ([24] Takeda 2000); some rare crabs ([24] Takeda & Manuel 2000) and a new species of the family Bythograeidae from the hydrothermal vents along volcanic front of the Philippine Sea Plate ([25] Takeda et al. 2000). Among the members of Xanthidae family, [20] Ng & Yang (1989) described some species of *Demania* LAURIE, 1906 from SEA that included the Philippines.

Table 1 presents the different species of freshwater and terrestrial crabs reported from the Philippines by different authors.

General methods for crustacean taxonomy and systematics as used in the National University of Singapore (NUS) (Dr. Peter K. L. Ng), the National Museum of Tokyo, Zoology Division (Dr. M. Takeda) and the Philippine National Museum (Ms. Marivene Manuel) are followed in this research project.

Acquisition of Crab Specimens. Fieldwork were carried out from selected areas in Southern Tagalog (Cavite and Batangas), Central Luzon (Nueva Ecija and Tarlac) and Bicol Region (Catanduanes, Camarines Sur and Albay) for the collection of freshwater and semi-terrestrial crabs. Crab samples were obtained by handpicking and the use of locally constructed crab traps, called “bintol” and “pukot” (Plates 1A and 1B). In some cases, some crab samples were obtained from fishers and crabbers in the said collection areas. Collected specimens were either brought to the laboratory alive using improvised boxes or baskets from banana (*Musa sapientum*) or abaca (*M. textiles*), PVC and rattan (*Calamus* sp.). Dead specimens were immediately fixed with 10% formalin or with 70% ethanol.

Measurements. Some quantitative and qualitative data of the different taxa of freshwater crabs are described in the study. In addition, measurements or morphometric data and ratios are computed. The abbreviations of G1 and G2 are used for the male first and second pleopods, respectively. The report essentially follows the terms used by [17] Ng (1988, 1992). Measurements of the different body parts (e.g. carapace, chelipeds, maxillipeds, abdominal segments, ambulatory legs (=periopods) are in millimetres (mm). Measurements of the materials/specimens used follow the work of [14] Ng (1992). The carapace height is measured from the base of the second sternal segment (where there is clear suture line) to the highest part of the gastric region of the carapace. The distance between the coxae of the last pair of ambulatory legs is called the posterior margin of the carapace. Measurement between the bases of the coxae of the chelipeds is determined also. Crab specimens were photographed using digital camera (Canon Model) courtesy of the Biological Sciences Department Research Lab of DLSU-D and at the Catanduanes State University NSD Lab.

Location where crab specimens are deposited. Crab specimens examined will be deposited at the Reference Collections of DLSU-D (Cavite, Philippines). Some collections (*Sundathelphusa* sp. nov.?) were deposited also to the Philippine National Museum, Carcinology Division in Manila. The need to deposit the crab collections in other museums (e.g. Raffles Museum at NUS and UPLB Museum of

Natural History) or any public collection will be in accordance with the International Code of Zoological Nomenclature (Recommendations 72D, 72G and 74D). These museums mentioned will make the crab specimens accessible to the public for study (Recommendation 72G) or comparison.

This move to deposit the crab specimens to world recognized museums has to be decided by the researcher considering that in spite of the dedicated efforts made in the present study, there could be “errors” of identification which cannot be avoided, even by consulting expert taxonomists. It

is worthy to mention that in identifying new species, designated as *species novum* (*sp. nov.*) or new species (*n. sp.*) of freshwater crabs in the Luzon Biogeographic Province (as claimed in this report) is an expression of an “opinion”, resulting from the comparison of a specimen and a description. Noting that there are no available descriptions for freshwater crabs in the Philippines, the researcher was constrained to consider the keys provided by foreign authors and the use of existing descriptions of another species within the family or genus or in another genus.

Table 1. Listing of Freshwater Crabs from the Philippines.

Family	Scientific Name	Collection Site	Collector/Researcher/Author	
Potamidae Ortmann, 1896	<i>Ovitamon arcanum</i> sp. nov. <i>Synonym: Tiwaripotamon artifrons</i> (Burger, 1894)	Tawang Tambangan, Sta. Cruz, Marinduque	Ramos Sison, 1976 [19] Ng & Takeda (1992)	
	<i>Ovitamon artifrons</i> (Burger, 1894)	Taal Lake, Tagaytay, South Luzon	M. [19] Takeda & S. Shokita, 1985, Ng & Takeda (1992)	
	<i>Ovitamon tomaculum</i> sp. nov.	Pitogo River, Panay		
	<i>Ovitamon</i> sp.	Borabod Stream, Buhi, Camarines Sur	Noe Gapas, 1985; [19] Ng & Takeda (1992)	
		Salvacion, Busuanga, Palawan	Gonzalez et al., 1976; [19] Ng & Takeda (1992)	
	<i>Insulamon unicorn</i> sp. nov.	Puerto Princesa, Palawan		
		Tagbariri, Palawan	M. Takeda & S. Shokita, 1985 [19] Ng & Takeda (1992)	
		Mindoron <i>balssi</i> (Bott, 1968), comb. nov.	Naujan Lake, Mindoro	M. Takeda & S. Shokita, 1985, [19] Ng & Takeda (1992)
		<i>Mindoron pala</i> sp. nov.	Tamarau Falls, Northern Mindoro	M. Takeda & S. Shokita, 1985 [19] Ng & Takeda (1992)
		<i>Telphusa (Ovitamon) cumingii</i>	Guimaras (Philippine Islands)	????
		<i>Isolapotamon sinuatifrons</i> (H. Milne Edwards, 1853)	Mindanao	?????
		<i>Isolapotamon spatha</i> sp. nov.	Kraan, Sultan Kradarat (?) Province (Kudarat), Mindanao	Y. Nishikawa, 1985; [19] Ng & Takeda (1992)
		<i>Isolapotamon mindanaoense</i> (Rathbun 1904)	Mindanao	????
	Parathelphusidae Alcock, 1910 (<i>sensu</i> [17] Ng, 1988)	<i>Isolapotamon</i> sp.	Salol Creek, Bo. Palkan, Cotabato, Mindanao	T. Oane, 1962; [19] Ng & Takeda (1992)
<i>Nanhaipotamon balssi</i> Bott, 1970		Mindoro	????	
		Simbulan, Palawan	Tage Ellinger, 1952	
<i>Parathelphusa palawanensis</i> (Bott, 1969)		Manili, Palawan	H. Morioka, 1985 Ng & Takeda (1993)	
		Irawan River, Palawan	M. Takeda, S. Shokita & N. Gapas, 1985 Ng & Takeda (1993)	
		Balabac Island, Palawan		
		Tagunaynay River, Balabac, Palawan	T. Ohmi, 1985 Ng & Takeda (1993)	
		Pinigisan, Palawan	????	
		Puerto Princesa, Palawan	Y. Kurata, 1986 Ng & Takeda (1993)	
		Panitan River, Palawan	M. Takeda, S. Shokita & N. Gapas, 1985 Ng & Takeda (1993)	
Gigarcinucidae Rathbun, 1904	<i>Parathelphusa rasilis</i> sp. nov.	Panibacan River, Palawan	M. Takeda, S. Shokita & N. Gapas, 1985; Ng & Takeda (1993)	
	<i>Parathelphusa nana</i> sp. nov.	Nagasguipi River, Balabac, Palawan	M. Takeda, S. Shokita & N. Gapas, 1985 Ng & Takeda (1993)	
	<i>Parathelphusa parma</i>	Balabac Island		
	<i>Parathelphusa mindoro</i>	Agan River, Oriental Mindoro		
	<i>Archipelothelphusa</i>	Luzon	[15] Ng (1991)	
	<i>Archipelothelphusa</i>	Luzon	[15] Ng (1991)	
	<i>Sundathelphusa cagayana</i>	Palawan	Mendoza & Naruse (2010)	
Grapsidae McLeay, 1838 (partim)	<i>Geosesarma protos</i>	Sultan Kudarat Province, Mindanao	Nishikawa, [19] Ng & Takeda (1992)	
	<i>Geosesarma vicentense</i> (Rathbun, 1914)		Rathbun (1914)	
	<i>Geosesarma rathbunae</i> (Serene, 1968)		Serene (1968)	

3. Results and Discussion

A total of 116 samples of freshwater and semi-terrestrial crabs were collected from different areas of the Luzon Biogeographic Province (LBP). These samples were preserved in bottles, labelled and diagnostic characters were determined. The samples were identified using the available descriptions of representative species of the different families and genera of Philippine freshwater crabs. Some samples were given to some carcinologists to solicit additional expression on the identity of the crabs.

Tentative Taxonomy of Some Noteworthy Freshwater and Semi-Terrestrial Burrowing Crabs from Selected Areas in the Luzon Biogeographic Province

The crab collections were placed under the following taxonomic hierarchy:

- Order Decapoda
- Suborder Pleocyemata
- Infraorder Brachyura
- Section Eubrachyura
- Subsection Heterotremata
- Superfamily Potamoidea
- Family Potamidae ORTMANN, 1896
- Genus *Ovitamon* gen. nov. [19] Ng & TAKEDA, 1992
- Ovitamon artifrons*

Material Examined. Mt. Palaypalay/ Mataas na Gulod National Pale Ternate, Cavite, 2 males (27.1 × 21.5 mm, 26.5 × 21.1mm) and 2 females (22.3 ± × 18.2 ± mm), coll. JT Masagca, 25.v.2004; [11] JT Masagca and H. Molines, 4.vi.2004). Specimen Nos. 0001, 0002, 0004, 0009.

Diagnosis. Carapace ovoid, branchial, cardiac, urogastric and cervical grooves very shallow; postero-lateral regions appear smooth; external orbital angle broadly triangular; epibranchial tooth low, but clearly separated from external orbital angle; antero-lateral margin convex; posterolateral margin appears converging. Male abdominal distinctly triangular, segment 7 slightly longer than segments 6 and 5; lateral margin of segment 7 straight; lateral margin of segment 6 slightly convex. Third maxilliped exopod with well-developed flagellum, longer than the width of the merus; ischium with sulcus, not medial. Dorsal margins of chela not serrated; finger slightly longer than palm. G1 segment stout, cylinder – shaped, curved towards the inside, surfaces covered with few hairs.

Remarks. The present specimens from Ternate, Cavite are tentatively identified with *O. artifrons*, although there are some differences in their G1 features and third maxilliped. Most specimens are generally small, but during field collections, it was known that a female (carapace=22.3 mm x 18.2 mm) is already mature carrying eggs in the abdomen. The carapaces of the present specimens appear to be similar to the descriptions of [19] Ng & Takeda (1992) from the specimens they obtained in Tagaytay. The difference lies in the shape of the G1 terminal segment (curved toward the inside) and possibly the features of the third maxilliped. Considering that the description prepared for this specimen

differs from the other *Ovitamon* species, the possibility that a new species (n. sp.) can be described in future papers.

According to [19] Ng & Takeda (1992), the type locality of *O. artifrons* is in Cavite, thus confirmed so far in the present study. The specimens were collected from the Palikpikan forest streams in Ternate, Cavite, particularly the Mts. Palaypalay/Mataas na Gulod National Park. It can be assumed that *O. artifrons* maybe found also in Mt. Pico de Loro..

Taxonomically, Bott (1968, as cited by [19] Ng & Takeda, 1992) classified *O. artifrons* in the genus *Isolapotamon* BOTT, 1968 and was later transferred to the new genus *Tiwaripotamon* BOTT, 1970). This was probably due to the shape of its G1 terminal segment ([19] Ng & Takeda, 1992) and could be considered also when a separate paper will be prepared for a taxonomic report of this endemic freshwater crab in Ternate, Cavite.

Physiology and Feeding Behavior. A total of 25 individuals were kept last July 4, 2004 in glass aquaria (water depth between 8 to 12 cm). Stones and some leaves obtained from the collection site in Ternate, Cavite were placed in the aquaria to simulate the habitat. Feeding was done *ad libitum* using fresh fish (*Chanos*, *Decapterus macrosoma* and *Thunnus*), grounded pork and beef. As of August 30, there were 9 that survived (5 males, 4 females), but as of September 5, only 3 survived. Mortality was due to the food (suspected to be containing formalin) and the use of marine shrimp and *Stolephorus indicus* which contained more salts. Dead crabs were observed to have softened carapaces.

As nocturnal animals, the crabs are found on top of the stones and stay motionless for about 20 to 30 minutes and change positions afterwards. When disturbed, by pointing a finger, the crabs tend to hide in the stones with chelae closed. The crabs appear to be shy, unlike other crab samples of *Sundathelphusa* from Tarlac which were known to be more aggressive with chelae wide open attempting to attack a prey.

Family Potamidae ORTMANN, 1896

Genus *Ovitamon* gen. nov. [19] NG & TAKEDA, 1992

Ovitamon sp.

Material examined. One female (38.3 x 31.5 mm) (DLSU–D BSD Reference Collection), Sulong Falls, San Miguel Catanduanes, Bicol Region, Luzon; coll. A. Diesmos, Brandy Vasquez & JT Masagca, 10 vi. 2004. Specimen No. 0079.

Morphometric data. Abdominal segments: s-7=8.1; s-6=8.3 mm; s-5=6.4 mm; s-4=4.2 mm; s-3=3.8 mm s-2=2.5 mm; s-1=1.4; maxilliped exopod=9.8 mm, flagellum= 5.2 mm,

Diagnosis. Carapace ovoid, broader than long, cervical and mid grooves wide, deep and distinct; external orbital angle slightly triangular, epibranchial tooth very low and blunt; epigastric cristae fairly distinct. Third maxilliped exopod with well developed flagellum. Female abdominal segments 6 and 7 almost equal size and larger than segments 4 and 5; lateral margins of abdominal segments with hairs.

Outer surface of chelipeds smooth; carpus with one dominant distal spine and one sharp basal granule; outer

margin of merus serrated, fingers almost equal in size with the palm; second ambulatory leg, longest); 4th ambulatory leg (5th periopod), shortest.

Remarks. Although the specimen obtained is large and mature, the identity will require a male specimen. Some characters tend to be similar with *Insulamona* sp. (?), *Ovitamon artifrons* and *O. arcanum* as described by [19] Ng & Takeda (1992). Carapace features (deep and distinct cervical and midgrooves) of this collection differ from *O. artifrons* obtained from Ternate (this study, [11] Masagca, 2004) and the report of [19] Ng & Takeda (1992).

Family Parathelphusidae ALCOCK, 1910

Genus *Sundathelphusa* BOTT, 1969

Sundathelphusa sp. 1

Materials Examined. Central Farm, Lennec, Guimba, Nueva Ecija, 1 female (54.6 x 43.5 mm), 4 juveniles (3 females, 1 male), coll. Rico Masagca, vi. 2004. Specimen No. 0075.

Morphometric characters. Cheliped- Merus, R=21.2 mm, L=23.5 mm; Carpus, R=18.5 mm, L=17.4 mm; Palm, R=32.5 mm, L=32.7 mm; Movable chela, R=22.6 mm, L=24.3 mm. Abdominal segments- Segment (S)-7=9.21 mm, S-6=10.9 mm, S-5=8.2 mm, S-4=7.2 mm, S-3=6.1 mm, S-2=5.3 mm, S-1=1.9 mm. 5th Periopod- Coxa/basis= 3.8 mm; ischium=4.5 mm; merus=16.2 mm; carpus=12.1 mm; propodus=11.5 mm; dactylus=6.2 mm. Third maxilliped: ischium=11.1 mm; merus=6.1 mm; exopod=11.52; flagellum=8.4 mm.

Description. Carapace transverse, gastric and bronchial regions deeply swollen, dorsal surface convex; cervical groove deep and distinct; arid groove shallow. Front almost straight; external orbital angle triangular; one epibranchial tooth not blunt, directed outwards. Dactylus of chela pigmented at the palm, dorsal margins not serrated. Dorsal margins of meri (in the periopods or ambulatory legs) not serrated, with blunt subdistal spine. Female abdominal segments rounded, segment 6 slightly longer than segment 7, lateral margins of segment 6, 5 and 4 slightly concave, lateral margin of segment 7 concave. Third maxilliped ischium with vertical sulcus (not medial), flagellum more than half of exopod. G1 gently curved outside.

Remarks. This specimen is temporarily confirmed as *Sundathelphusa* sp. Based on the digital photo sent to Dr. Ng, the specimen is probably a member of the family Parathelphusidae of the genus *Sundathelphusa*. To be confirmed by consulting taxonomists, a male specimen has to be brought to a museum like the Raffles Museum for Biodiversity Research (RMBR) or elsewhere for further taxonomic "opinion" or compare the existing museum collections through a short scientific visit. The only other known sundathelphusid in Luzon is *Sundathelphusa picta* and possibly *S. philippina*, the vector of the lung fluke, *Paragonimus westermanii* ([3] Cabrera, 1984).

Family Parathelphusidae ALCOCK, 1910

Genus *Sundathelphusa* BOTT, 1969

Sundathelphusa (?) sp. 2

Materials Examined. San Juan, Moncada, Tarlac. 3 males,

4 males; coll. Pedro Rosete, Manrico Masagca, 14. viii.2004.

Diagnosis. Carapace appears transverse, gastric and bronchial regions distinctly swollen, cervical groove appears deep; post-orbital cristae slightly sharp; single epibranchial tooth well developed directed forwards. Chelipeds unequal in males (left smaller than right), equal in females; cheliped carpus with strong spine on inner distal angle, with 2 denticles (?); dactylus of chela pigmented, soft in the upper margins; movable finger longer than palm, outer surface of palm smooth; merus of cheliped gently serrated with subdistal spine (?). Merus of ambulatory legs broad, slightly serrated, with short subdistal spine. Male abdominal segment 7 almost equal in length with segment 6, lateral margin of segment 7 slightly concave, segment 6 slightly convex, segments 5 and 4 deeply convex, segment 3 slightly concave. Female abdominal segment 6 longer than segment 7, lateral margins of all segments lined with hairs. G1 curves outwards, gradually tapering to the terminal end. G2 also tapers to the terminal point.

Remarks. This is the second collection possibly belonging to the genus *Sundathelphusa*. The carapace features are somewhat different from the sundathelphusid collected from Nueva Ecija particularly the grooves on the carapace. Further collections can prove that collections from Tarlac and Nueva Ecija are just conspecifics. Further microscopic analyses of the G1 features can confirm this collection from Tarlac as well as that of Nueva Ecija.

Family Gegarcinidae

Genus *Cardisoma* LATREILLE, 1825

Cardisoma carnifex (HERBST, 1794)

Material examined. Balayan, Batangas, 1 female (51.3 mm × 48.7 mm), 1 male (67.3 mm × 62.4 mm), coll. Ven de los Reyes, 2. viii.2004. Specimen Nos. 00106, 00107, 00108, 00109.

Morphometric data. Female (Specimen No. 00106)- *Cheliped:* movable chela, R=20.2 mm, L=24.8 mm; palm, R=32.8 mm, L=43.5 mm; carpus, R=12.8 mm, L=18.2 mm; merus, R=20.2 mm, L=21.5 mm. Abdominal segments: s-7=7.2 mm; s-6=14.6 mm; s-5= 7.9 mm; s-4=5.8; s-3=4.1 mm; s-2=2.6 mm; s-1= 0.9 mm. *Third maxilliped:* ischium=11.2 mm; merus=8.1 mm; carpus=5.2 mm; dactylus=3.4 mm; propodus=3.5 mm; exopod=12.3 mm; flagellum=6.2 mm. 5th Periopod (R=right): coxa/basis=4.1; ischium= 5.1 mm; merus=19.7 mm; carpus=12.3 mm; propodus=11.2 mm; dactylus=15.4 mm.

Male (Specimen No. 00107)- *Cheliped:* movable chela (finger), R=38.5 mm, L=31.4 mm; palm, R=56.3, L=42.5 mm; carpus, R=26.2, L=21.3 mm; merus, R=33.7 mm, L=31.5 mm. Abdominal segments: s-7=9.7 mm; s-6 17.4 mm; s-5=9.5 mm; s-4=6.7 mm; s-3=5.2 mm; s-2=3.4 mm; s-1=2.1 mm. 5th *Periopod:* coxa=6.5 mm; basis=4.1 mm; ischium, 9.5 mm; merus, 28.5 mm; carpus, 17.4 mm; propodus, 18.5 mm; dactylus, 19.5 mm. Third maxilliped: ischium, 14.5 mm; merus, 10.2 mm; carpus, 6.2 mm; dactylus, 3.1 mm; propodus, 6.1 mm; exopod, 18.6 mm; flagellum, 9.5 mm.

Diagnosis. Carapace medial groove and cervical groove

shallow; anterolateral margin concave, without epibranchial tooth; external orbital angle sharp, triangular directed forwards. Male abdominal segment 7 shorter than segment 6, lateral margins of all segments lined with smooth hairs. Female abdominal segments rounded, segment 7 much shorter than 6, short hairs found on the lateral margins of all segments. Male chelipeds unequal (right larger than left); female chelipeds equal in size; cheliped carpus with strong spine on inner distal angle; dactylus of chela not pigmented, fingers subequal to length of palm; inner margin of cheliped merus serrated, without meral tympanum. Carpus and propodus of the 2nd to 5th pereopods with numerous and dense hairs; few hairs at the ischium and basis ventrally. Third maxilliped merus longer than broad; ischium with soft hairs on the margins; exopod very slender with flagellum almost half the length of ischium and almost equal with carpus. Merus of ambulatory legs with granules, serrated in the upper margins and pigmented on the surfaces; carpi, propodi and dactyli with stiff hairs all throughout. G1 is very stout, straight, terminal tip pointed with several hairs. G2 also tough subterminally and is half the length of G1.

Remarks. Carapace of *C. carnifex* is soft and does not contain epibranchial teeth. The most distinguishing characteristics of this gegarcinid is the hairy portions of the walking legs.

The specimens of *C. carnifex* were brought to DLSU-D by Mr. Ven de los Reyes purchased from crabbers of Balayan, Batangas. The researcher also collected a sample in Lian, Batangas near coconut trees. This gegarcinid crab is a semi-terrestrial crab found burrowing near the mangrove areas of Batangas. No specimens were obtained from the Bicol region, but assumed to be present owing to the wide distribution of this gegarcinid crab from the Indo-Pacific region.

Family Grapsidae MCLEAY 1838

Genus *Sesarma*

Sesarma (Sesarmops) impressum H. MILNE EDWARDS, 1887

Material examined. Maragondon, Cavite (1 female), coll. JT Masagca & H. Molines, vi.2004; and Lictin Stream, San Andres Catanduanes, 1 male and 2 females, leg. JT Masagca & Bong Alberto, 10. vi.2004.

Morphometric data. Carapace, 31.1 mm × 30.9 (Male: #0083); abdominal segments, s7=5.2 mm, s6=6.0 mm, s5=5.1 mm, s4=4.7mm, s3=3.9 mm, s2=1.1 mm, s1=0.8 mm. 37.1 mm x 36.4 mm (Female, #0084), s7=6.1 mm, s6=9.2, s5=7.1 mm, s4=6.3 mm, s3=5.0 mm, s2=2.1 mm, s1=1.2 mm.

Diagnosis. Carapace trapezoidal, longer than broad, some regions are relatively distinct; midgroove distinct; transverse groove separating intestinal and cardiac regions very distinct.

Remarks. This sesarmid has squarish carapace with epibranchial teeth (2 are larger and the other appears very small). Four ambulatory legs have hairs. Distance between base of chelipeds is longer at 13.5 mm. This sesarmid is a very aggressive and can jump to about 4 to 5 cm in height when collected in Cavite, Batangas, Tabaco City and

Catanduanes.. Although these crabs do not readily using the chelae, the walking legs are sharp that could harm the collector. The advantage to jump and move fast perhaps enabled them to migrate to higher elevations. Some samples were captured under large stones or boulders in rivers located 100 to 150 masl in Bicol.

Remarks. These crabs were seen under rocks, swims and move fasts, jumping and attacks immediately using the chelae. When captured, they tend to jump at a height of 6 inches, but not attack the collectors.

Family Grapsidae

Subfamily Varuninae ALCOCK, 1900

Genus *Varuna* H. MILNE EDWARDS, 1830

Varuna litterata FABRICIUS, 1798

Materials examined. Molino and Bacoor, Cavite; Ricefield in Tabaco City (Albay); Rice Field in Sto. Niño and Gogon, Virac, Catanduanes; Palico River, Batangas; coll. JT Masagca, B. Arajo & Boyet Alberto, vii.2004.

Morphometric data: Carapace, width, 35.5 mm; length, 34.7 mm; palm, 11.2 mm; chela, 10.5 mm.

Diagnosis. Carapace glabrous, less flattened, slightly broader than long; transverse groove separating cardiac and intestinal areas very distinct. Frontal margin appears bilobed; surface of frontal region slightly concave. Anterolateral region concave with 2 epibranchial teeth (1st tooth longer than 2nd); external orbital angle triangular directed inwards; posterolateral margins lined with hairs. Merus of 3rd maxilliped oval shaped, widest part of merus much wider than length of proximal margin; ischium with distinct medial sulcus; exopod broad with very slender flagellum longer than the width of merus. Male chelipeds equal in size; surface of palm with scattered granules, some parts smooth; fingers shorter than the length of palm; carpus with teeth; merus with granules, margins with distinctly serrated portions; distal end of merus lined with hairs; meral tympanum absent. Second ambulatory leg (3rd pereopod) longest, meri of all legs flattened, broad, upper margin not serrated, with sharp distal spine, lower margin of merus with short hairs. Carpi, propodi and dactyli of 5th pereopods lined with stiff long hairs. Male abdominal segment 7 much shorter than segment 6; lateral margin of segment 6 slightly convex, margins without hairs. Female abdominal segment 7 and 6 with slightly concave lateral margins; all segments lined with long, smooth hairs. G1 very stout, terminal segment with hairy portion; subterminal segment stout. G2 short without distal segment.

Remarks. *V. litterata* is very common in ricefields, rivers and streams of the Luzon Biogeographic Province. The carapace appears thicker or less flattened compared to *V. altimana*. Male gonopods of this varunid species are stout and appears to much stout and more straight in contrast to the other species, *V. altimana* and maybe *V. yui*. A revision of the subfamily Varuninae was carried out by an NUS graduate student and could be followed up by collecting more Philippine samples. *V. yui* has not been reported in the country as of this date (?).

Family Grapsidae MCLEAY, 1838

Subfamily Varuninae ALCOCK, 1900

Genus *Varuna* H. MILNE EDWARDS, 1830

Varuna altimana

Materials examined. Bato and San Miguel River, Catanduanes; coll. ET Tribiana & JT Masagca, vi.2004. Specimen Nos. 0061, 0062, 0063.

Morphometric data. Male (0062), 38.2 mm (length), 34.5 mm (width); Male (0061), 34.3 mm x 31.5 mm; Male (0063), 28.3 mm x 27.1 mm.

Diagnosis. Carapace glabrous, appears trapezoidal, more flattened, longer than broad; transverse groove separating cardiac and intestinal areas very distinct. Frontal margin appears bilobed; surface of frontal region slightly concave. Anterolateral region concave with 2 epibranchial teeth (1st tooth longer than 2nd); external orbital angle triangular directed inwards; posterolateral margins lined with hairs. Merus of 3rd maxilliped oval shaped, widest part of merus much wider than length of proximal margin; ischium with distinct medial sulcus; exopod broad with very slender flagellum longer than the width of merus. Male chelipeds equal in size; surface of palm with scattered granules, some parts smooth; fingers shorter than the length of palm; carpus with teeth; merus with granules, margins with distinctly serrated portions; distal end of merus lined with hairs; meral tympanum absent. Second ambulatory leg (3rd periopod) longest, meri of all legs flattened, broad, upper margin not serrated, with sharp distal spine, lower margin of merus with short hairs. Carpi, propodi and dactyli of 5th periopods lined with stiff long hairs. Male abdominal segment 7 shorter than segment 6; lateral margin of segment 6 slightly convex, margins without hairs. Female abdominal segment 7 and 6 with slightly concave lateral margins; all segments lined with long, smooth hairs. G1 stout, terminal segment with less hair; subterminal segment stout.

Remarks. Samples collected from BICR are reddish brown, with the last 3 segments of the walking legs with long black hairy fringes. Carapace of *V. altimana* is more flattened compared to that of *V. litterata*. Its carapace also appears to be longer than broad which is the opposite of *V. litterata*. The male G1 appears to be less stout and tend to curve slightly to the outside.

4. Conclusion

Based from the results obtained, a total of eight taxa [6 freshwater brachyurans: *Ovitamon artifrons*, proposed as a new species: *Ovitamon cavitiensis* sp. nov.?], *Ovitamon* sp., *Sundathelphusa* sp. 1, *Sundathelphusa* sp. 2, *Varuna altima* and *V. litterata*; and 2 species of semi-terrestrial crabs: *Cardisoma carnifex* and *Sesarmops (Sesarma) impressum*] were identified from different collections made in Southern Tagalog, Central Luzon and Bicol Region. These crabs belong to the four families of Potamidae, Parathelphusidae, Grapsidae and Gecarcinidae. Further systematic studies (aside from the morphological approach) that will focus on the genetic characters and the ultrastructures of the male gonopodium, particularly on the sperm transfer tubes. More field collections from other parts of Luzon (Zambales,

Pampanga, Pangasinan) and other islands of the country (e.g. Masbate, Samar, Polilio, Sarangani, Camiguin, Batames) will be worthwhile for future studies on systematics and the biogeography of Philippine crabs.

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