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An Account of the Accessioned Collections of the UP Biology Invertebrate Museum

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ABSTRACT

The University of the Philippines (UP) Biology Invertebrate Museum has recently completed the curation of its accessioned collections of invertebrates. This paper reports on the availability of the said collections to the community of researchers studying invertebrates. The accessioned collections were assessed in terms of their taxonomic scope, geographical range, and chronological breadth. A total of 4,238 accessioned specimens are in the Museum, which is composed of 1,108 non-insectan arthropods, 1,149 cnidarians, 178 echinoderms, and 1,803 mollusks. The insect specimens, all of which do not have any accession numbers, are yet to be curated. A total of 1,185 species belonging to 621 genera are found in the collections. The Museum's sampling activities were greatest in the western part of the Philippines, specifically in Puerto Galera, Oriental Mindoro. Much of the Eastern regions in the Philippines are yet to be sampled, particularly the terrestrial habitats. Prolific museum contributors include Francisco Nemenzo, Sr. (709 specimen lots), Neon Rosell (327 specimen lots), and Fernando Dayrit (233 specimen lots). At present, plans for collection expansion is underway, to encourage collaborative research with other natural history museums.

Keywords: Invertebrate zoology, museum, Philippine invertebrate fauna, collection

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INTRODUCTION

Museums are institutions that function to support research in various disciplines (Winston 2007) and are regarded as massive information resources (Graham and others 2004). Winston (2007) outlined ten key points regarding the significance of museum collections: 1) they support research in numerous disciplines; 2) they are non-renewable resources; 3) they are cost-effective; 4) they have an important function in human medicine, public health, and security; 5) they can be used to monitor climate change; 6) they can be used to demonstrate biological differences and/or changes in genetic diversity; 7) they can be used for research on the history of a discipline; 8) they educate new generations of students; 9) they have aesthetic importance; and 10) they are the foundation for taxonomic research and the study of biodiversity.

Invertebrates make up almost 96% of known metazoan species (Brusca and Brusca 2003 c. in Winston 2007), and museum collections (both living and fossil) provide a valuable resource in studying their diversity and evolutionary relationships (Winston 2007). In the University of the Philippines Diliman, the UP Biology Invertebrate Museum has served as a repository for several well-known invertebrate collections. Among these are the hermatypic corals of Francisco Nemenzo Sr. (the Father of Philippine Coral Taxonomy) that date back to 1935, and the cirriped type specimens of Neon Rosell from the MUSORSTOM campaign in the 1980s (Rosell 1981, Rosell 1989, Rosell 1991). However, the Museum has not been prolific as a resource in taxonomic research since then. Thus, this study aimed to accomplish the following: 1) report the extant accessioned collections, 2) determine the chronological breadth of the Museum's activity in terms of taxonomic research, 3) determine the scope—in terms of taxa and geographic range—of invertebrate research done by the Museum, and 4) identify the gaps in invertebrate research and the possible future directions for the Museum.

METHODOLOGY

Due to the neglect of the Museum for decades, the initial step was to restore the specimens' conditions and storage. Collections processed included non-insectan arthropods, soft and hard corals, echinoderms, and marine and terrestrial mollusks.

An electronic database, in MS Excel (Microsoft Office Excel 2013) format, was created by encoding records from the card catalogues and logbooks. The entries included the 1) unique specimen code, 2) species binomen, 3) collection data (collector, collection date, and locality), and 4) other pertinent details about the

organism (e.g., type designation). However, not all specimens have collection details. The scientific names were updated using publication records and online databases, such as the World Register of Marine Species (WoRMS Editorial Board 2014) and Encyclopedia of Life (EOL) (Encyclopedia of Life 2014).

The database was then used to determine the number of specimens under each phylum, the chronological breadth, and the geographical range of invertebrate sampling. QGIS 2.2.0-Valmera (Quantum GIS Development Team 2014) was used to illustrate the locality data from the specimens.

RESULTS AND DISCUSSION

The UP Biology Invertebrate Museum holds a total of 4,238 accessioned specimens, comprising 1,108 (26%) non-insectan arthropods, 1,149 (27%) cnidarians, 178 (4%) echinoderms, and 1,803 (43%) mollusks (Figure 1). The entire collection comprises 226 families, 621 genera, and 1,185distinct species. Among these, 2,440 specimens have collector data, 2,427 specimens have locality data, and 1,773 have collection date entries.

The earliest recorded specimen in the Museum is a bivalve mollusk *Pteria peasei* (Pteriidae) collected in 1909 by an unknown contributor. The collections started to

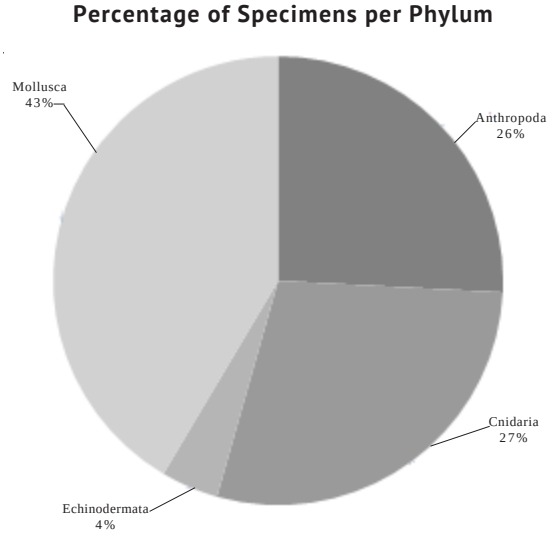

Figure 1. Percentage of specimens per phylum; verified specimens distributed in four phyla: Non-insectan Arthropoda (1,110 specimens), Cnidaria (1,148 specimens), Echinodermata (181 specimens), and Mollusca (1,809 specimens).

grow after the war during the 1940s, with expeditions led by P. de Mesa, who specialized on marine mollusks, and M. Delgado, who specialized on Cnidarians. Table 1 lists the primary contributors to the Museum's collection.

Table 1. Primary contributors to the UP Biology Invertebrate Museum

Collector	Verified Specimens in Collection
Fidel Nemenzo	709
Neon C. Rosell	327
Fernando Dayrit	233
F. Abad Santos	210
Neon Rosell Staff	113
Biology Class*	96
Banzon, Militante, and Zarco	80
E.S. Muego and R.G. Visconde	68
dela Cruz	48
P. de Mesa	47

*Collection of students as a requirement in ecology and/or taxonomy classes

The peak of museum activity was observed in the 1950s through the efforts of Nemenzo, Sr., who spearheaded the collection and description of Philippine hermatypic corals. His collection comprises 57% of all coral specimens, 65 species of which he has described (Note: type designations of these specimens are yet to be verified). This particular collection, comprising 335 species under 48 families, is of great importance to Philippine coral taxonomy (Nemenzo 1986, Gomez and others, 1994). Notable contributors to this collection were Banzon, Militante, Zarco, Estampador, dela Cruz, and Zambo. Nemenzo and his colleagues' work flourished until the late 1980s.

Echinoderms have been included in the collection only during the 1960s through the efforts of the UP Zoological Society, D.Z. Llamas, E.S. Muego, and R.G. Visconde, who collected sea feathers (Crinoidea) and sea stars (Asteroidea). During this period, N.C. Rosell also started building the arthropod collection, particularly the barnacles (Cirripedia). Rosell's research on Philippine barnacles proliferated from the 1970s to the 1980s. His participation in the MUSORSTOM 1, 2, and 3 expeditions resulted in the description of 14 new species (Rosell 1981, Rosell 1989, Rosell 1991). Nines species described by Rosell are housed in the Museum (Note: type designations of the specimens are yet to be verified).

Another notable contributor is F. Dayrit, whose donation comprised 13% of all the mollusk specimens in the collection. However, only locality data were affixed to his collection.

Figure 2 shows the chronological breadth of museum activity based on the number of specimens for each taxonomic group, added to the collection per decade from 1909–2007. Peaks from the 1940s to the 1970s are attributed to the expeditions described above. However, the taxa representation was observed to be very limited. This verifies Alberch's (1993) observation that museum collections grow indiscriminately, which is mainly dependent on the curator's interest or preference. Alberch (1993) further states that natural history collections have not properly been appreciated, and consequently unfunded, because of the lack of standard data-keeping procedures and "failure to identify new potential users". In 1995, President Ramos signed an Executive Order no. 247 (E.O. 247 issued May 18, 1995), which requires the securing of permits when collecting biological specimens for scientific, commercial, and other purposes. This may have dampened the collection activities. Furthermore, the Institute stopped offering the Field Biology course (Biology 161) in the mid-90s, and only resumed in 2007. The taxonomy and ecology courses, although having systematic sampling activities, did not assign catalogue numbers, thus the specimens have not been included in the database (I.K.C. Fontanilla, personal communication, September 5, 2014). This has been the case for all the insects, worms (both terrestrial and aquatic) and most freshwater invertebrates in the collection (Note: These uncatalogued specimens are in the process of being assigned unique specimen codes). Another reason for the lack of growth in the Museum's collections beginning from the 1990s was the absence of a designated curator in the Institute.

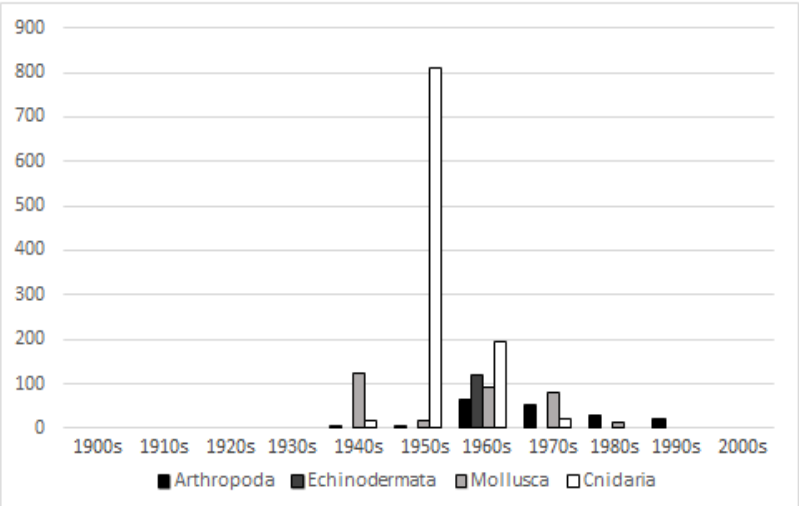

Figure 2. Collection of the UP Biology Invertebrate Museum from 1904–2007.

Using the locality data from 2,427 (55.6%) specimens, maps were generated to show the geographical range of invertebrate sampling by the Museum (Figure 3) The data were sorted according to phylum. Sampling of all taxa was greatest in Puerto Galera, Oriental Mindoro, with 732 specimens. The Southern Luzon region was the most represented, having 919 specimens. An apparent bias towards aquatic—mostly marine—invertebrates (4,129 specimens) also persists, as opposed to terrestrial invertebrates (109 specimens).

In general, the Eastern region of the Philippines appears to be poorly sampled. Samples from the Northern and Central Luzon, and Central and Eastern Mindanao,

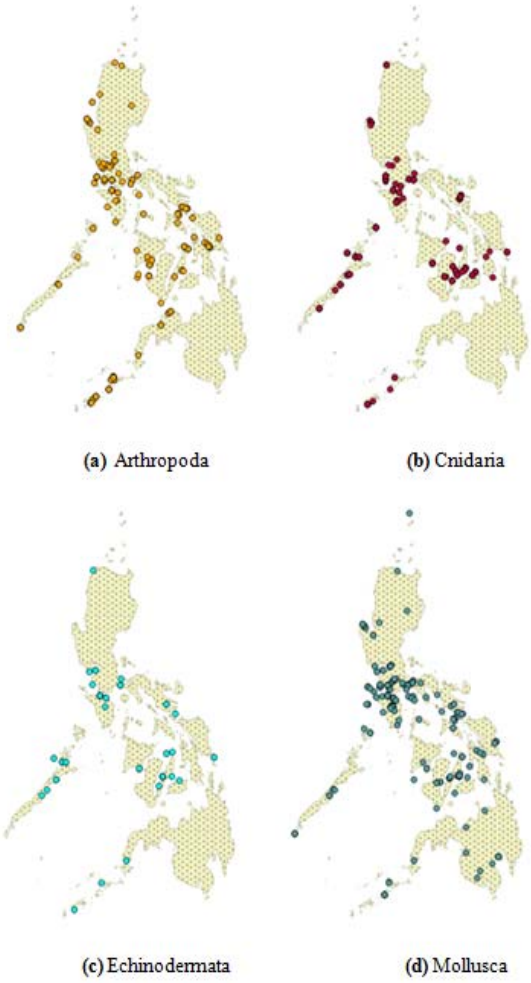

Figure 3. GIS map representing sampling sites of museum researchers throughout the Philippine Islands. Points represent locality of museum specimen with biogeographical data.

are also evidently lacking. The island of Palawan, which is known to have a high biodiversity (Phelps and others 2010) is represented only by 166 specimens in the collection.

Natural history museums must "change their mode of operation and public image" to contribute in addressing the biodiversity crisis (Alberch 1993). The current holdings of the UP Biology Invertebrate Museum may be reflective of the work done by UP Diliman in the Philippines. The Museum must, at this stage, create networks with other natural history institutions. The zoological collection of the Philippine National museum boasts a collection of 292,628 invertebrate specimens, amounting to 86% of its total holdings (The National Museum Zoological Collection, n.d.). The University of Santo Tomas Natural History Collection is also of great importance, as their collections date as early as 1682 (Natural History Collection, n.d.). The center for research and documentation of Phlippine biota is the UP Los Baños Museum of Natural history (UPLB-MNH), which includes 700 shells on display, and the largest entomological (insect) collection of 200,000 specimens (UPLB Museum of Natural History, n.d.). The UPLB-MNH is also the leader in museum research in the Philippines; it has had research projects since 1985, expeditions from 2006 – 2013, and has its own refereed journal, the UPLB Museum Publications in Natural History (UPLB Museum of Natural History, n.d.). Finding ways to do collaborative work with these institutions to complement them in their undertaking is essential for the Museum.

Under-represented taxa must be given attention in terms of sampling and consequent processing. These include the terrestrial arthropods (excluding insects), worms (from different habitats), sponges, and invertebrate chordates (e.g., tunicates/ascidians). The lack of experts in these specific groups does not warrant them to be excluded in the collection, as communications can be done with experts from other museums. Furthermore, the Museum must not simply focus on building its collection. Rather, museum-based research must also be conducted, as the present collections are important tools in comparative biology (Alberch 1993), conservation, and genomics (Austin and Melville 2006).

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