Earthworm Distribution in Selected Islands of the Visayan (Central Philippine) Archipelago

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ABSTRACT

Nine (9) genera were identified from sixty seven (67) collection sites within ten selected islands of central Philippines distributed over thirty municipalities. Among these nine genera, seven (*Pheretima, Pleionogaster, Pithemera, Amynthas, Polypheretima, Metaphire, Archipheretima),* belong to family Megascolecidae and two were highly invasive exotics (*Pontoscolex, Eudrilus*). Genus *Pheretima* showed the most diversity and is widely distributed, followed by the *Pleionogaster* group. *Pithemera* and *Polypheretima* could have native and exotic representatives as suggested by the vegetation type from which they were collected, while *Amynthas* and *Metaphire* could be native species.

***Keywords*:** Central Philippine Earthworms, *Pheretima, Pleionogaster, Pithemera, Amynthas, Polypheretima, Metaphire, Archiperetima,* Megascolecidae

INTRODUCTION

As one of the megadiverse countries in the world, the Philippines "probably supports the greatest concentration of unique biological diversity currently known on the planet" and has been aptly described as "Galapagos times ten" by Heany (Ong, *et al.,* 2002). However, knowledge of the biodiversity of earthworms in the country is very limited. The literature on the species-taxa that have been reported from the Philippines is practically non-existent; we rely only on the recent publications of James (2004a, 2005) on the earthworms in our country. To date, there are almost no data from the Central Philippines (Visayan region)- except for the previous collections from Samar and Cebu (in James, 2004b).

Earthworms are important contributors to the soil ecology, yet much remains to be known of their diversity, biology, and ecology. As such, there is a need to gather essential baseline information on their species diversity and distribution before their impacts on the physical and biological environment can be ascertained. Prior to the works of James (2005, 2004), no systematic collection and taxonomic work has been done on Philippine earthworms. This work represent the initial findings of the second phase of the project Philippine Terrestrial Annelids Biodiversity Survey that primarily aims to document annelid faunas of the main islands of the Visayas. It includes collection from sixty seven sites involving ten islands within the central Philippines. These islands represent various biogeographic regions such as follows: Greater Negros-Panay (Panay, Negros, Cebu and Masbate), Greater Mindanao (Bohol, Leyte, Samar and Biliran), Siquijor, and Camotes (Ong *et al.,* 2002).

MATERIALS AND METHODS

Collection sites (Figure 1) were chosen based primarily on the Key Conservation Sites identified by Haribon Foundation (Mallari *et al.,* 2001). These are more or less similar to those identified in the Philippine biodiversity conservation priority areas (Ong *et al.,* 2002). Since most of the collection sites are part of the Protected Area under the administration of the Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources, Prior Informed Consent certificates were secured from the Protected Area Management Board from each site before actual collection was made.

Earthworms were collected by digging moist blocks of soil and hand sorting them looking for worms. We also searched under rocks, under and on top of fallen trees, on pandan leaf axils, and under mats of mosses on rocks and tree trunks. Photographs of live specimens assumed to be distinct species based on morphological differences were taken. Samples were preserved using phosphate-buffered formalin overnight then drained and replaced with 80% alcohol for storage. Duplicate sets of field-differentiable "species" were preserved in 95% ethanol for DNA extraction. GPS (Magellan) determined latitude, longitude and elevation data were recorded including site name and municipality.

Preliminary identification of genera involved determination of the location and number of spermathecae, external markings, and other salient features from the dorsal dissection of representative samples. Taxonomic key on Philippine worms developed by James (unpublished) and James (2005, 2004) were used.

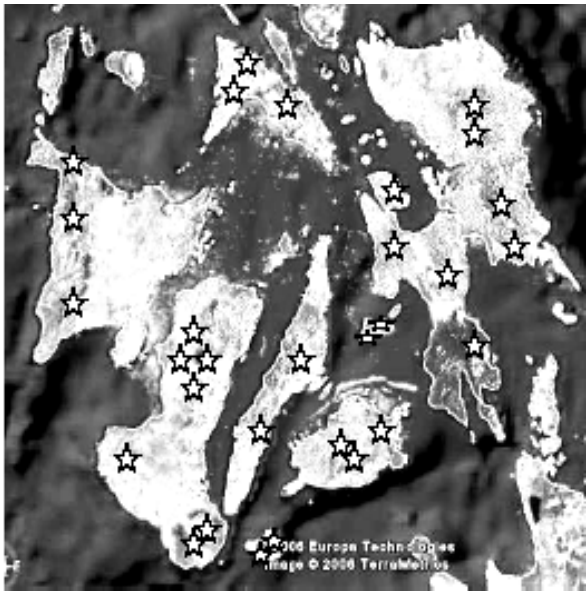

Figure 1. Map of the islands of central Philippines showing the collection sites.

RESULTS AND DISCUSSION

Table 1 shows the genera present in each island. Initial results show that the genus *Pheretima* seems to be widely distributed over the different islands of the central Philippines.

Table 1. Summary of Genera per Island

	Pheretima spp.	*Pleionogaster* spp.	*Pithemera* spp.	*Polypheretima* spp.	*Amynthas* spp.	*Metaphire* spp.	*Archipheretima* spp.	*Pontoscolex* spp.	*Eudrilus* spp.
Panay	☼	☼	☼	☼	☼	☼		☼	
Negros	☼	☼	☼	☼				☼	☼
Masbate	☼	☼						☼	
Cebu	☼	☼	☼	☼				☼	
Samar	☼	☼	☼	☼	☼		☼	☼	
Leyte	☼	☼	☼					☼	
Bohol	☼	☼		☼				☼	
Biliran	☼							☼	
Siquijor	☼	☼		☼				☼	
Camotes	☼	☼							

Diversity of the genus is also high, reaching up to ten possible species in one of the sites in Salvador Benedicto, Negros Occidental. *Pheretima* is also diverse in other sites such as in Cuernos de Negros, Negros Oriental and Madja-as, Antique, Panay Island. Table also shows that the genus *Pheretima* is well distributed over the four biogeographic regions under study. *Pleionogaster* seems to be more diverse in Cebu and Bohol though they are as widely distributed as the *Pheretima* group. *Archipheretima* is the least distributed, having been collected only in Samar. *Pithemera*, though present in Samar, Leyte, Cebu and Negros, their diversity and density is comparatively low based on the summary report submitted by James to the DENR in 2004. He suggested the possibility that Luzon is the original home of *Pithemera* owing to the high diversity discovered in the island.

Pheretima, Pleionogaster, Pithemera and *Polypheretima* seem to inhabit a very diverse vegetation type from deep native/primary forest to agro-forests. Data suggest that *Pithemera* and *Polypheretima* could have both exotic and native representative species while *Amynthas* and *Metaphire* could be native species as they were collected from deep native forests.

The *Pheretima* genus-complex is regarded as the largest group of earthworms in the world, consisting of more than 700 nominal species and subspecies. The *Pheretima* complex is a Southeast Asian group with a range extending from Northern Australia to Myanmar, and north to Korea. Formerly all the species were placed in the genus Pheretima, but this was divided into several restored genera (Amynthas, Archipheretima, Polypheretima, Planapheretima, Metapheretima) and some new genera (Pithemera, Ephemitra, Metaphire) by Sims and Easton (1972).

Endemic earthworms currently known in the Philippines are listed in James (2004, 2005). However, James' species list is not comprehensive enough since it is based only on a few studies dealing with earthworms in the Philippines. Most of the species recorded from Mt. Pulag in the Cordilleras of the Luzon Island belong to the genera *Pithemera, Polypheretima,* and *Pheretima*. Two genera, found on Southern Luzon were described as new, namely *Dendropheretima* and *Isarogoscolex*.(James 2004) Other species found on Luzon Island belong to *Pleionogaster* and *Lampito;* the latter includes an exotic species native to Southeast Asia and India. Luzon also has Amynthas, Archipheretima, Polypheretima, some possible Graliophilus, and an undescribed Sierra Madre genus similar to the Australian Propheretima.

Species of *Polypheretima* and *Pheretima*, as well as *Amynthas* were found on Mindoro Island. The genus *Amynthas* can generally be found from Korea, China, Taiwan to Southern Asia. *Polypheretima* is mostly Indonesian but can be found in Papua New Guinea and the Philippines. *Pleionogaster* is endemic to the Philippines. *Archipheretima* is another endemic genus in the Philippines with records from Luzon, Samar, and Marinduque. In the last four years, more than 400 hundred species have been identified by the Philippine Terrestrial Annelids and Gastropods Survey (PTAGS), headed by Dr. Sam W. James.

It is interesting to note that vermicomposting is widely practiced in Negros Occidental and that *Eudrilus* which is very popular for such purpose has already found its way to the mountains via the agro-forest strips of the protected areas. *Pontoscolex* proved to be the highly invasive as it is present in all islands except Camotes, and its density is extremely high in Hinoba-an, Negros Occidental which has already lost more than 95% of its forest cover due to intensive logging in the 1960's through the 1970's. Some representative samples of the various genera are presented below (Figure 2).

Figure 2. *Arhipheretima spp.* from Fatima, Hinabangan, Samar.

CONCLUSION

The initial findings of the second phase of the project Philippine Terrestrial Annelids Biodiversity Survey showed that a total of nine genera were identified, seven belonging to family Megascolicedae and two highly invasive exotics (*Pontoscolex, Eudrilus)*. Genus *Pheretima* showed the most diversity and is widely distributed, followed by *Pleionogaster* group.

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