

## LAYMAN'S ABSTRACTS

### Main Articles

#### **Crustal Deformation of Luzon and its Implications on the Stability of the Philippine Survey Network**

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The island of Luzon is situated in a broad region of intense geologic deformation, called a Plate Boundary Zone. Such regions are dotted with tectonic faults that produce periodic, earthquake-related motions, as well as rotations and internal deformation of small tectonic plates with respect to one another. These dynamic environments are characterized by continuous strain or deformation in the crust, which in turn affects the natural environment including man-made structures—among these are plat or property boundary monuments, benchmarks, horizontal control/triangulation stations and other survey control stations. When such survey networks are moved or deformed, this disrupts the integrity of the fundamental reference system that is being used to provide coordinates or positions of reference markers for land surveys and mapping systems. Essentially, this work partly identifies and resolves an important component of a persistent problem that has plagued the old Philippine Survey network: deformation based on geologic or tectonic motion. This research focuses on identifying the deformation patterns of Luzon, then presents a two-step modeling approach that estimates the deformation specifically due to locking of the faults and to rotation and internal deformation of the tectonic plates that compose Luzon. The implications as to how and where resurveys should be implemented are then briefly discussed.

## **The Jordan Canonical Form of a Product of Elementary $S$ -unitary Matrices**

Erwin J. Gonda and Agnes T. Paras

A generalization of a unitary matrix is the  $S$ -unitary matrix for nonsingular and Hermitian  $S$ . A complex matrix  $Q$  is said to be  $S$ -unitary if  $Q^*SQ = S$ . An  $S$ -unitary  $Q$  is called elementary if  $\text{rank}(Q - I) = 1$ . The multiplicative group of  $S$ -unitary matrices is generated by elementary matrices. We determine all the possible Jordan canonical forms of a product of two elementary  $S$ -unitary matrices.

## **Mineralization, Biodegradation, and Antagonistic Activities of Gut-associated Bacteria and Fungi of African Nightcrawler, *Eudrilus eugeniae* (Kinberg, 1867)**

Maria Reynalen F. Mapile and Marie Christine M. Obusan

Earthworms and their interactions with microorganisms offer beneficial effects that can improve organic matter decomposition, enhance nutrient availability, and suppress pathogens in the soil. In this study, bacteria and fungi isolated from the gut of *Eudrilus eugeniae* (Kinberg 1867), commonly known as African nightcrawler or ANC, were found to exhibit activities that add value to its casts and compost. Six fungal isolates inhibited the growth of bacteria. Two bacterial isolates demonstrated the ability to fix nitrogen, solubilize phosphate, and use polyethylene as carbon source. The activities of these bacteria and fungi must be further explored to optimize the use of ANC's casts and compost for agricultural, medical, and other applications.

## **Body Size, Habitat, and Diet of Freshwater Crabs *Isolapotamon mindanaoense* and *Sundathelphusa miguelito* (Crustacea: Brachyura) in the Municipality of Lake Sebu, South Cotabato, Philippines**

Ziljih S. Molina, Jemateo B. Neri, Rizza May P. Cañete, and Ephrime B. Metillo

Two species of edible freshwater crabs, namely *Isolapotamon mindanaoense* (Rathbun 1904) and *Sundathelphusa miguelito* (Mendoza and Sy 2017), are known to be found only in Mindanao Island, but the biology of these species is poorly investigated. The authors studied the body size, microhabitat, and feeding habits of these two crab species collected by hand in the vicinity of three waterfall sites in South Cotabato, Southern Philippines. Both species feed on a variety of food composed of plant fragments, insect and fish fragments, and unidentified food items, but the larger sized *I. mindanaoense* fed more on animal fragments compared to the smaller sized *S. miguelito* that mainly ate plant fragments and unidentified food items. Apart from differences in body size and feeding habits, the two species differ in habitats with the larger species found in areas with big boulders while the smaller species inhabit sand and gravel substrates. These differences may help minimize competition, allowing the coexistence of the two species.

## **Tracing the Source of the Non-native Philippine Population of the Greenhouse Frog *Eleutherodactylus planirostris* (Cope, 1862) through DNA Barcodes**

Gerard Clinton L. Que, Emerson Y. Sy, Perry S. Ong<sup>†</sup>, and Ian Kendrick C. Fontanilla

The Greenhouse Frog (*Eleutherodactylus planirostris*) is a small amphibian native to Cuba and outlying islands that has recently been accidentally introduced into the Philippines. Following its first detection in Davao in 2013, it has since spread to eight islands in the country, including Negros, Cebu, and Luzon Island. The authors of this paper wanted to find out where the frogs came from and how they were introduced. Several frogs were collected from Luzon and one from Negros.

Using DNA barcoding, a tool that relies on a segment of DNA that can reliably discriminate between various groups of organisms, we were able to narrow down the source population to Florida, USA or Western Cuba. All collected frogs had similar nucleotide sequences with each other, with almost no genetic diversity among them. Importation of plants from the USA is the probable mode of introduction, since the Greenhouse Frog lays its eggs in soil rather than water and is often found in bromeliad plants.