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Comparative studies on woody species diversity and structure in subtropical evergreen broadleaf forests along a latitudinal thermal gradient of the Ryukyu Archipelago

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were used to determine correlates of endemism, while non-metric multi-dimensional scaling (NMDS) was used to investigate species compositional variations. Sampling yielded a total of 198 terrestrial mollusc species. GLMMs revealed an important contribution of karst area and surrounding soil type on mollusc endemic richness, while NMDS showed that karsts separated by vicariant barriers in different parts of Peninsular Malaysia and Sabah had distinct malacofaunas. These results have important conservation implications: planners should take karst area and surrounding soil type into account, together with the effects of vicariant barriers such as mountains, when designing karst reserves in order to maximize the protection of invertebrate diversity.

Poster -12

First inventory of the aquatic and semi-aquatic bugs (Heteroptera: Nepomorpha & Gerromorpha) of Langkawi Island, West Malaysia

H. Zettel¹ and A.D. Tran²

¹*International Research Institute of Entomology, Natural History Museum Vienna, Austria, and*

²*Department of Biological Science, National University of Singapore, 14, Science Drive 4, Singapore 117543, Republic of Singapore*

Langkawi Island (Pulau Langkawi) is situated off the northwest coast of Peninsular Malaysia, in the southern Andaman Sea. Although the water bug fauna of the Malay Peninsula is relatively well known, knowledge on the fauna of Langkawi is almost none, except for three reliable species records from Langkawi in the literature: *Halobates hayanus* White, 1883, *Haloveloides sunaensis* Andersen, 1992 and *Xenobates murphyi* Andersen, 2000. In 2006, we and Dr Tohru Naruse visited Langkawi for three days to explore the diversity of water bugs. The intensive collections primarily focused on habitat diversity (freshwater habitats, mangroves, and rocky shores) to record as many species as possible. Additional specimens collected from the island by Dr Damir Kovac in 1993 (deposited in Raffles Museum of Biodiversity Research, Singapore) are also included in this study. This survey unveils 52 species (47 species identified) belonging to 31 genera and 11 families from the island. Most of the species belong to two families, the Gerridae (19 species) and the Veliidae (12 species), while the remaining nine families together contain only 21 species. This agrees proportionally with the species numbers known from the Malay Peninsula. Three species are new to science, they are of the genera *Hydrotrepes* (Helotrephidae), *Strongylovelia* and *Microvelia* (both Veliidae). Another nine species are recorded from Malaysia for the first time. The fauna of Langkawi Island is compared with those of Tioman Island, where intensive surveys were carried out in the past, and of the Malay Peninsula.

Poster -13

Comparative studies on woody species diversity and structure in subtropical evergreen broadleaf forests along a latitudinal thermal gradient of the Ryukyu Archipelago

S. M. Feroz, Akio Hagihara, and Masatsugu Yokota

Faculty of Science, University of the Ryukyus, Nishihara, Okinawa 903-0213, Japan

In order to compare woody species diversity and stand structure on the basis of the architectural stratification of subtropical evergreen broadleaf forests along a latitudinal thermal gradient of the Ryukyu Archipelago, tree censuses in a 750 m² plot in Okinawa Island and a 400 m² plot in Ishigaki Island were performed. The number of layers increased along a latitudinal thermal gradient from four in the forest of Okinawa Island to five in the forest of Ishigaki Island. The values of Shannon's index H' and Pielou's index J' tended to increase from the top layer downward in the forest of Okinawa Island. However, in the forest of Ishigaki Island, these values tended to increase from the bottom layer upward. High woody

species diversity depended on small-sized trees in the forest of Okinawa Island, whereas it depended on large-sized trees in the forest of Ishigaki Island. The forest of Okinawa Island ($H' = 4.83$ bit) showed higher woody species diversity than the forest of Ishigaki Island ($H' = 4.36$ bit). According to successively decreasing height of layers from the top downward, the value of H' increased continuously from the top layer downward in the forest of Okinawa Island. This increasing trend was different from the forest of Ishigaki Island, where the value of H' increased up to the second layer and then decreased downward. In the forest of Okinawa Island, the expected number of species increased continuously from the top toward the bottom layer, i.e. the bottom layer contained the highest potential number of species (65). However, in the forest of Ishigaki Island, it increased from the top to the fourth layer, and then decreased to the bottom layer, i.e. the fourth layer contained the highest potential number of species (90). The species composition in the forest of Okinawa Island was different from that in the forest of Ishigaki Island, though approximately half of the species were common between the forests. The highest degree of similarity in species composition was between the second and third layers in the forest of Okinawa Island, whereas it was between the third and bottom layers in the forest of Ishigaki Island. The degree of similarity in species composition between the top and the lower three layers was high in the forest of Okinawa Island, whereas it was very low between the top and the lower four layers in the forest of Ishigaki Island. Except the top and the bottom layer respectively for the forests of Okinawa Island and Ishigaki Island, the spatial distribution of trees was random in each layer. The degree of overlapping in the spatial distribution of trees among layers in the forests suggested that light can not penetrate easily to the lower layers. For both of the forests, mean tree weight of each layer decreased from the top toward the bottom layer, whereas the corresponding tree density increased from the top downward. This trend resembled the mean weight–density trajectory of self-thinning plant populations.

Poster -14

Preliminary examination of zooxanthellate zoanthid (*Hexacorallia*, *Zoantharia*) and associated zooxanthellae (*Symbiodinium* spp.) diversity in Singapore

James Davis Reimer^{1,2}

¹ *Department of Chemistry, Biology and Marine Science, Faculty of Science, University of the Ryukyus, 1 Senbaru, Nishihara, Okinawa 903-0213, Japan*

² *Research Program for Marine Biology and Ecology, Extremobiosphere Research Center, Japan Agency for Marine-Earth Science and Technology (JAMSTEC), 2-15 Natsushima, Yokosuka, Kanagawa 237-0061, Japan*

The order Zoantharia (=Zoanthidea, Zoanthiniaria) remains one of the most taxonomically neglected and least examined orders of Cnidaria despite a worldwide distribution in marine environments. In particular, zooxanthellate zoanthids from the genera *Palythoa* (family Sphenopidae) and *Zoanthus* (Zoanthidae) are very common in tropical and subtropical shallow waters. Confusion surrounding the taxonomy and species diversity in these two families is largely attributable to the morphological plasticity (i.e. polyp shape and size, oral disk color, etc.) within species, the lack of accurate morphological markers to properly discern species, and the paucity of accurate species descriptions in past literature. However, recent examinations utilizing mitochondrial 16S ribosomal DNA (mt 16S rDNA), mitochondrial cytochrome oxidase subunit I (COI) and the internal transcribed spacer of ribosomal DNA (ITS-rDNA) data from *Zoanthus* and *Palythoa* spp. specimens from Japan combined with more traditional morphological methods have begun to bring taxonomic order to these two genera. Other studies utilizing ITS-rDNA from symbiotic zooxanthellae (*Symbiodinium* spp.) from these two genera have shown varying levels of symbiont specificity and flexibility between zoanthid species. Here, we utilize the “combined” molecular and morphological methodology to examine the species diversity of these two genera in the waters of Singapore. 44 zooxanthellate zoanthid specimens representing a wide range of morphotypes were collected from three locations (Raffles Lighthouse, Lazarus Island, Kusu Island) in November-December 2006. Upon collection, specimens were assigned tentative species identifications based solely on morphology. Further examinations of mt 16S rDNA, COI, as well as ITS-rDNA from *Symbiodinium*, allowed us to 1) identify specimens to the species level, and 2) examine the accuracy of morphological identifications. Our results show collected specimens represent five species of zooxanthellate zoanthids; *Zoanthus sansibaricus* (n=11), *Zoanthus vietnamensis* (n=17), *Palythoa tuberculosa* (n=13), *Palythoa mutuki* (n=2), and a potentially undescribed *Palythoa* species (n=1) closely related to *Palythoa heliodiscus*. Species identifications are somewhat tentative due to the almost complete lack of previous reports of zoanthids in Singapore. Based on morphology alone, we were able to identify