Taxonomy, biogeography, and conservation of tarsiers

Poster -6

History of taxonomic recognition of reptile diversity in the East Asian Islands

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The East Asian Islands consists of several hundred of inhabited islands and uninhabited islets of Japan and Taiwan, and is located in the eastern off-shore of the Eurasian continent. It extends from the cool-temperate zone in northeast to the subtropical zone in southwest. Such topography, along with its diverse geomorphology, makes the climate of this region highly variable, offering diverse temperature, humidity and precipitation environments to its terrestrial organisms. Geologically the East Asian Islands is characterized by radical and complicated tectonic movements, which often lead to heavy earthquakes and cause remarkable uplifting and subsidence of localized crusts. To the terrestrial animals with limited ability of oversea dispersals, formation of a landbridge and its subsequent fragmentaion, involved by such tectonic movements and also by the eustatic sea level changes, offer good opportunities of range extension and vicariance. Indeed, terrestrial fauna of the East Asian Islands is characterized by a high degree of endemism and distinct difference in species composition even between neighboring areas, when they are separated by long standing straits.

The taxonomic description of terrestrial animals in the East Asian Islands was first started in the early 19th Century by a few European naturalists. Since then, nearly two centuries have passed. Nevertheless, a huge number of new and newly recorded taxa are still reported from this region every year. On this opportunity, I review the history of taxonomic recognition of reptile diversity in this region.

Over 160 native species and subspecies of terrestrial reptiles have been reported from the East Asian Islands. From Japan, 80 are currently recognized, of which nearly 3/4 are endemic to this region. With respect to Taiwan, more than 80 species and subspecies are also reported, of which, however, less than half are endemic. The difference in the ratio of endemic taxa between the two regions seems to reflect the difference in their history as isolated islands: many of the Japanese islands are considered to have been consistently isolated from the continent for more than one million years, whereas the main island of Taiwan, where most Taiwanese species and subspecies occur, seems to have connected to the continent around 15,000—20,000 years ago, when the sea level lowered by ca. 120 m as a result of continental glaciation.

Of the native taxa of terrestrial reptiles in the East Asian Islands, more than 2/3 were described or recorded from this region by the middle of the 20th Century, and over 9/10 by the early 1980s. However, with the progress and prevalence among taxonomists of molecular and cytogenetic techniques that are quite effective in detecting morphologically poorly diverged but genetically distinct or reproductively isolated species, the number of taxa newly discovered from the East Asian Islands have started to increase again during the last two decades. The temporal pattern of increase of the reptile taxa recognized from this region predicts that a substantial portion of the cryptic taxonomic diversity still remains to be appropriately recognized.

Poster -7

Taxonomy, biogeography, and conservation of tarsiers

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Hill (1955) classified tarsiers into three species, each from a distinct biogeographic region: *Tarsius bancanus* from island areas of Sundaland, *T. syrichta* from islands of the southern Philippines, and *T. tarsier* (=*spectrum*) from Sulawesi and nearby islands. Multiple species and/or subspecies have been

described from each region, and each of these three taxa may be a cluster of related taxa. The distribution of *T. syrichta* conforms well to the Ice Age landmass Greater Mindanao. The distribution of the *T. tarsier*-complex covers the Ice Age landmass of Sulawesi, and extends to discontiguous island groups, possibly indicating a relatively ancient dispersal throughout the proto-Sulawesi archipelago. The distribution of *T. bancanus* is limited to a greatly reduced subset of Sundaland, and may indicate a Holocene range expansion from a Pleistocene refuge in Borneo. The alpha-level taxonomy of the *T. tarsier*-complex is reviewed. Acoustic evidence provides a hypothesis of at least 17 distinct taxa, 16 known acoustic forms plus the enigmatic *T. pumilus*. The distribution of tarsier acoustic forms conforms to empirical biological and geological data to form a compelling biogeographic hypothesis for Sulawesi. Congruence among tarsier acoustic, genetic, and morphologic data is reviewed. One implication for conservation is that biodiversity in Sulawesi may be underestimated by as much as an order of magnitude. Rigorous testing of the hypothesis of so many new taxa will require a large investment of resources and time, but regrettably, current rates of deforestation indicate that time may be of short supply.

Poster -8

Cryptic species: What we don't know might hurt us

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The taxonomic challenge posed by cryptic species has been recognized for nearly 300 years, but the advent of relatively inexpensive and rapid DNA sequencing has given biologists a powerful new tool for detecting and differentiating morphologically similar species. Here, we synthesize the literature on cryptic and sibling species and discuss trends in their discovery. However, a lack of systematic studies leaves open the tantalizing questions such as whether cryptic species are more common in particular habitats, latitudes or taxonomic groups. Such uncertainties could have profound implications for evolutionary theory, biogeography planning and conservation planning.

Poster -9

Insular biogeography of web-building spiders on small tropical islands surrounding Singapore

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The main objective of this study was to investigate biogeographical effects that influenced the distribution and assemblage of web-building spiders on small tropical islands off Singapore in order to understand how this group of arthropods responded to biogeographical, environmental and human factors. Fifteen islands were sampled for web-building spiders. Correlation analysis, simple linear and multiple regressions, nestedness index and choros (*K*) model were used to test the six specific predictions that (1) area is the best predictor of species/genus richness at both community and specific/generic levels; (2) there is no correlation between island size and population density; (3) web-building spiders are non-randomly distributed on the islands and exist as nested subsets; (4) there is a correlation between environmental variables and web-building spider species/genus distribution; (5) body size (chelicerae to end of abdomen) of female insular *Nephila pilipes* increases with increasing island area; and (6) the choros (*K*) (Triantis *et al.*, 2003) model offers a better-fit than the classic species-area one.

Area *per se* was found to be the most significant factor accounting for web-building spider assemblage at both community and specific/generic levels. Contrary to the theory of Island Biogeography, there was a positive correlation between island size and population density. Web-building spiders were