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## Factors affecting the current diversity and distributions of mammals in the Ryukyu Archipelago, Japan

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morphological groups. Four groups are likely to correspond to four known species, *N. olivacea*, *N. anterostigmatica*, *N. astigmatica* and *N. pyriformis*. The remaining four groups may contain *N. gaoae*, *N. minuta*, *N. rotunda* or new taxa but detailed ultrastructural observations are needed to identify these groups conclusively. To help achieve this, some strains were subjected to TEM observations, pigment analyses and molecular phylogenetic analyses. Morphologically, three potentially undescribed groups are designated here as three undescribed species, sp. 1 to sp. 3. The molecular phylogenetic analysis of 18S rDNA sequences revealed that the three undescribed species were distributed in a monophyletic genus *Nephroselmis*. The genus was divided into four monophyletic clades (A to D) and each clade was supported by relatively high bootstrap values. In addition, pigment compositions of carotenoids and xanthophylls were somewhat related with molecular phylogeny of the genus *Nephroselmis*. The rest of the collected strains from the Ryukyu Islands may also contain previously unrecorded known or unknown species, and further characterizations are needed. In this paper we present an overview of some of our work on the unique genus *Nephroselmis*.

Oral -10

### **Factors affecting the current diversity and distributions of mammals in the Ryukyu Archipelago, Japan**

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The Ryukyu Archipelago lies between Kyushu of Japan and Taiwan, and consists of more than 150 islands. The northern tip of this archipelago belongs to the temperate zone, whereas the remainder to the subtropical zone. Within the Ryukyu Archipelago, following eight island assemblages are usually recognized—Osumi Group, Tokara Group, Amami Group, Okinawa Group, Miyako Group, Yaeyama Group, Senkaku Group, and Daito Group. Components of the first six assemblages form an island chain from northeast to southwest and are separated from the continent by East China Sea. The Senkaku Group is located on the continental shelf north of the Yaeyama Group, whereas the Daito Group, the only representative of oceanic islands in this region, are located ca. 360 km east of the Okinawa Group. The Tokara Group is further divided into two parts, the northern and southern Tokara islands, by the Tokara Tectonic Strait, which is often considered as a border between the Palearctic and the Oriental zoogeographical realms, being referred to as the Watase's Line. The Kerama Gap, located between the Okinawa Group and the Miyako Group, is often considered as another important biogeographical border under the reference name, the Hachisuka's Line.

The fauna of the Ryukyus is generally characterized by high lineage diversity and remarkable endemism as a whole, and distinct population divergence in many lineages among islands and island assemblages. These faunal characteristics are usually attributed to the complicated geological history of this archipelago. We review mammal fauna of the Ryukyu Archipelago and discuss geographical features of its diversity by considering not only the paleogeographical process of this archipelago, but also ecological properties of this group of organisms and insular environments. We try to make best use of the results from most recent studies, although quite a few taxa obviously need further evaluation for their taxonomic status (e.g., the Iriomote cat), or indigenism of the Ryukyu populations (e.g., house mouse), or actual occurrence in this region (e.g., various forest-dwelling bats).

A total of 35 putatively indigenous species of terrestrial mammals are known from the Ryukyu Archipelago. Distributions of these species can be classified to several types. From a viewpoint of endemism, for example, five species are confined to single islands and four to single island groups, whereas five species are shared by two or more island groups and one by the Ryukyu Archipelago and Taiwan. The remaining 20 species are widely distributed, although six of them are still endemic to Japan, and many of the remainder need further taxonomic studies and distribution surveys (see above).

We chiefly discuss three biogeographical features of mammals of the Ryukyu Archipelago.

1) Scarcity and range limitation of medium- and large-bodied mammals in this region. This seems to be related to various biotic and abiotic environmental factors, such as habitat diversity and community structure on each island. Small area and low altitude of most Ryukyu islands, obviously reflecting their low habitat diversity and simple community structure, are likely to be strictly limiting the chance for such mammals to establish populations there, unless they acquire certain ecological specializations as

exemplified by the Iriomote cat (see Oral-12). Consequent vacancy of some niches in the Ryukyu islands seems to have enabled other animals to make their niches unusually broad.

2) Distinct patterning in geographic distributions of non-volant mammals in this region. Most of their ranges are delimited by the Watase's Line and the Hachisuka's Line (see above), as has been already noted. This suggests the substantial influence of paleogeography on the formation of current distributions of species and subspecies in mammals as in the case of other animal groups.

3) Unexpectedly limited distributions of chiropteran species and subspecies in this region. Many previous authors implicitly or explicitly assumed that bat taxa generally show distributions whose pattern does not necessarily correspond to island configuration due to their highly effective migration ability. However, many of the Ryukyu bats actually show strongly limited distributions that more or less correspond to island shapes. This probably reflects the influence of geographic arrangements of important resources, such as resting sites and foraging areas.

O-11

### **Taxonomic importance of a tiny island: type locality - Singapore. New species from inland to off-shore. Will we discover more?**

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The island of Singapore has been the designated type locality for practically hundreds of newly described taxa for more than a hundred years. New genera, subgenera, species and subspecies of a wide variety of vertebrates and invertebrates have been described by various scientists from around the world, even till today. In total, how many published taxa have been described. Of these, how many are actually valid still? In the future, how many more discoveries remain to be unearthed? Where are some of the local 'hotspots' for biodiversity, where potentially new species lie waiting to be found? This is a preliminary attempt to answer these, and other questions, pertaining to Singapore's past, present and future significance from a taxonomic perspective.

Oral -12

### **Significance of diversity of small animals as viewed from a wild cat surviving on a small subtropical island**

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The Iriomote cat *Prionailurus bengalensis iriomotensis*, a wild cat endemic to Iriomotejima Island, is the only indigenous medium-sized carnivore in the Ryukyu Archipelago. Recent molecular studies indicated that this cat is closely related to the leopard cat distributed from India and Southeast Asia to Russia and that the former was derived from the latter through migration to Iriomotejima island and subsequent isolation for about 200,000 years. Carnivores, occupying the top of the food chain, usually need wide ranges of habitats that guarantee constant provision of prey animals. The Iriomotejima Island (284 km<sup>2</sup>) is apparently too small for such medium-sized carnivores as the Iriomote cat. Moreover, except for some chiropteran species, no small indigenous terrestrial mammals that are almost always the staple of feline diet occur on this island. The survival of the Iriomote cat on Iriomotejima Island has therefore been regarded as a kind of enigma by mammalogists and ecologists.

We have studied food habits, home ranges, and activities of the Iriomote cat to solve this enigma. The scat analyses showed that the diet of this cat consists of an extraordinarily wide range of animal taxa, including not only such small mammals as the native fruit bats and the introduced black rats, but also