# Keynote Speech: Summary

## Diversity of ants in Asia: an overview

*Seiki Yamane, Kagoshima, Japan*

Since the publication of Bolton's keys to the world genera of ants in 1994, the diversity of ants has frequently been a focus of biodiversity researches in many places in the world. The rapid development of websites for ant images, though with some danger in misidentification, has also promoted the rapid increase in the progress of ant diversity researchers.

Recently, tropical areas in Asia have attracted many ant researchers. Some famous sites in Borneo, Java, Sumatra and Malay Peninsula have been intensively surveyed for myrmeco-fauna. Later, previously untouched countries or areas have been the targets. In Thailand, until late 1990's almost nothing was known of its ant fauna, there being no substantial ant collection too. Decha Wiwatwitaya, Suparoek Watanasit and their students altered the situation completely. At present, Thailand's ant fauna is one of the most intensively studied insect group in tropical Asia. Similarly, Vietnamese ants have been studied mainly by Tuan Viet Bui and Katsuyuki Eguchi for more than 10 years. Ant research in Laos was initiated by Weeyawat Jaitrong and Seiki Yamane in 2010, and in Cambodia, Shingo Hosoishi started intensive sampling in 2010. Ant fauna of Hainan Island and Hong Kong in China have been surveyed by John Fellowes. Recently Indian and Sri Lankan ants have been intensively studied by Himender Bharti and Sriyani Dias and their students.

Some ant genera or groups have been revised taxonomically, for example e.g., *Aenictus* by W. Jaitrong and Sk. Yamane, *Crematogaster* by S. Hosoishi and

Kazuo Ogata, Dacetini by Barry Bolton, Dolichoderinae by M. Dill, *Pheidole* by K. Eguchi, *Polyrhachis* by Rudy Kohout and Wolfgang Dorow, *Pristomyrmex* by Min-ShengWang, and *Tetraponera* by P. S. Ward. Himender Bharti has published many papers on Indian ants, and Zheng-Hui Xu and Syanyi Zhou described many new taxa from China. However, some large genera such as *Camponotus*, *Carebara* (including *Oligomyrmex* and *Pheidologeton*) and *Hypoponera* are left unrevised and should be challenged by the young taxonomists.

Although numerous ant specimens have been collected from various places in tropical Asia, available checklists are very limited. This is because the identification at species level is often difficult for many genera due to the lack of taxonomic revisions. Thus, in many cases the number of species in the list is under-estimated; lists for Borneo (717 spp.) and Thailand (247 spp.) do not include unidentified species. Dave General and Gary Alpert counted 500 spp., including unidentified ones, from the Philippines. H. Bharti recognized 652 spp., including unidentified specimens, from India. More local species lists (including unidentified species) are available for Lambir Hills National Park in Sarawak (540 spp.; unpublished), Bogor Botanical Garden (216 spp.), and Pasoh Forest Reserve in Malay Peninsula (489 spp.). On the other hand, in temperate and subtropical countries or areas the lists approximate to the real numbers: Taiwan (264 spp.), Japan (296 spp.), North Korea (99 spp.), Mongolia (71 spp.) and Russian Far East (85 spp.). Benoit Guénard and Rober Dunn listed 939 spp. for China, but the real number may be much higher. In those areas the next step is the detection of cryptic species, applying DNA analyses.

Ants on small islands and island groups have been intensively studied in some areas. The Ryukyu Islands stretch over 1,200 km from north to south with Palearctic-Oriental border in the middle, and comprise islands with different isolation histories, generating many interesting topics to be studied. M.

Terayama and Sk. Yamane and their research groups have studied endemism and distribution pattern of ants, and the spreading of tramp species. Akmad Rizali and others compared ant species composition among 18 small islands in the Thousand Islands Archipelago off Jakarta, Indonesia in relation to island area, isolation from the mainland, and habitat disturbance. The recolonization process of ants was studied by Sk. Yamane on the Krakatau Islands, located in the Sunda Straits, Indonesia, around 120 years after the catastrophic eruptions.

Altitudinal distribution was studied for Mt. Kinabalu, Sabah, Borneo by Carsten Brühl, revealing that the number of leaf litter ants decreased progressively with the elevation, from 128 species at 560 m altitude to 3 species at 2,300 m. On the other hand in the Himalayas, H. Bharti found that more than 200 ant species were found above 1,000 m altitude and that more than half of them occur at 2,000 m altitude. This suggests a big difference in ant distribution pattern between high mountains on isolated tropical islands and those in the continent that can receive many temperate species or groups.

Ant communities have been compared between natural forests and disturbed forests or oil palm plantations by C. Brühl, M. Pfeiffer, W. Wang and others in Borneo, mainly based on the sampling at the ground level using the pitfall traps and leaf litter samples. The species number and composition are much poorer in oil palm plantations than those recorded in the natural rainforests. However, Yoshiaki Hashimoto and others showed the highest diversity resulted from the soil samples, and Hiroshi Tanaka and others found many species almost exclusively from the tree canopies in the natural forests. Information on the soil and canopy ant species is still very poor for oil palm plantations. Other aspects of ant diversity have also been studied, particularly the ants associated with certain plants such as *Macaranga* by German, American and Japanese researchers, for example, Ulrich Maschwitz and co-workers, Takao Itioka and co-workers, Joachim Moog, and others. Y. Hashimoto and Takeshi Yamasaki

have been cooperating to establish the sound taxonomic system of Asian ant-mimicking spiders and to reveal interesting relationships between ants and ant-mimicking spiders. Mizue Ohashi, Sasitorn Hasin and others revealed that the ants in high densities affect the spatial pattern of $CO_2$ emission in tropical forests, developing a completely new field in the study of ant ecology.

The development of ant research in Asia has been strongly affected by the rise of interest in biodiversity in general and rapid disappearance of natural habitats, especially of tropical rainforests. However, without Bolton's generic key and world species catalogue, the process could have been much slower. The increase in the number of ant researchers and the level of research activity in Asian developing countries apparently seem to be paralleled with the initiation and development of the ANeT in the past 15 years. With enormous effort by its founding members, especially of Maryati Mohamed, myrmecology spread very quickly to cover most of the Asian countries. Initially, sampling and identification techniques were most important. This lead to the establishment of some large ant collections in Malaysia, Indonesia, Thailand and Vietnam. The next step was the handling of data and the publication of results. The starting of a new journal, Asian Myrmecology, helped many Asian researchers, including complete beginners, to publish their data. John Fellowes, Martin Pfeiffer and some Western people contributed much to this. Current rapid change in myrmecology worldwide, in both technology and scope, has been tremendous, leaving us much behind. Even with this, the activities of ANeT changed the Asian situation, giving rise to many researchers in developing countries recording ant species of their own countries, naming ants of their own countries, co-operating together, and joining the international activity.

Finally, I would like to emphasize the safe and effective management of specimens. Reference collections can help beginners and specialists of non-taxonomic fields in identifying the species. For this purpose, identified

specimens should be extensively exchanged among different collections and countries. Holotypes are primarily used by taxonomic specialists of the world, in ideals do not belong to a particular institution or country, and should be managed by an international system. Currently, we can access beautiful high quality ant images due to the recent advances in photographic techniques and thanks to Brian Fisher and co-workers who photographed the holotypes. This allows taxonomists to examine the image of a holotype first and then decide if a specimen should be borrowed or not. Paratypes can be distributed to many institutions or countries because in most cases we can have several to many paratypes from single colonies for each new species. Recent terroristic incidents and natural disasters strongly warn us of danger in concentrating all the holotypes and paratypes in particular institutions or countries. We should be cleverer in protecting valuable specimens, particularly in countries like Japan, where big earthquakes, tsunamis, and nuclear power station accidents could happen again in the future. Furthermore, I suggest that even museums can be the target of terrorism as actually happened in Egypt recently.