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NOTES AND COMMENTS

BBCI: A new initiative to document Chinese bumble bees for pollination research

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Since the 1990s there has been a growing concern worldwide for the survival of pollinators, including bumble bees, not least because of the implications for food security. This concern was formalized for the International Convention on Biodiversity in the *São Paulo Declaration on Pollinators*. A response to coordinate actions for pollinator protection was then organized in the *International Pollinator Initiative* (IPI). Among other aims, the IPI is calling as a priority for taxonomic information and for the monitoring of species distributions. The IPI has already resulted in regionally focused initiatives with identification products to aid pollination biologists in Africa and in the New World, and in Europe it is linked with major regional projects such as ALARM and STEP. As yet, however, there has been no regional initiative covering China.

Across China, declines in bumble bee populations are suspected in several parts of the country (reviewed in Williams and Osborne, 2009). This gives urgency to the taxonomic challenges, because the bumble bee fauna of China is especially rich on a global scale, with approximately 46% (at least 115 species) of all of the world's known bumble bee species believed to occur there (Williams *et al.*, 2009). Although China has a similar land area to the USA or to Europe, it has more than twice as many bumble bee species as the USA, and more than 50% more than Europe (Williams, 1998). High diversity is therefore not just a consequence of its geographic extent, but is associated with unusually high levels of endemism. Another indication of this exceptionally high number of unique species is that the rate of discovery of new bumble bee species has been greater recently for China than for any other region of the world (Williams, 1998). The magnitude of the taxonomic impediment is demonstrated by the only published list of the bumble bee species of China, published more than half a century ago (Wu, 1941), which shows only half as many species as are currently believed to occur there. The largest number of species is associated with the high mountains around the edge of the Tibetan plateau (the darkest areas of Fig. 1), and to a lesser extent with the northern border areas where there is overlap with the north temperate fauna.

There is now a new Chinese initiative to document the bumble bees of China, the "Bumble Bees of China Initiative" (BBCI). In Beijing, the Key Laboratory for Insect-Pollinator Biology (LIPB) of the Ministry of Agriculture is coordinating surveys of all Chinese bumble bees. The BBCI initiative, led by Associate Professor Jiandong An, has initiated a systematic survey across the provinces of China, joining in collaboration with other bee research groups, including those at the Institute of Zoology (Beijing), the Institute of Horticulture (Taiyuan), the Gansu Institute of Apiculture (Tianshui), the Yunnan Institute of Apiculture (Honghe), the Guandong Institute of Entomology (Guangzhou), the Fujian Agriculture and Forestry University (Fuzhou), and the Research Institute of Resource Insects (Kunming).

The first goal of the BBCI is a review of the bumble bees of North China, an area that traditionally covers the provinces of Neimenggu, Hebei, Beijing, Tianjin and Shanxi. The BBCI team have conducted regular field surveys in many counties of these provinces since 2005 (e.g. An *et al.*, 2008). Bumble bee specimens from these surveys have been pin-mounted for reference in a growing collection of voucher material at the LIPB. Collaboration outside China with the Natural History Museum, London, is another strength of this consortium, because it is helping with the identification of species by comparisons with the name bearing type specimens deposited in many collections around the world. Detailed information on the names, dates, elevations, and locations (using GPS technology) of the collection sites and on the species identifications is now being recorded by Huang Jiaxing in a database for the BBCI housed at LIPB. By the end of 2009, the database will exceed 10,000 geo-referenced specimen records, and two thirds of the species will have been DNA barcoded.

The aim of the BBCI is to develop some of the kinds of products recognized as priorities by the IPI. In the short term, it will

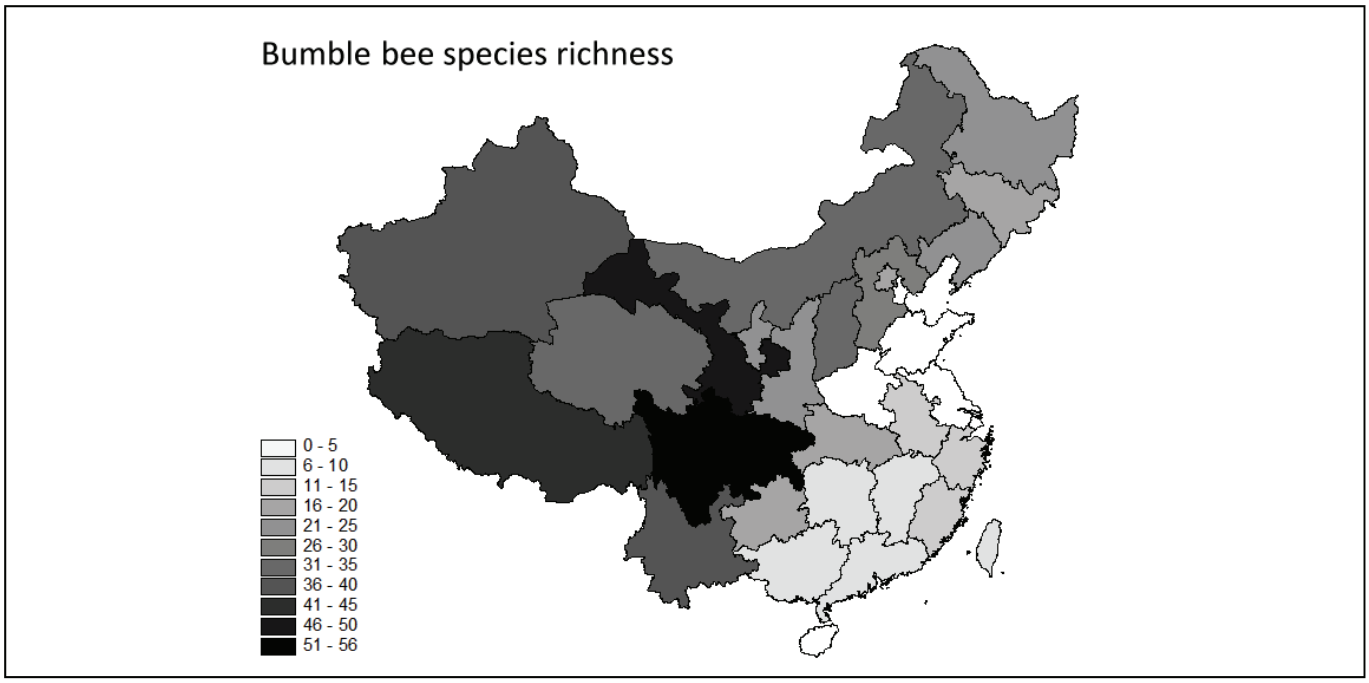

Fig. 1. Map of China showing current knowledge of the numbers of bumble bee species by province using a grey scale (shown to the left, unadjusted for differences in area extent among provinces). Based on recent BBCI surveys and museum specimens identified by PW.

deliver identification products aimed at conservation and bumble bee rearing needs, such as species lists and distribution maps for provinces and regions, to provide well documented baseline data. The team has selected six of the most effective bumble bee species from northern China, for rearing for use as cultivated pollinators in greenhouses, and has already succeeded in taking them though their entire life cycle in captivity. Other products of value to pollination biologists will be phenological activity plots, which could assist in climate change monitoring, and lists of food plants for the different bumble bee species. In the longer term, products for all users will include identification aids based on bee morphology and on DNA barcodes. Reliable species identifications are a fundamental requirement for almost all projects, because species names provide the essential links between the different kinds of information, both from the existing literature and from new research.

Reviewing the bumble bee fauna of China is a major challenge, because of the enormous size of the country, because of the large number of species, and because of the particular taxonomic problems posed by Asian bumble bee species with their extreme variability. We look forward to expanding the current joint studies to benefit a wider range of people by bringing together a broad range of skills. To match the current demand for information on these pollinators recognized by the IPI is beyond any one individual, so it will be essential that people work together in collaborative projects like the BBCI.

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