Bumblebee Specialist Group Report 2014

Edited by Paul Williams (Chair, UK) and Sarina Jepsen (Deputy Chair, USA)

BBSG IN 2014

The BBSG exists to foster the conservation of bumblebees (c. 250 species) and their habitats around the world. In this third report of the BBSG's activities, we see the BBSG now adding Red List assessments of bumblebee species for North America, and being poised to add assessments for other regions in the New World. For another year it is very encouraging to see such strong progress by our 77 volunteer members in many regions. The challenge is to move assessments forward in those regions that have fewer specialists and where access to some habitats may be difficult.

STATE OF BUMBLEBEE RED LISTING

The BBSG has been making significant progress towards our goal of evaluating the extinction risk of all c. 250 species of bumblebees worldwide using the IUCN Red List Criteria.

So far, global assessments of 25 bumblebee species have been published on the IUCN Red List (www.iucnredlist.org), including 12 species from Europe and 13 species from North America. In addition to the 12 European species for which global assessments have been completed, regional assessments for 55 additional species of bumblebees have been completed, considering their status and trends only within the EU.

In Europe, assessors found that approximately 1/3 of the European fauna faces some level of extinction risk, from Near Threatened to Critically Endangered.

In North America, assessments for the remaining 33 species of bumblebees have either been submitted to the IUCN Red List for publication, or are nearing completion. Preliminary results from the North American assessments have found that approximately 1/4 of the North American bumblebee fauna faces some level of extinction risk, from Near Threatened to Critically Endangered.

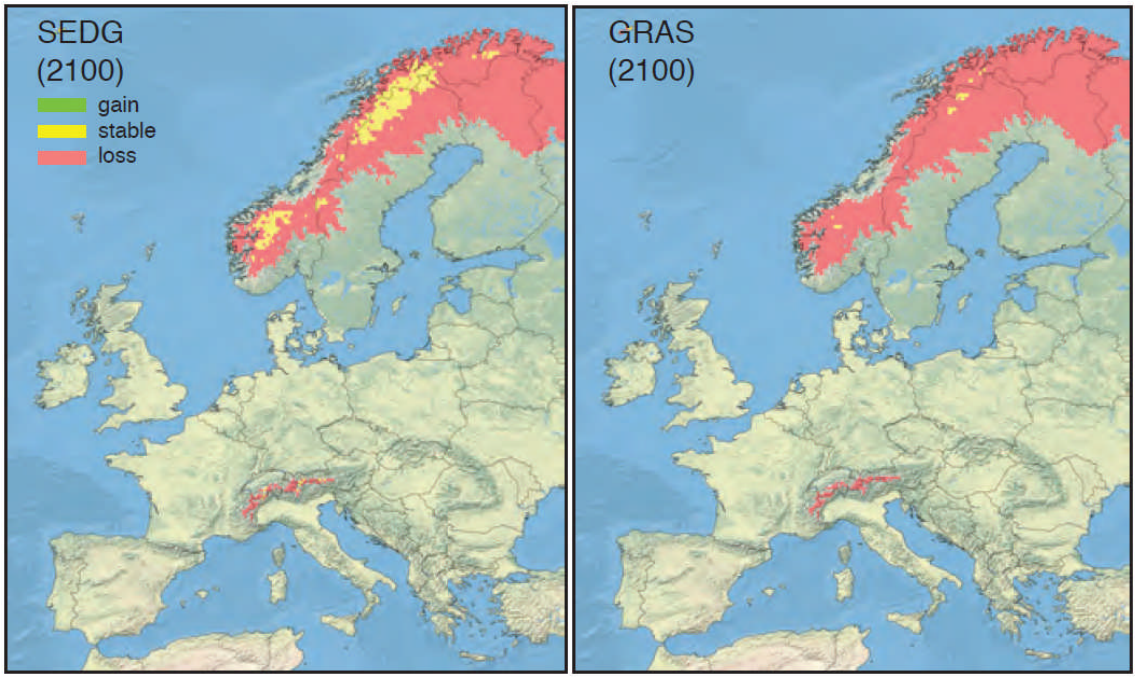
Draft assessments are in progress for the 11 species of bumblebees endemic to Mexico, and draft assessments have been completed for the 24 species that occur in South America.

Regional reports

EUROPE

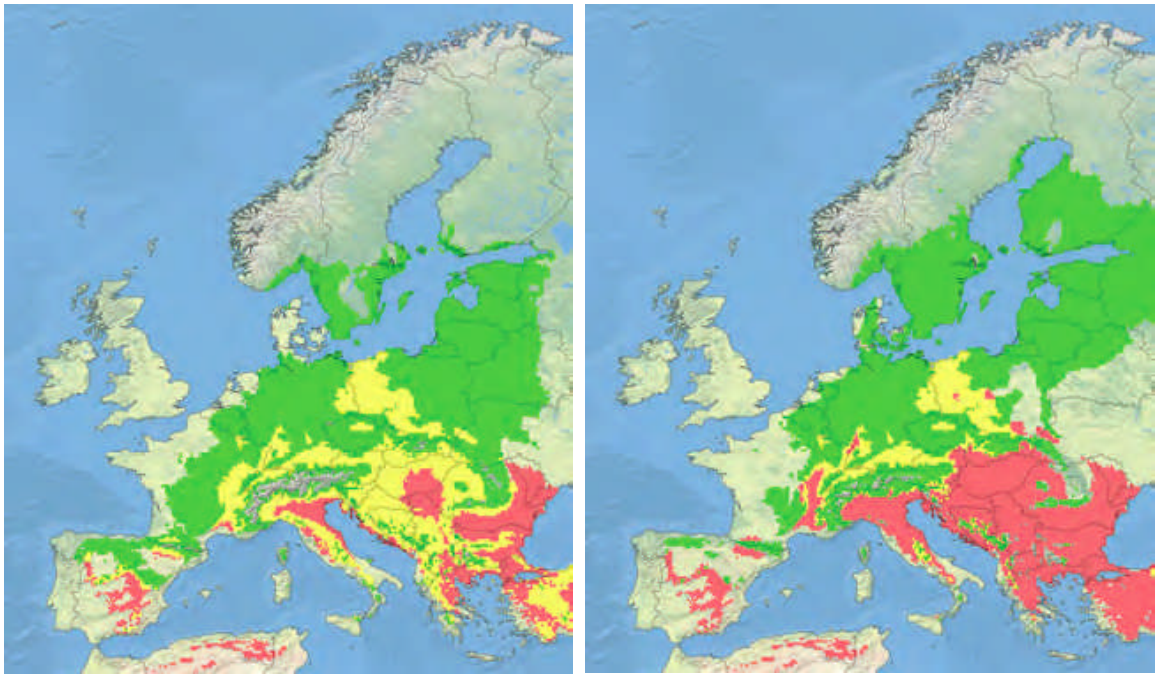
Pierre Rasmont / Stuart Roberts

Bombus polaris

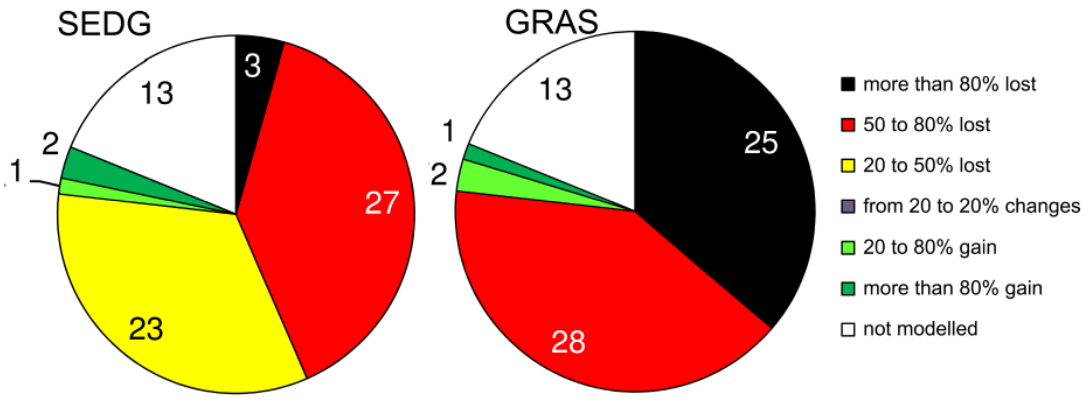


Changes in climatic niche distribution for *B. polaris* in Europe from the *Climatic Risk and Distribution Atlas*. Even the most optimistic scenario projects that the species will lose the largest part of its climatically suitable area, placing it at risk of extinction in Europe. Left: modelled from SEDG scenario, right: GRAS scenario.

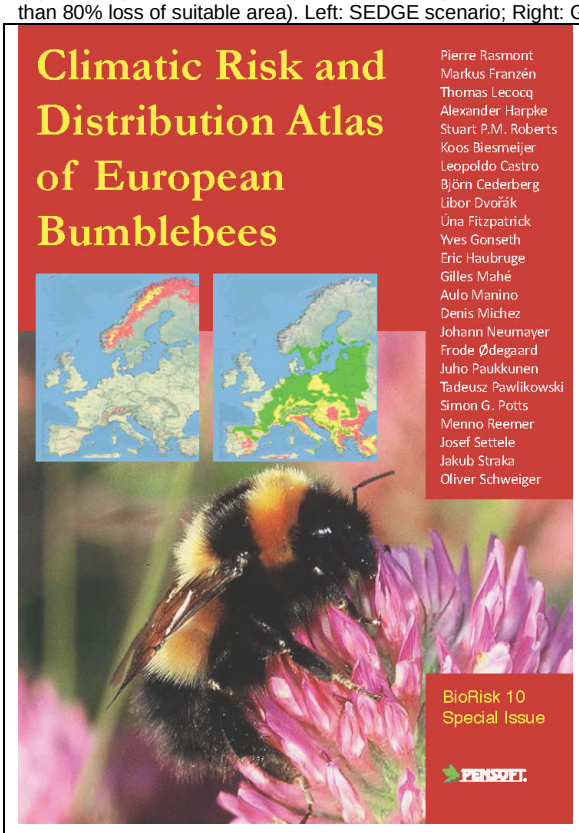
Bombus haematurus



Changes in climatic niche distribution for *B. haematurus* projects that the species will gain large areas in all cases. Only 3 bumblebee species would make such area gain. Left: modelled from SEDG scenario, right: GRAS scenario.



Severity of projected changes in 2100 for the 69 studied European bumblebee species. For 21 species we assumed full dispersal, for the remaining no dispersa. Thirteen species have not been assessed (white background). Dark green background indicates a large expansion (more than 80% gain in suitable area); light green indicate expansion (between 20 and 80% gain in suitable area); yellow background indicates regression (between 20 and 50% loss of suitable area); red background indicates strong regression (from 50 to 80% loss of suitable area); dark background indicates very strong regression with extinction risk (more than 80% loss of suitable area). Left: SEDGE scenario; Right: GRAS scenario..



http://www.pensoft.net/book/13021/climatic-risk-and-distribution-atlas-of-european-bumblebees

The European BBSG completed Red List assessments in 2013. In 2014, members of the BBSG Europe Group are part of a team who have published a book assessing the risks for bumblebees from climate change using over one million records from all over Europe. Based on data from 1970 to 2000 we modelled the current climatic niche for almost all European species (56 out of 69) and projected future climatically suitable conditions based on three climate change scenarios (SEDG, BAMBU and GRAS) for the years 2050 and 2100. Due to limited knowledge of actual bumblebee dispersal, we made two extreme assumptions: (i) species have full dispersal abilities (meaning that species are able to spread over all of its suitable area) or (ii) species are unable to disperse at all (i.e. that changes in climatic conditions can only lead to projected range retractions). However, to aid the assessment as to which of these two extreme assumptions are more likely to meet reality, we also provide a rough indication of the species' potential dispersal ability based on the ecology of the different bumblebees. The book includes up-to-date pin-pointed maps and photographs of all West-Palaearctic bumblebee species, including species from western Russia, Near-Orient (part of the BBSG West Asian region) and North-Africa.

NORTH AMERICA

Rich Hatfield / Sarina Jepsen / Sheila Colla / Robbin Thorp / Sarah Foltz-Jordan

Left: *B. borealis*, right: *B. terricola*. (Photos V. MacPhail.)

The BBSG regional group for North America has been busy finalizing assessments for 45 species, entering biological information and knowledge about known and suspected threats for each species into the SIS database, and submitting the assessments to the IUCN for review. The *Xerces Society for Invertebrate Conservation and Wildlife Preservation* Canada have supported the input and updating of the information compiled by the North American group. At this point 13 species have been published on the IUCN Red List, and another 19 species have been reviewed by the IUCN and are in the final stages of editing before publication. We anticipate submitting an additional 2 species to the IUCN in the next few weeks, so that by mid-2015 most North American bumble bees will have assessments published on the IUCN Red List. There are several species for which assessments have been delayed because of cross-continental distributions, or taxonomic questions. We hope to complete those global assessments, in coordination with other BBSG regional groups in 2015. In some cases, the outcome for these species might be Data Deficient.

An overview of the North American fauna suggests that the status of bumble bees in North America is very similar to the results seen for the European fauna, with more than 1/4 of them facing some degree of extinction risk. Some of these assessments are still pending review by the IUCN, but preliminary results suggest that 5 North American species are Critically Endangered, 2 species are Endangered, 5 species are Vulnerable, 1 species is Near Threatened, 28 species are Least Concern, and 5 species will be listed as Data Deficient. Of particular note is that species in the subgenus *Psithyrus* seem to be experiencing dramatic declines and make up three of our five Critically Endangered species.

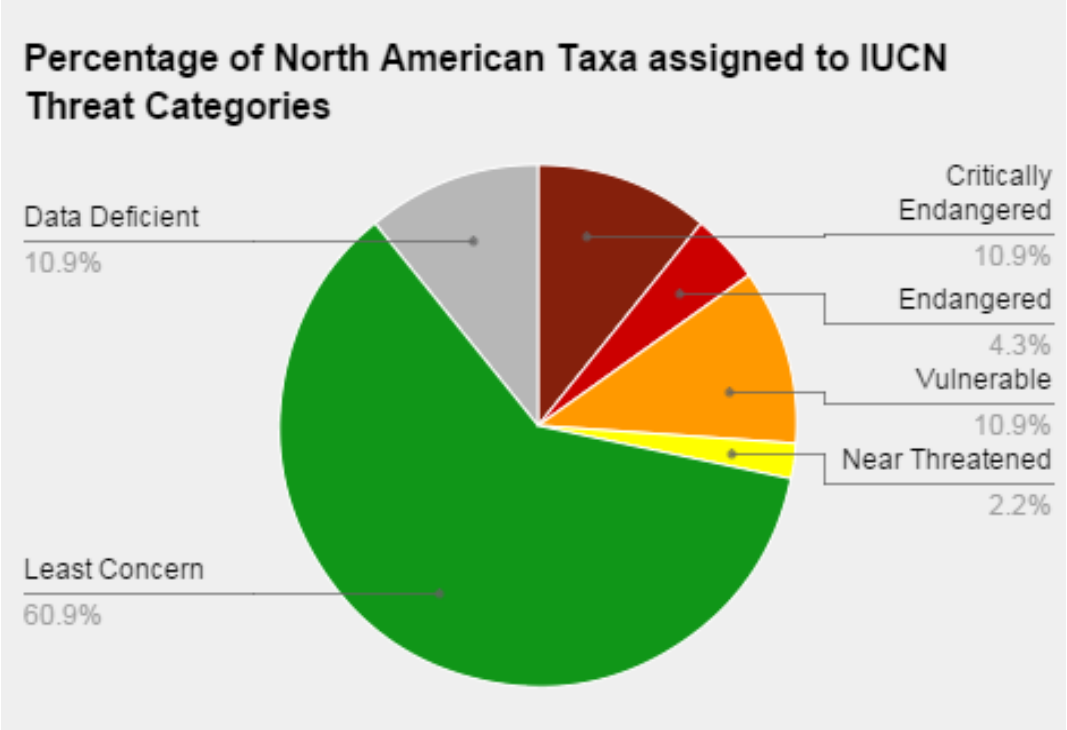


Figure compiled by Rich Hatfield.

MESOAMERICA

Remy Vandame

Bombus weisi at Cerro El Zamorano, Querétaro. (Photo Jorge Mérida.)

For the Mesoamerica regional group, 2014 has been the last year of field sampling and compiling historical data from US collections. The database now includes more than 20,000 data, which allows us to start the formal Red List process, which should be completed for at least half the species of the region during 2015.

In April 2015, the *IX Mesoamerican Congress on Native Bees* (www.ecosur.mx/abejas) will be held in Chiapas, which will be a great opportunity for all of the Mesoamerican group to meet, but we hope also to meet some key members of the regional groups for North America and South America. A workshop will allow us to share advances and improve the Red List work of the three groups.

In parallel, studies of genetic patterns and disease performed on the samples collected recently should give information on the state of native bumblebees, and thus feed into a discussion on the regulation of the use of exotic and native bumblebees within the region.

SOUTH AMERICA

Carolina Morales

Bombus bellicosus in Sierras de Córdoba, central Argentina. This species has declined strongly in the NE portion of its distribution (South Brazil) according to Martins *et al.* (2014). (Photo Carolina Morales.)

We made great progress in 2014 towards our aim to assess all of the bumblebee species occurring in South America for the IUCN Red List. During 2013 the first draft versions of the assessments for all of the South American species (total 24) have been completed by volunteer assessors (Claus Rassmusen, Aline Martins, and Carolina Morales, with the assistance of Yamila Sasal). After that first but huge step, the second step was to compile and facilitate all of these draft assessments. This work was carried out by Nieves García and Neil Cox (IUCN) during part of 2013 and completed by early 2014. In March 2014 all of the draft assessments were submitted to the Xerces Society for external review, which was completed in December 2014 by Rich Hatfield, Sarah Foltz Jordan, and Sarina Jepsen. The draft assessments were greatly improved during this facilitation/compilation and review process. In particular, comments and inputs by Nieves, Neil and Rich were of great help. Now, by suggestion of the reviewers, the drafts have been sent back to the assessors, to address the comments, questions and proposed changes. In particular, we discussed the problem of dealing with lack of information and the difficulty of adjusting the available data to comply with the type of information required for IUCN standard Red List assessments. Therefore assessors were asked to try to find out if additional justification may be available for some of these species. Many South American species had been assigned to the category of Least Concern, but in the absence of quantitative or qualitative information about trends and given that many of these species are considered rare or scarce, reviewers suggested changing their status to Data Deficient. Three species for which additional relevant information was published during 2014 were Bombus rubiventris (Williams, 2014), Bombus bellicosus (Martins et al., 2014), and Bombus dahlbomii (Schmid-Hempel et al., 2014). We expect to be able to more accurately define their extinction risk status in the short term. Finally, we expect that after the assessors have addressed the proposed changes, and when these have been approved by the corresponding authority, we can submit the assessments for consideration for publication in the IUCN Red List.

References

Martins AC, Silva DP, De Marco Jr P, Melo GA (2014) Species conservation under future climate change: the case of *Bombus bellicosus*, a potentially threatened South American bumblebee species. *Journal of Insect Conservation*, 1-11.

Schmid-Hempel R, Eckhardt M, Goulson D, Heinzmann D, Lange C, Plischuk S, ... Schmid-Hempel P (2014) The invasion of southern South America by imported bumblebees and associated parasites. *Journal of Animal Ecology*.

Williams PH (2014) *Bombus rubriventris*: type locality, different histories of bumblebees in the New World, and a likely invertebrate extinction. *Journal of Natural History*, (ahead-of-print), 1-13.

NORTH ASIA

Alexandr Byvaltsev / Vladimir Molodtsov

Left: *B. hypnorum*, right: *B. cryptarum*, both queens on *Salix* (an important spring forage source) at the Novosibirsk Arboretum. (Photos Alexandr Byvaltsev.)

Bumblebees are some of the most well known insects. Although there are representative data for the distributions of species in Europe (Rasmont, Iserbyt, 2010-2013) and North America (Koch et *al*., 2012; Wiliams *et al*., 2014), these are not yet available for Asia. Russia is the largest country in the World and the Asian part includes about 13.1 million km² (approximately 77 % of the territory). Until now we have no clear data about how many species occur in Russia or what their ranges and regional abundances may be. Without this information we cannot do a good job for conserving these bees. Our aim is to summarize available information on the bumblebee fauna of Russia and the distribution of species across this territory. To do this, we need to solve the following problems:

1. Make an inventory of the bumblebee fauna of Russia from collections and literature.
2. Solve taxonomic and nomenclatural problems, using modern molecular genetic methods where appropriate.
3. Create an illustrated catalog of all known bumblebee taxa for the country.
4. Map species ranges.
5. Evaluate the diversity of bumblebees by region and analyze faunal distribution across the country.
6. Identify the particularly vulnerable taxa.
7. Create an annotated species list of the bumblebees of Russia.
8. Create a complete bibliographic database with full-text files of publications (in cases where this does not violate copyright).

So far we have achieved:

1. An inventory of the specimens in the collections of the Zoological Institute (St. Petersburg) and of some universities and private collections. A preliminary list of 90 species has been completed.

2. The label data are recorded and georeferenced to coordinates for 52 taxa.
3. Digital maps have been created for 14 taxa.
4. Digital images of most type material from Russia have been obtained and are now being processed.
5. A database of species abundance by frequency of records now includes data for the forest-steppe and steppe zones of the West-Siberian Plain, Moscow, Tomsk and Kemerovo Oblast', The Republic of Khakassia, and for the region around Surgut.
5. A web application has been developed for the registration and display of records, as well as for concomitant information, for both species and other taxonomic units.

We hope to put all of this into our web-site "Шмели России" (www.bombus.nsu.ru). At present the site is running in test mode in Russian, but you can look for the mostly completed maps and the account of *B. confusus* (separately for *confusus s. str.* and for *paradoxus* Dalla Torre, 1882) and *B. fragrans* (Pallas, 1771). Site functionality provides the ability to display on one map from 1 to 3 taxa simultaneously. For a general account please choose the option "Списки видов", and for maps "Географическое распространение", from the site menu. If you choose more than one taxon when mapping distributions, these will be shown using different symbols. Three time periods are allocated for the collection data - before 1950, 1951-2000, and from 2001 to the present, and these are shown using different colours on the map.

Any data on the occurrence of bumblebees in Russia are welcomed.

References

Koch J, Strange J, Williams P (2012) *Bumble bees of the western United States.* USFS and The Pollinator Partnership. 144 pp.
Rasmont P, Iserbyt I (2010-2013) *Atlas of the European Bees: genus* Bombus. 3d Edition. STEP Project, Atlas Hymenoptera, Mons, Gembloux. www.zoologie.umh.ac.be/hymenoptera/page.asp?ID=169
Williams PH, Thorp RW, Richardson LL, Colla SR (2014) *Bumble bees of North America. An identification guide*. Princeton University Press. 208 pp.

WEST ASIA

Murat Aytekin / Alireza Monfared

BBSG work and surveys in Turkey and surrounding countries in 2014 continued with the help of PhD and MSc students. Unfortunately the problems in Syria and Iraq meant that no new data were received from those countries. A very good Syrian student completely disappeared and contact was lost after 2013. On the other hand, new students began to take an interest in bumblebees in Pakistan and Georgia, so we look forward to new data from these countries. From Georgia, Dr George Japoshvili was accepted as a member for the COST action SUPER-B project. For the same action, Prof. Murat Aytekin was elected as the Short Time Mission Coordinator. In addition, Turkey and Azerbaijan made a new contract for joint research between bee laboratories. The First Iranian International Congress of Entomology will be held in Tehran in August (for more information, please see the website http://iice.ut.ac.ir/). This congress will be very interesting for bumblebee researchers.

Two big projects in the Aytekin laboratory continue. One project is on the identification of bumblebee venom using proteomic methods and Fourier transform infrared spectroscopy (FT-IR). It has provided very informative and interesting data for systematics. The other project focuses on pollination studies in open field safflower (*Carthamus tinctorius* L.). No other students or universities have published papers on bumblebees in Turkey in 2014 other than from this lab.

During spring and summer of 2014, Dr Alireza Monfared continued to survey new localities for bumblebees in Iran. After several years of sampling, his group found the first three specimens of *Bombus (Psithyrus) rupestris* from Qazvin, Moalem kelayeh, Verk. His group has also been researching what appears to be a previously undocumented phenomenon, in which irrigation of fields appears to have caused workers and queens of *Bombus (Thoracobombus) sylvarum* to abandon their nests and relocate.

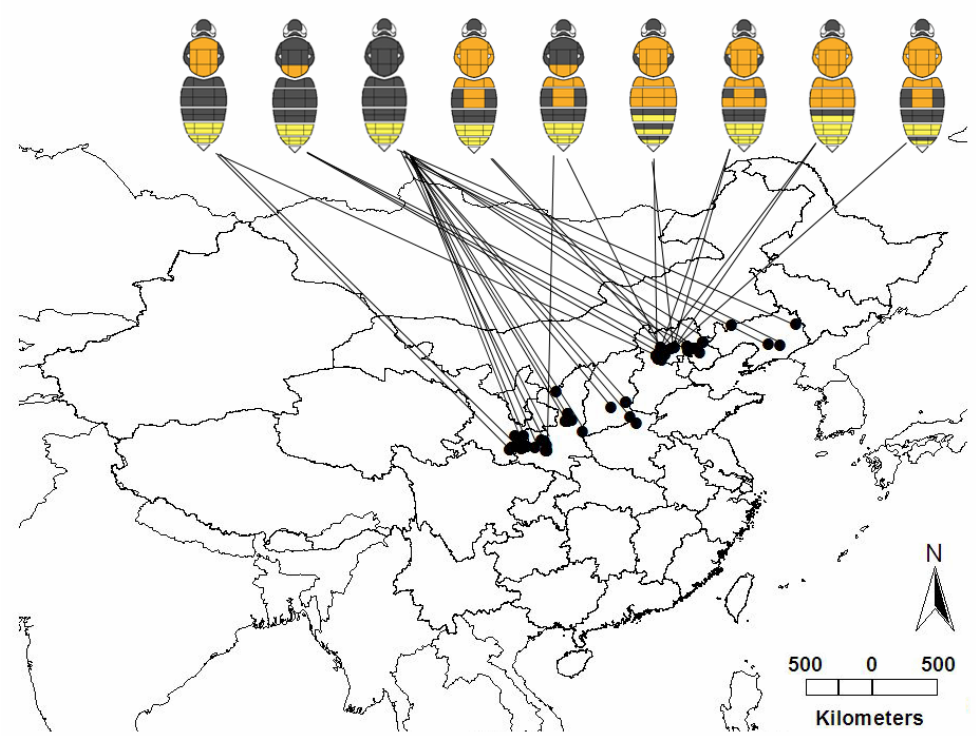
Bombus sylvarum workers and queen (white-banded colour pattern) with larvae of *Volucella bombylans* from a hole in a field at Ardabil-Meskhinshahr-Moeil, Iran.

EAST ASIA

An Jiandong / Huang Jiaxing / Paul Williams

Map of North China showing the principal geomorphological structures (numbered in white), 1: the Qilian mountains; 2: the east Qinghai-Tibetan plateau; 3: the Qin-Ba mountains; 4: the Loess plateau; 5 the Hebei plain; 6: the Taihang mountains; 7: the Yanshan mountains; 8 the Great Khingan mountains; 9: the Otindag semi-desert; 10: the Mu Su semi-desert; 11: the Tengger desert; 12: the Badain Jaran desert; 13: the dry Beishan mountains. (An *et al*., 2014.)

2014 has been a productive year for the East Asia group in China as we move towards being able to Red List assess this large fauna. China has a similar land area to the USA or Europe, but with about half the world's bumblebee species. Especially significant this year has been the publication of a review of the bumblebee fauna of North China (above) – with 77 species, covering nearly a third of the world's bumblebee fauna, and a poorly known third with no previous complete faunal treatment (An *et al*., 2014). This review was based on a new survey with 21,636 geo-referenced and individually databased specimens.



Principal dorsal colour patterns of female *B. koreanus* in China – previously only the extensively black unbanded colour pattern (third from left) was known. The species also has a narrow distribution with the darkest colour pattern in Korea. (Huang *et al*., 2014)

Faunal treatments have to be based on reliable taxonomy, so we have also been looking into revising several groups of bumblebees with problematic species complexes within China. Jiaxing Huang has been making progress with a PhD encompassing the subgenus *Megabombus*, beginning with an analysis of colour variation in *Bombus koreanus*, including many previously unknown colour patterns (above; Huang *et al*., 2014).

Continuing work on the extreme high elevation subgenus *Mendacibombus* received a boost when Zhengying Miao discovered *Bombus superbus* at over 5200 m in the Tanggula mountains of central Tibet (Williams *et al*., 2014). This is one of the world's oldest and rarest bumblebee species, previously known from just five individuals.

References

An J-D, Huang J-X, Shao Y-Q, Zhang S-W, Wang B, Liu X-Y, Wu J, Williams PH (2014) The bumblebees of North China (Apidae, *Bombus* Latreille). *Zootaxa* 3830: 1-89.

Huang J-X, Wu J, An J-D, Williams PH (2014) Newly discovered colour-pattern polymorphism of *Bombus koreanus* females (Hymenoptera: Apidae) demonstrated by DNA barcoding. *Apidologie*.

Williams PH, Huang J-X, An J-D (2014) One of the oldest and rarest bumblebees rediscovered. *Buzzword* 26: 5.

BBSG IN 2015

We are now making good progress with species assessments in many regions of the world. This is a good time to share experiences on how best to overcome problems in applying IUCN Red List criteria to bumblebee data. In April 2015, the *IX Mesoamerican Congress on Native Bees* (www.ecosur.mx/abejas) will be held in Chiapas and will host a BBSG workshop for the New World regional groups. Not only will this be a great opportunity for all of the Mesoamerican group to meet, but also we hope to have an opportunity for some key members of the regional groups for North America and South America to meet. Thanks to support from IUCN and The Xerces Society, this workshop will allow us to share advances and improve the assessment work of the regional groups. As ever, let us know what you need and we will try to find a way to help.

London 7 March 2015