Bumblebee Specialist Group Report 2020

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

BBSG IN 2020

The BBSG exists to foster the conservation of bumblebees and their habitats around the world. In this eighth report of the BBSG's activities, 2020 has been an unusual year complicated by the pandemic. But despite the difficulties, there has been progress towards our goal of evaluating the extinction risk of all *ca* 265 species of bumblebees worldwide using the IUCN Red List Criteria.

THE BBSG AND THE NEW *WILD BEE SPECIALIST GROUP* (WBSG) IN 2021

Paul Williams

The BBSG is commissioned by the IUCN Species Survival Commission (SSC), with responsibilities centred around the Red List assessment of all bumblebees world-wide (*ca* 265 species). It has been running for two IUCN quadrennia (eight years) and has completed the first assessments for most of the species of the New World and Europe. These assessments have greatly advanced conservation action by focusing on these species, allowing the most imperiled species to be listed on national, state, and local lists, with resulting projects on restoring and managing their habitats. However, Asia, with many more species and fewer specialists, remains more of a challenge, although surveys to map species distributions are now under way in the larger countries, which are compiling growing data bases of information on their bumblebees.

During 2020 a growing need was recognised by the SSC for providing information on threats and conservation for all wild bees (*ca* 20,000 species), not just bumblebees. The SSC proposed for its *Species Strategic Plan Framework* for the next quadrennium that it would commission a more inclusive **Wild Bee Specialist Group** (WBSG), to cover all bees. The WBSG will retain the BBSG as a subgroup within the WBSG, with Paul Williams as Deputy Chair for bumblebees and Sarina Jepsen as Deputy Chair for conservation. With the new, greatly broadened responsibilities, leadership of the WBSG for the next quadrennium will be held jointly by Prof. Simon Potts (University of Reading, UK) and Dr Rémy Vandame (ECOSUR, Mexico) as Co-Chairs. Oscar Martinez and Rich Hatfield will serve as Red List Authorities for this new group.

Rémy has also agreed to continue as the BBSG Regional Coordinator for Mesoamerica. In the Himalaya, Prof. Malkiat Saini is succeeded by Dr Rifat Raina as BBSG Regional Coordinator. We thank Prof. Saini for all his work and look forward to working with Dr Raina. With this re-structuring at the end of the second quadrennium, we have an opportunity if any Regional Coordinators feel that they would like to encourage someone new in their role. We are all immensely grateful for the time and effort that people contribute.

The formation of the WBSG is an exciting new opportunity to achieve more for the conservation of all bees world-wide. Sarina and I very much hope that BBSG members will not only continue to contribute to the work on bumblebees but will also help to make a difference for the conservation of all other wild bees as well.

One of the most northerly distributed of all arctic bumblebees, B. pyrrhopygus. (Photo by G. Holmström.)

UPDATE ON SOME OF THE WORLD'S MOST THREATENED BUMBLEBEES

Paul Williams

Just over a decade ago, in a short review paper with Prof. Juliet Osborne on bumblebee vulnerability and conservation world-wide, I included a table (Table I) that attempted to list the most threatened bumblebee species world-wide (Williams & Osborne 2009). These assessments were only very preliminary and informal, based on collections that were then known to me. Progress with formal Red List assessment for all bumblebee species world-wide since then was reviewed in last year's BBSG report (Williams & Jepsen 2020).

However, the 2009 list did offer comments on some very poorly known species, especially from Asia, that are of particular interest because these species have yet to be assessed. The little information that is available has not yet been published in one place. Now, more than a decade later, and with a great deal of survey effort having been invested in reaching many sites that are difficult to access, it is worth re-visiting this list to see how our understanding has changed. These changes in perceived status must be considered to be the consequences of improving knowledge of their status rather than of true changes in threat status. The species are included here in the order in which they were originally listed and under the threat classification headings that were given in 2009, with revisions where available.

'EXTINCT'

Bombus (Thoracobombus) ***rubriventris*** and *B. (Megabombus)* ***melanopoda*** were believed to be extinct. Unfortunately there have been no further records of either of these species. More work has been done to elucidate what is known about the enigmatic *B. rubriventris* (Williams, 2015), although there has been no further information on *B. melanopoda* since Williams (1998). *Bombus rubriventris,* known only from the single holotype specimen of uncertain origin, has been formally assessed as critically endangered (Sasal 2016). *Bombus melanopoda* has not been formally assessed.

Bombus rubriventris is a morphologically distinctive species – the only known specimen was collected at least 180 years ago, possibly from the Brazilian Atlantic Forest (Williams 2015). It may now be extinct. (Photo by NHM.)

'CRITICALLY ENDANGERED'

Bombus (Bombus) ***franklini*** had been formally assessed with the status critically endangered (Kevan 2008), although it has not been seen since 2006 (S. Colla, L. Richardson, pers. com.) and may now be extinct. *Bombus (Bo.)* ***affinis*** was also interpreted in 2009 as being critically endangered and has subsequently been formally assessed with the same status (Hatfield *et al*. 2015).

‘ENDANGERED’
Bombus (Bo.) ***terricola*** was listed as including the taxon ***occidentalis***, although this was later recognised from molecular evidence as a separate species (Williams, Brown *et al*. 2012). Subsequently both *B. terricola* and *B. occidentalis* have been assessed as vulnerable (Hatfield *et al*. 2015).

‘VULNERABLE’
Bombus (Bombias) ***confusus***, *B. (Cullumanobombus)* ***cullumanus***, and *B. (Subterraneobombus)* ***fragrans*** have been assessed only for Europe, where they are classed as vulnerable, critically endangered, and endangered respectively (Rasmont *et al*. 2015). All three species extend into Asia where they may be locally more common: for *B. confusus* and *B. fragrans* in Central Asia north of the Central Asian deserts (Williams *et al*. 2011), whereas *B. cullumanus* is sometimes still one of the most abundant species in Siberia (Williams, Byvaltsev *et al*. 2012).

Bombus (Alpigenobombus) ***genalis*** has been seen in small numbers at several sites in south-eastern Tibet (Williams *et al*. 2017) and in the eastern Himalaya (Streinzer *et al*. 2019). *Bombus (Mg.)* ***irisanensis*** has been found in small numbers on several occasions in the Philippines.

‘NEAR THREATENED’
For most of the European or East-European endemics listed in the 2009 table, formal or informal assessments (Rasmont *et al*. 2015) have now been made: *B. (Mg.)* ***gerstaeckeri*** (vulnerable); *B. (Th.)* ***inexspectatus*** (endangered); *B. (Th.)* ***mucidus*** (least concern); *B. (Th.)* ***pomorum*** (vulnerable); *B. (Sibiricobombus)* ***sulfureus*** (not evaluated: rare in Turkey and neighbouring countries); and *B. (Th.)* ***velox*** (not evaluated: rare in Turkey). See the comments later in this report on the European fauna for further updates.

Formal assessments have been made for the Mesoamerican endemics: *B. (Cu.)* ***haueri*** (endangered: Martinez Lopez *et al*. 2015); *B. (Cu.)* ***macgregori*** (least concern: Escobedo-Kenefic 2015); and *B. (Th.)* ***trinominatus*** (least concern: Martinez Lopez & Vandame 2015).

The Asian species have yet to be assessed: *B. (Pyrobombus)* ***abnormis*** has been recorded again in the eastern Himalaya but remains rare (Streinzer *et al*. 2019); *B. (Ag.)* ***angustus*** has not been recorded again on Taiwan; *B. (Orientalibombus)* ***braccatus*** has now been recorded not only more widely within Sichuan but also from several neighbouring provinces in China (Williams *et al*. 2017); *B. (Mendacibombus)* ***makarjini*** is difficult to identify reliably but has been recorded again in Central Asia (especially from Kyrgyzstan), where it appears to be genuinely rare (Williams *et al*. 2016); *B. (Psithyrus)* ***monozonus*** has not been recorded again on Taiwan; *B. (Pr.)* ***mirus*** has been recorded again in the eastern Himalaya where it appears to be locally common (Streinzer *et al*. 2019); and *B. (Melanobombus)* ***simillimus*** is still locally common in the western Himalaya (Williams *et al*. 2020).

Bombus (Th.) ***atripes*** has been widely recorded in Central China (Williams *et al*. 2017) and *B. (Bo.)* ***sporadicus*** in Europe has been assessed as being of least concern (Rasmont *et al*. 2015).

What is urgently needed now is to extend the surveys to map the distributions of the half of the world's bumblebee species in Asia, especially in China, the Himalaya, and Central Asia. A programme to revise Asian bumblebees is underway.

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EUROPE

Approximately 66-70 species have been recognised in Europe recently, depending on the species concept accepted. Within Europe, distributions are relatively well recorded and databased, so that baseline data are available (by arrangement) for comparison in the future.

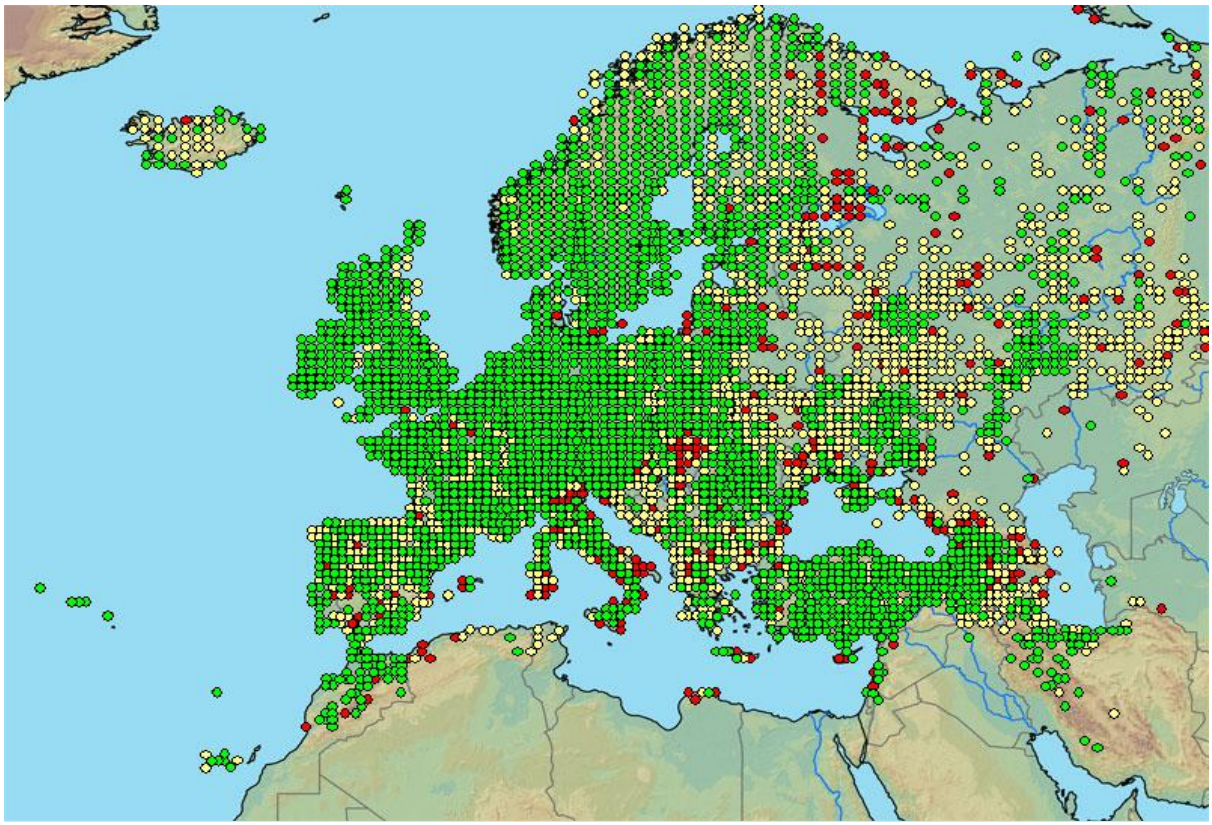
European Region in 2020

Guillaume Ghisbain / Pierre Rasmont

Data records for the bumblebees of the West-Palearctic region

In the framework of a complete renewal of the webpage of the *Atlas of European bumblebees* (http://www.atlashymenoptera.net/page.aspx?id=169), a completely updated version of the displayed data has been uploaded by the authors (gathering a total of 1,378,902 data records) (figure below). Significant improvement has been made by integrating large amounts of data from Central and Eastern Europe that were lacking in the latest *Atlas of European bumblebees* (Rasmont *et al*. 2015).

New important data have recently come from Novaya Zemlya (Potapov *et al*. 2019), Morocco (Lhomme *et al*. 2020) and Lebanon (Boustani *et al*. 2020). An important new feature allowing to download map datasets is now available on the website Atlas Hymenoptera. Please notice that the website is in a transitional situation. Most problems should be addressed by the spring 2021 with a completely renewed *Bombus* page.



Compiled bumblebee data for the West-Palaearctic region (January 2021; 1,378,902 data records). Yellow (from 1950 to 1990) and red dots (before 1950) are places where recent data is missing.

There are several bumblebee species for which recent data remain especially scarce:

B. caucasicus (possibly conspecific with ***B. eriophorus***): mountains of the Caucasus. The last record of the taxon *eriophorus s. str.* (below) is from 1953, and the last expeditions in the Caucasus failed to find it (see Williams *et al*. 2020 for a more complete discussion on the topic).

A queen of B. eriophorus (dorsal view), which may be conspecific with B. caucasicus (Williams et al. 2020). Russia, central Caucasus, Beshtau, 1915, Zoological Museum, Saint-Peterbourg. (Photo P. Rasmont)

B. confusus: the species has vanished from a large part of its original range and is completely extinct in many countries. The red-tipped subspecies (*B. confusus confusus*) can still be found locally but the yellow-banded subspecies (*B. confusus paradoxus*) has not been found in Europe for decades. The species still seems to exist in Eastern Europe, and any verified observations or collects are welcome.

B. cullumanus: last European observation in the Pyrenees in July 2009. Given the possible extinction of this taxon in Europe and resemblance to many other bumblebee species of the region, any identification should be double-checked by a specialist and be published.

B. fragrans: the largest European bumblebee seems to be in regression in part of its original range. It could originally be found in the steppes of eastern Austria, Hungary, Romania, Ukraine, Russia, Turkey and Iran. This species can generally be well identified with pictures, and any new observations are welcome.

B. konradini: this species, endemic to the Central Apennines (Italy), has only recently been recognised with species status. More data on its biology and distribution are needed. Any good-quality picture of this colourful high-altitude species is also welcome.

B. laesus (including the black dotted taxon *mocsaryi*): another steppe species for which recent data is very scarce. The most recent observations have been from the high altitudes of the Moroccan Atlas. Can be found in Spain, South of France, steppes of Eastern Europe and the Middle-East.

B. modestus: a small species, typical of the Siberian taiga. In Europe, *B. modestus* can be found in a few locations between Moscow and the Ural, within the boreal forest. Any verified observations or collects from these places are welcome.

B. patagiatus: although this species can be quite common locally in the boreal taiga of Russia, data for the western part of its range remain scarce. In Europe, any observation close to the Finnish border (near Lake Ladoga) is most welcome.

B. polaris pyrrhopygus (*B. pyrrhopygus* could also be considered as a species separate from the Nearctic *B. polaris* depending on the species concept used for taxonomic delineation): the species has vanished in many areas of Scandinavia and northern Russia. Any identification of the species must be confirmed by a specialist, as the species is very similar to the more common *B. alpinus*.

B. pomorum: the species has drastically declined from most of its historical locations in Central Europe. Any verified observations are welcome.

B. ruderarius tunensis: last record from North Africa in 1979. Observations from Tunisia and Algeria would be much appreciated.

B. saltuarius: the last observation of this species was in 1992 near Vorkuta (Ural). New observations and collects from this area would be much appreciated.

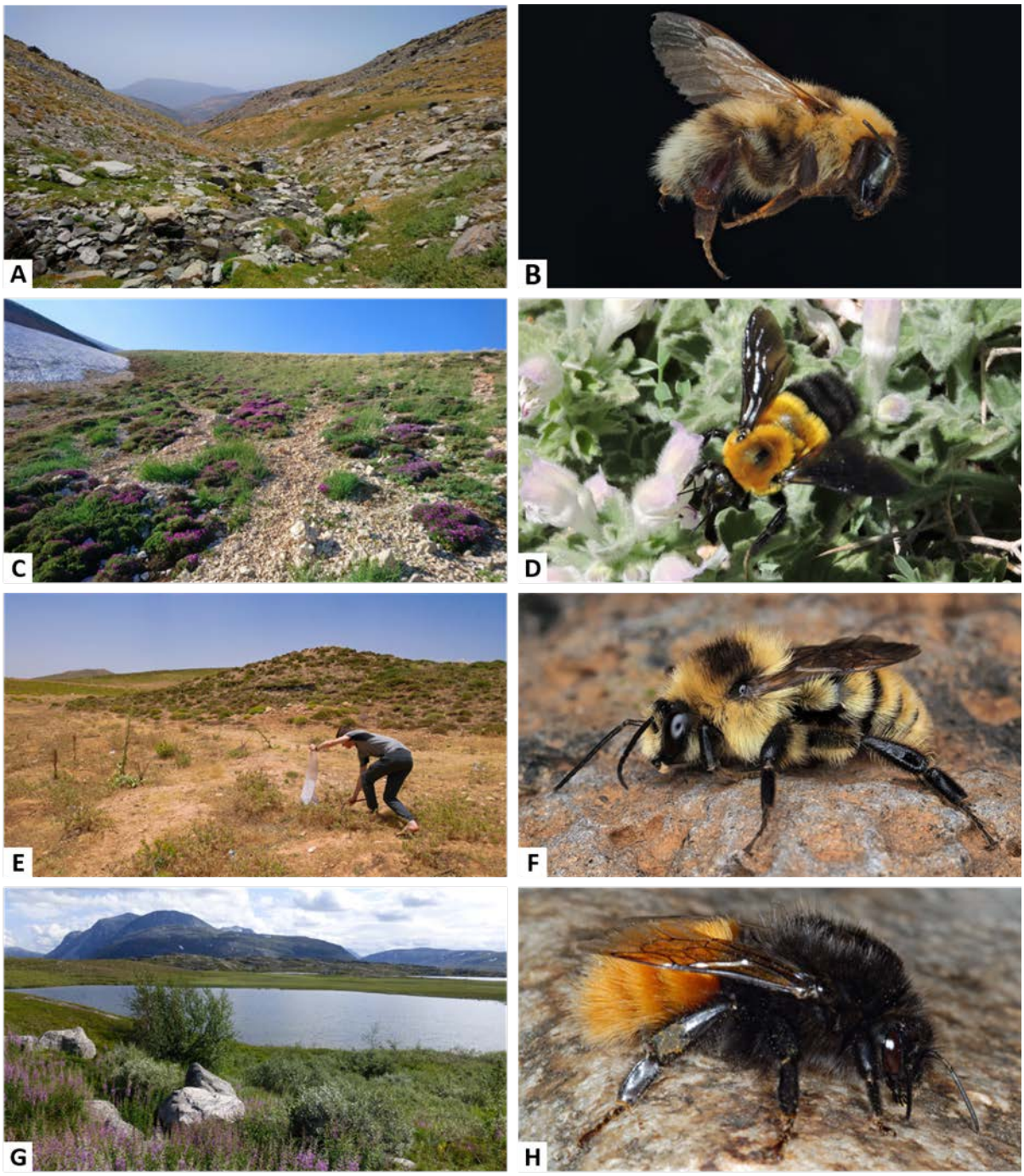
Some species continue to expand in Europe: *B. argillaceus* (could be expected in Germany soon), *B. haematurus* (now in Italy: Biella *et al*. 2020a,b), *B. hypnorum*, *B. niveatus vorticosus*, *B. schrencki* (could be expected in Germany soon), and *B. semenoviellus* (now widespread in Poland, Michołap *et al.* 2020). New occurrence data for any country should be published to track their range expansion.

Taxonomy of the West-Palearctic bumblebees

a. Taxonomic revisions

Within the subgenus *Thoracobombus,* the species status of several bumblebee species and subspecies have been confirmed: *B. inexspectatus* (one of the rarest bumblebees of Europe), *B. mlokosievitzii*, *B. ruderarius* (including the well differentiated subspecies *simulatilis* from the Middle-East), *B. sylvarum* (including the phenotypically differentiated subspecies *daghestanicus* from the Middle-East), *B. velox* and *B. veteranus* (Brasero *et al.* 2020).

The global revision of the subgenus *Melanobombus* by Williams *et al*. (2020) confirmed the species statuses of *B. alagesianus, B. incertus, B. lapidarius* and *B. sichelii.*



Recent sampling in the Spanish Sierra Nevada (A) allowed the collect of the endangered Reinig's bumblebee (taxon reinigiellus, B) for taxonomic assessment. Sampling in Lebanon (C) allowed the observation of the high-altitude B. melanurus (D). Sampling in the High Atlas in Morocco (E) allowed the collect and taxonomic assessment of B. laesus aliceae (F). Sampling in north Norway (Narvik) and north Sweden (Kiruna) (G) allowed the observation of many bumblebee species, including B. alpinus (H). (Photo credit for A, C: Guillaume Ghisbain; D: Mira Boustani; B, E, F, G, H: Pierre Rasmont.)

b. Taxonomic issues
The taxon *bisiculus* is either considered as a valid species (Lecocq *et al*. 2019) or as part of the widespread *B. lapidarius* (Williams *et al*. 2020).

The taxon *eriophorus s. str.* (figure above) has been recently suggested to be conspecific with the taxon *caucasicus* (Williams *et al*. 2020) on the basis of morphology only. Further work is ongoing to test this hypothesis.

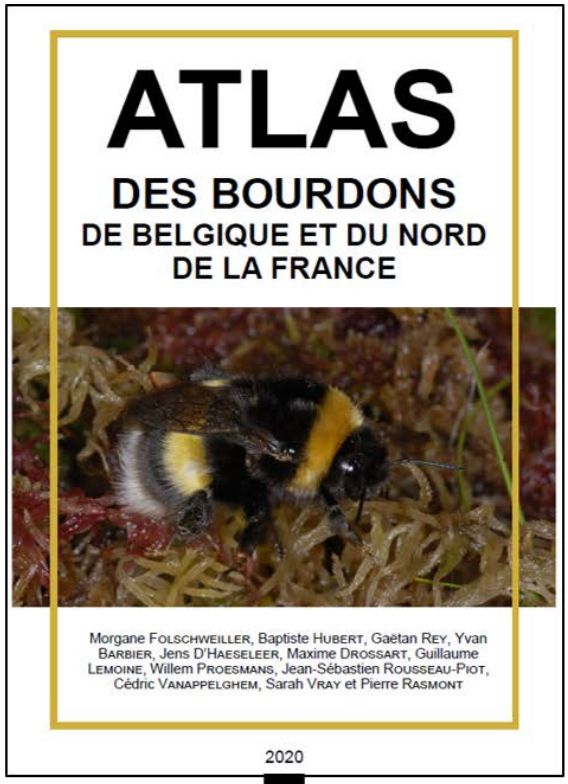
Global change and conservation
a. Bumblebees under climate change and landscape fragmentation
Two studies have analyzed the impact of heat waves on male bumblebee survival under laboratory conditions (Zambra *et al*. 2020; Martinet *et al*. *in press*). Results show a significant interspecific variability but a low inter-populational variability in heat stress resistance (estimated with the time before heat stupor, THS), supporting heat resistance as a species-specific trait. Species found in colder climates are much more sensitive to heat stress than temperate/Mediterranean species. Another study (Martinet *et al*. 2020) shows a significant impact of heat waves on sperm viability under laboratory conditions.

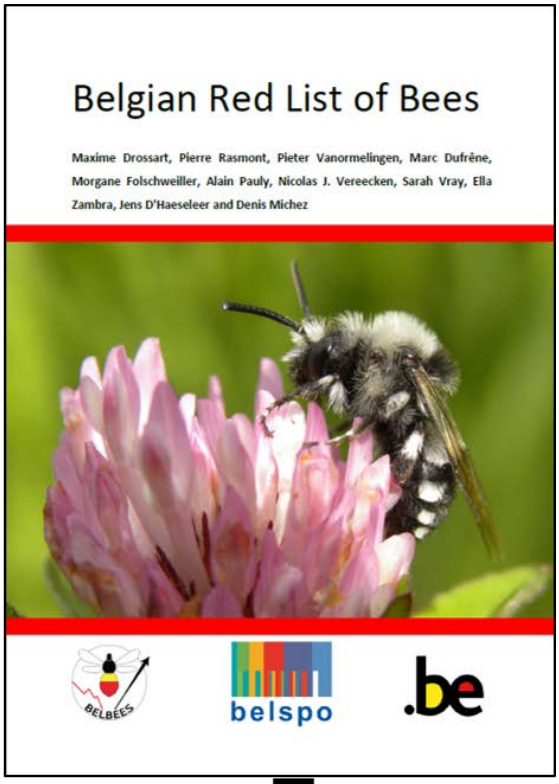
Shifts to higher elevations have been observed for both bumblebees (averaging 129 meters) and plants (averaging 229 m) in the Pyrenees in the last 115 years following global changes (Marshall *et al*. 2020).

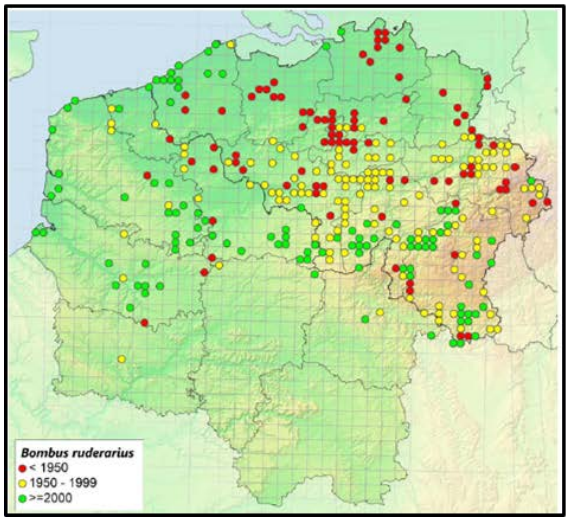
Body size of the two largest species studied by Gérard *et al*. (2020) has significantly increased over the last century in landscapes with higher fragmentation, while the body size of the two smallest ones decreased with higher fragmentation. This highlights that landscape fragmentation can act as a driver of body size clines in bumblebees.

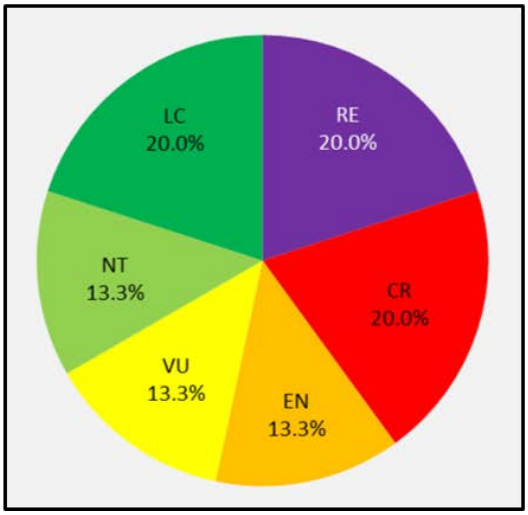
Analyses based on >125,000 data records of 68 species have recently highlighted species-specific and non-phylogenetically structured associations of bumblebee distributions with climatic and land cover variables, depicting the strong relevance of taxon-specific mitigation strategies for their effective conservation (Ghisbain *et al*. 2020).

b. Local conservation plans and actions
The Interreg project SAPOLL (*Sauvons nos pollinisateurs / Samenwerken voor pollinators*), aiming to implement a conservation action plan at the Belgian and Northern French scale, ended in 2020 (all results of the project available at http://sapoll.eu/sapoll/les-resultats-du-projet/). Belgium now has an updated *Red List of Bees* (Drossart *et al*. 2019, figure below), including the local conservation status of all bumblebees originally found in the territory. In addition, the *Atlas of the bumblebees of Belgium and the North of France* was published by Folschweiller *et al*. (2020).







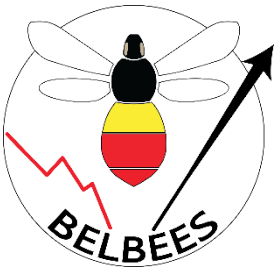


2020 marked the end of the SAPOLL project, a collaborative work that has led to the publication of two important books about the conservation of the bumblebees of Belgium and the North of France. Left: the Atlas of the Bumblebees of Belgium and the North of France (Folschweiller et al. 2020). Right: the Belgian Red List of bees (Drossart et al. 2019).

The BELBEES project, funded by the governmental agence BELSPO, dealt with the conservation of wild bees in Belgium. The project joined the efforts of University of Gent (D. De Graaf, G. Smagghe), Liège (M. Dufrêne), Mons (P. Rasmont), Namur (N. Dendoncker) and the Royal (J.-L Boevé). The main results of the project can be found in the Box below, quoting the abstract (Rasmont *et al*. 2020).

BOX: abstract of the BELBEES Project (Rasmont *et al*. 2020)

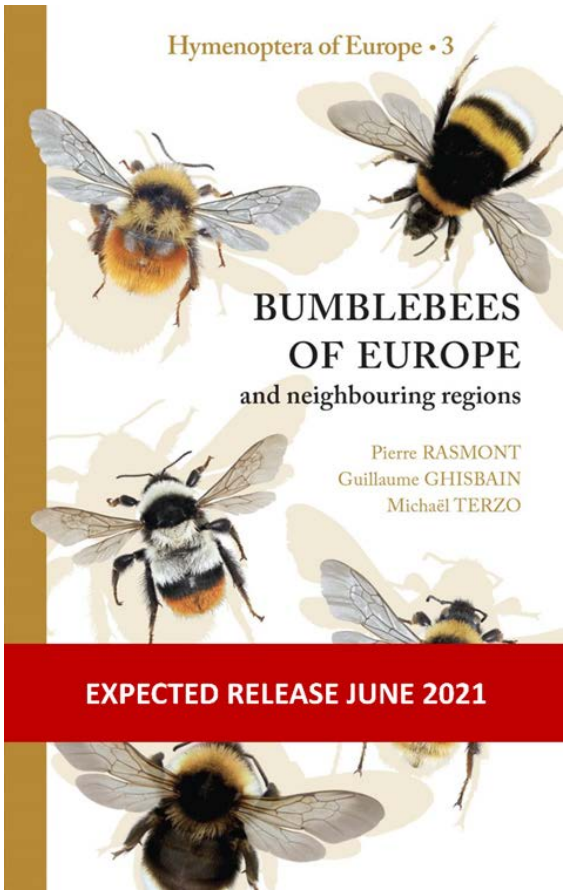
"The Red List of Belgian wild bees prepared by the BELBEES project shows that on the 399 wild bees recorded in the country: 45 species (12%) are now extinct, 139 species (35%) are threatened or declining, 162 species (41%) are stable or expanding while 53 species (13.3%) are not assessable due to deficient data. Compared to the 1993 assessment, the situation clearly got worse: while already 12% of species appeared declining in 1993, there are now nearly half of the species (48%) that are declining or even extinct. ***For bumblebees, our analysis revealed that thistles constitute a very important food resource. Their most threatened species are highly dependent on these plants.*** *Floral resource availability decreased significantly, thus threatening most of the specialist bee species and forcing the generalist ones to shift their foraging to other plant species. [...]* ***Climate change appeared as a main threat against bumblebees because most of them are very sensitive to heat stress (occurring during heat waves). Models show that most species may disappear in the next decades. While urbanization has been clearly involved in change in bumblebee fauna, land use and climate change appear as linked factors. No population structuring was found at country scale (Belgium) and only low levels of structuring in an international sampling for seven bumblebee species at continental scale (Europe). This indicates that there is no limitation in gene flow, not even for the restricted bumblebee species.*** *[...] As recommendations and mitigation for Belgian wild bees, we advocate to the inclusion of a significant number of wild bees in habitat protection regulation (threatened ones mentioned in the Red List of Belgian wild bees). Agri-environment Measures (MAE) should maximise the inclusion of relevant foraging flowers like leguminous plants. We recommend the abrogation of the present regulation that constrain the destruction of thistles of agricultural sowed areas. We recommend to study wild bees friendly practices that could specially fit for cities. We underlined the importance to prevent all importation of uncontrolled domesticated bees."*



The complete report can be downloaded here : http://www.belspo.be/belspo/brain-be/projects/FinalReports/BELBEES_FinRep.pdf

A new book for the West Palearctic bumblebee fauna

The authors are delighted to announce the upcoming release of their new book *Bumblebees of Europe and neighbouring regions* (figure below). This work, written by Pierre Rasmont, Guillaume Ghisbain and Michaël Terzo will be available in both English and French at N.A.P. Editions (Verrières-le-Buisson, France) in June 2021 (https://www.napeditions.com/en/).



This guide is the third volume in a series on Hymenoptera of Europe. After a short introduction to this order of insects, the book provides a wealth of information on the bumblebees of Europe, northern Africa, the Caucasus, and the Middle-East, covering the most recent scientific advances. A key allows the identification of the 14 subgenera of bumblebees present in this region. Then, for the first time, there are detailed identification keys for the 79 species of bumblebees found in Europe and neighbouring countries.

Each species is presented with all its geographic variations as well as notes on its ecology, behaviour, flower preferences, and conservation status. Original photos are included for each of the West Palearctic species. Some extremely rare bumblebees are pictured for the very first time. The book also features many colour plates to help readers recognize over 240 forms and subspecies. Accessible to non-specialists, this is an invaluable reference guide to have in the field to discover the diversity of these magnificent pollinators!

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NORTH AMERICA

50 species are listed here up to the end of 2020. Almost all of these species have now been assessed for Red List status globally, although the species of the subgenus *Alpinobombus* and the *lapponicus*-group need to be revised. Assessments of species listed as Data Deficient will be improved in future years as data gaps are filled, especially from parts of species ranges beyond North America (e.g. by bringing together experts from around the world). Within North America, distributions are relatively well recorded and databased, so that baseline data are readily available for comparison in the future.

North American Region in 2020

Sheila Colla / Rich Hatfield / Sarina Jepsen / Jonathan B. Koch / John M. Mola / Leif Richardson

In 2020, many components of North American bumblebee research and conservation management were impacted by the global pandemic. Below we report on only the current status of conservation efforts and the legal designations of at-risk bumblebees. In addition, the Commission for Environmental Cooperation (CEC, a tri-national governmental organization), is in the process of drafting an *Operational Plan* for conserving pollinators. Stakeholders and experts met in Mexico in February of 2020 to help inform this document. More about this effort can be found here: http://www5.cec.org/our-work/projects/strengthening-regional-pollinator-conservation-secure-local-benefits

USA Policy and Management Update

In February 2020, there was a meeting in Apple Valley, Minnesota, USA, to discuss next steps for the conservation of *B. affinis*, hosted by the U.S. Fish and Wildlife Service (USFWS), the IUCN, Ohio State University, and the Minneapolis Zoo. Results from this workshop included development of *in-situ* and *ex-situ* conservation actions and identifying important knowledge gaps. The report from that meeting, *Rusty Patched Bumble Bee* (*Bombus affinis*) *Ex Situ Assessment and Planning Workshop* can be found below (Smith *et al*. 2020). In late 2020, the USFWS declined to designate critical habitat for *B. affinis*, suggesting that the species is a "habitat generalist" and that “habitat is not the primary limiting factor for the species.”

In other federal species legal protections, the USFWS has been petitioned in early 2021 to assess the status of this *B. pensylvanicus* under the *U.S. Endangered Species Act*, citing its IUCN Red List status of Vulnerable. In April 2020, the Center for Biological Diversity filed a petition to list *B. suckleyi* under the federal endangered species act and designate critical habitat. The USFWS in concert with the U.S. Geological Survey (USGS) is working on a species status assessment for *B. occidentalis* to determine whether it should be listed under the *U.S. Endangered Species Act*, with a decision due in 2023. In relation to this, a paper was published in 2020 highlighting the research and survey needs for this species (Graves *et al*. 2020). The status of *B. franklini* has not changed since it was proposed for listing in 2019. Its official status stands as Proposed Endangered.

There are also some state-level protections that have arisen. Vermont will be listing *B. pensylvanicus* as endangered soon. In 2018, the Xerces Society petitioned four species of bumblebees (*B. crotchii, B. franklini, B. occidentalis*, and *B. suckleyi*), for protection under the *California Endangered Species Act*, and in 2019, California designated these four as

candidate species under the *California Endangered Species Act*. Following that decision in late 2019, a consortium of agricultural groups sued the state of California, asserting that the state does not have authority to protect insects under its *California Endangered Species Act*. In November of 2020, a Superior Court Judge ruled in the agricultural groups' favour, but the California Fish and Game Commission, the Xerces Society, and other conservation organizations appealed that ruling. In Washington State, new legislation has been introduced to protect wild bumblebees, following recommendations made by the Xerces Society to the Washington Pollinator Task Force. One recommendation of interest, which is now part of proposed legislation, is to prohibit the use of nonnative commercial bumblebee species (*B. impatiens*) for open field pollination in the state.

Newly described species

Two new species were formally described as occurring in North America: *B. vancouverensis* (Ghisbain *et al*. 2020) and *B. johanseni* (Sheffield *et al*. 2020).

Research of significant importance to inform management and conservation

The United States Department of Agriculture - Agricultural Research Service - Pollinating Insects - Biology, Management, and Systematics Research Unit (USDA-ARS-PIBMSRU) in Logan, Utah, USA, is leading an effort to sequence the *B. affinis* genome using the PacBio Sequel System along with collaborators at the USGS, USFWS, and the USDA-ARS Daniel K. Inouye Pacific Basin Agricultural Research Center. Additionally, a population genetic study being led by the USGS, and in collaboration with the USDA-ARS-PIBMSRU, is underway examining population genetic diversity of extant *B. affinis* populations. These research items were identified to be of high prioritization by stakeholders who attended the *Rusty Patched Bumble Bee (Bombus affinis) Ex Situ Assessment and Planning Workshop* (Smith *et al*. 2020).

Canadian Policy and Management Update

There are approximately 42 bumblebee species known to occur in Canada. Some of these species have been considered and processed for federal protection by the *Species At Risk Act*, which legislates the listing and protection process. In Canada, species are assessed by an arms-length committee of scientists (COSEWIC), after which the government chooses to list the species after consideration of socio-economic consequences. Once listed, a species has a recovery strategy and management plan listed and is protected on federal property (but not on private or provincial property). There are also funds allocated for its conservation.

Despite intense public interest, none of the assessed at-risk bumblebee species have been fully protected, despite over a decade from the first listing. The last known Canadian record for *B. affinis* was in 2009. Below lists the current status of the species which have been assessed in Canada. It should be noted that the jurisdiction for wildlife protection falls largely to the provinces, many of which do not have endangered species legislation or have recently had legislation gutted (e.g. Ontario where *B. affinis* and *B. bohemicus* are listed as Endangered) (see Munoz & Obrist 2020).

1. ***B. pensylvanicus***, assessed as Special Concern in 2018, not yet listed
2. ***B. bohemicus***, assessed as Endangered in 2014, listed in 2018, recovery strategy being drafted
3. ***B. affinis***, assessed as Endangered in 2010, listed in 2012, recovery strategy finalized in 2020, currently undergoing re-assessment

4. ***B. suckleyi***, assessed as Threatened in 2019, not yet listed
5. ***B. occidentalis mckayi***, assessed as Special Concern in 2014, not yet listed
6. ***B. occidentalis occidentalis***, assessed as Threatened in 2014, not yet listed
7. ***B. terricola***, assessed as Special Concern in 2015, listed in 2018, Management Plan being drafted

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MESOAMERICA

Approximately 18 species are currently recognised, although several species groups are being revised, with the promise of several more species to be added soon. The Red List status for all 18 species has now been assessed globally. Within Mesoamerica, distributions are being recorded and databased, so that improved Red List assessments should be possible in the next few years.

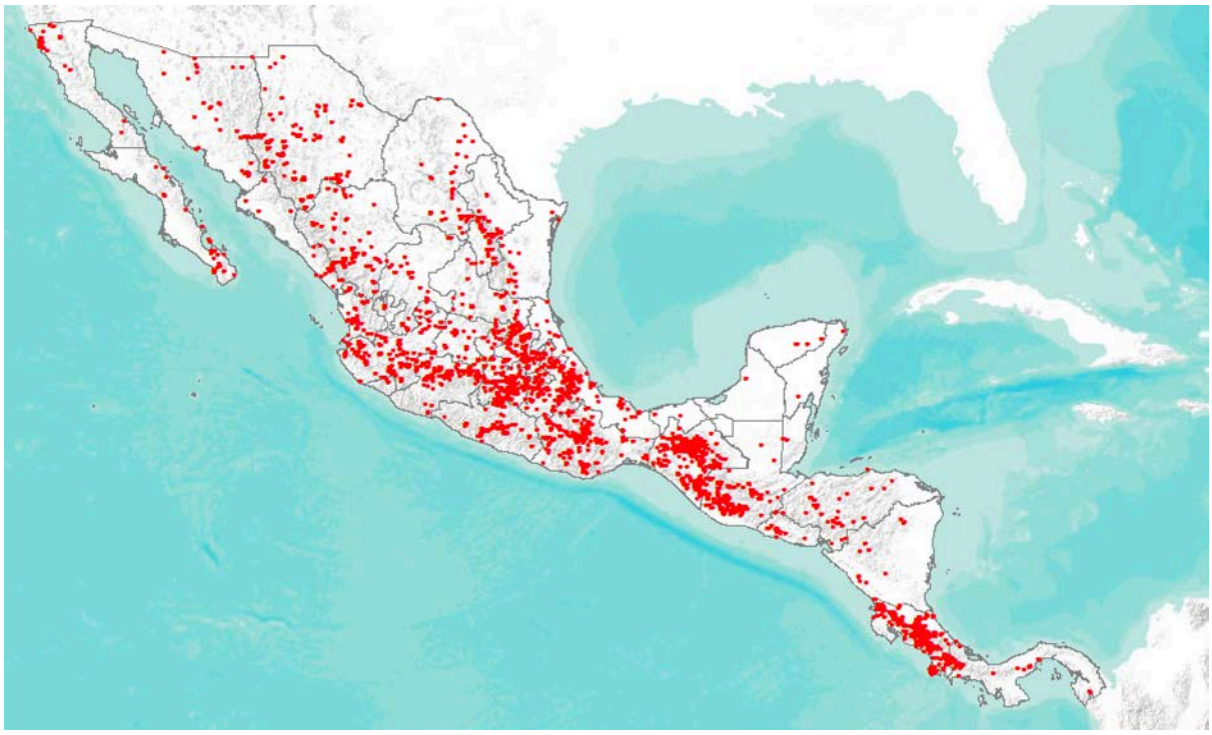
Mesoamerican Region in 2020

Rémy Vandame

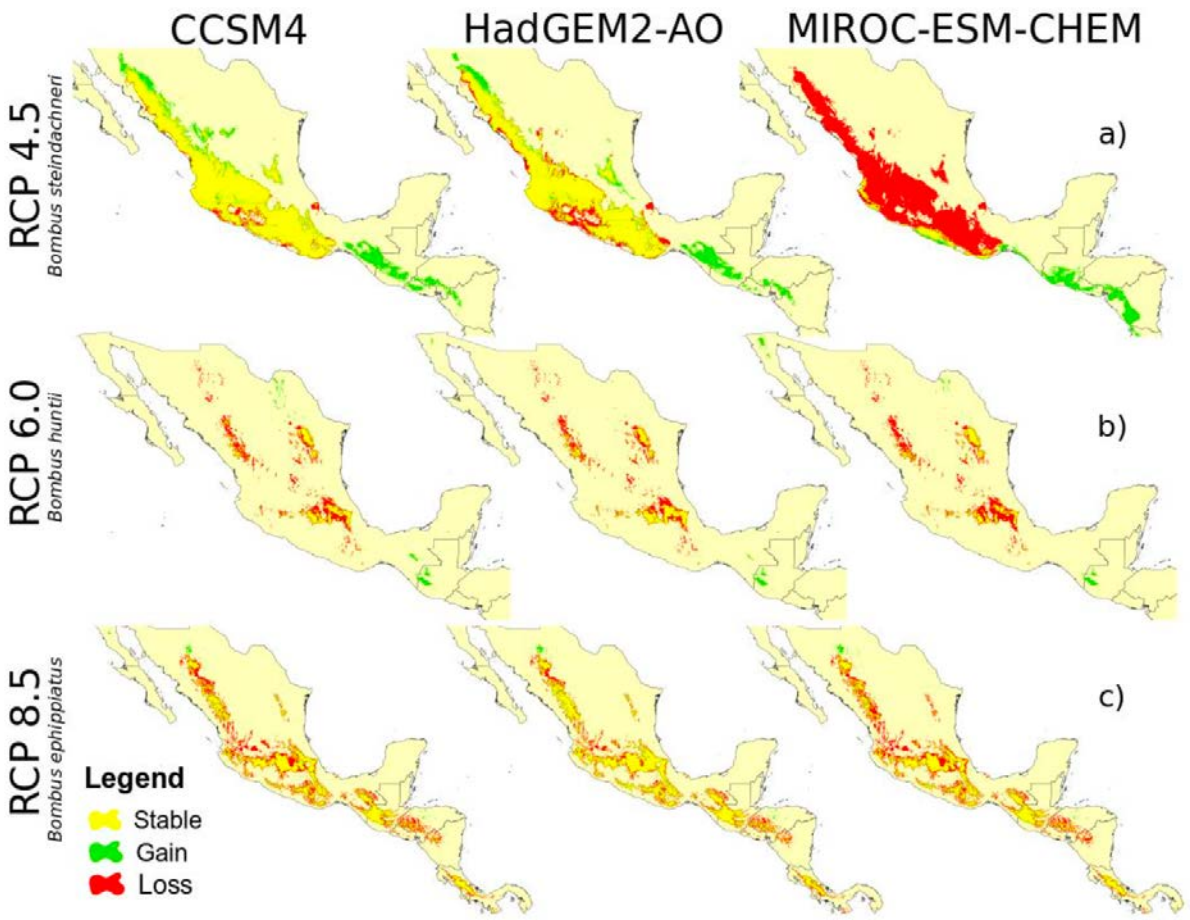
Field work and sampling have decreased significantly in Mesoamerica during 2020, due to the pandemic. However, different student projects and sampling activity have permitted the collection of *ca* 300 *Bombus* specimens from the Mexican states of Oaxaca, Chiapas, and Veracruz in the south and in the Baja California peninsula in the northwest. Including species with limited distribution, such as *B. trinominatus*, *B. crotchii,* or *B. vosnesenskii*, or from recorded from localities sampled for the first time, they add significant information to the knowledge of the Mesoamerican species.

The database now includes 32,039 records of bumblebees from Mesoamerica, from samples collected between 1867 and 2020. The distribution map of the sampling sites (below) shows a high sampling density in some regions, but also many under-sampled regions. Focused sampling is highly necessary, although difficult to put into action, considering the budget restrictions and the need for safety.

On another note, Oscar Martínez, a Guatemalan student at ECOSUR defended his master‘s degree with an analysis of expected future changes of bumblebee species distribution according to different climate change scenarios (Martinez 2019). Considering three models (CCSM4, HadGEM2-AO, MIROC-ESM-CHEM) and three scenarios (RCP 4.5, 6.0 & 8.5), it shows an expected reduction in distribution, ranging from 7% to 67% by the year 2050 (below). A paper currently submitted for publication will be important for informing policy makers about the threat that climate change poses to pollinator diversity, wild plant reproduction, and food security.



Map of sites sampled for bumblebees in Mexico.



Modelling expected changes in distribution for three bumblebee species in the Mesoamerican region.

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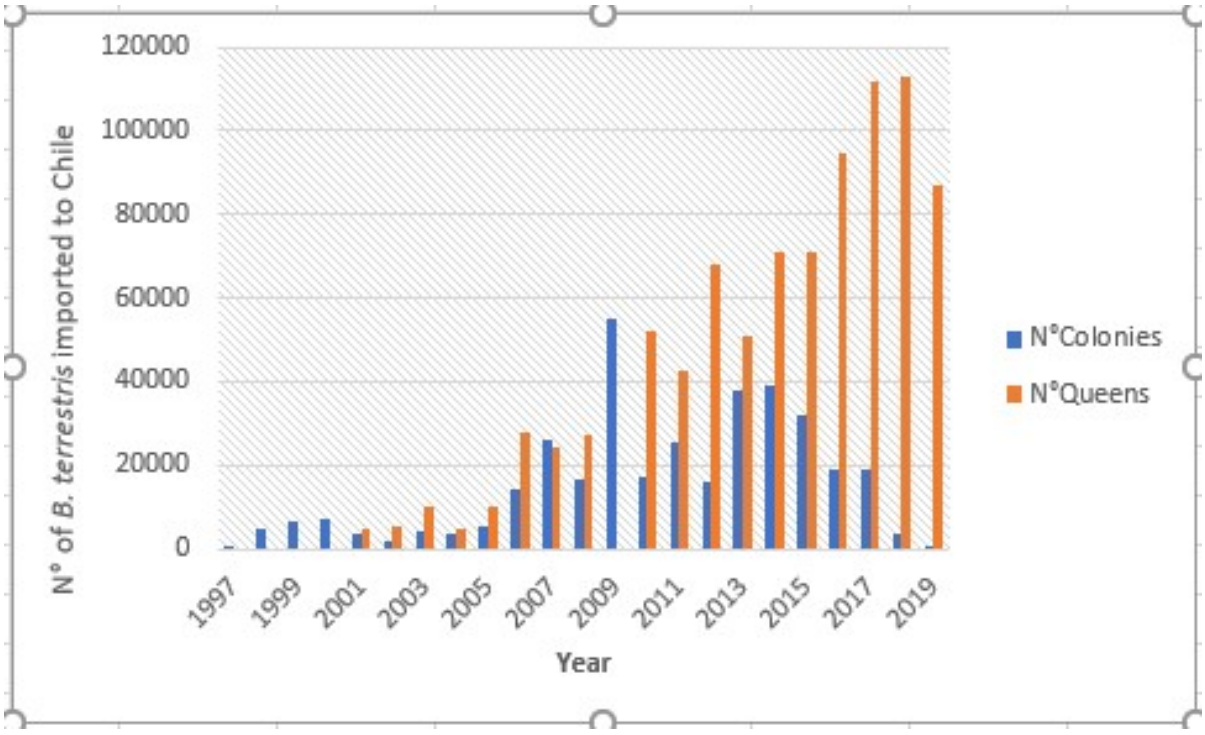
SOUTH AMERICA

Approximately 25 species are currently recognised. Most species have now been assessed for Red List status globally. Within South America, distributions are being recorded and databased, so that assessments may be updated in the next few years.

South American Region in 2020

Carolina L. Morales / Rodrigo M. Barahona-Segovia / Cecilia Smith-Ramirez / José Montalva / Marina Arbetman

Argentinean and Chilean Members of the BBSG continue their multiple tasks to document the impacts of the European *B. terrestris* introduced for crop pollination on biodiversity, on native plant-pollinator interactions, and to create social awareness around the problem of continuing importation (graph below).



Bombus terrestris colonies and queens imported into Chile. Data Source: SAG Chile, graph provided by José Montalva.

Continuing Research

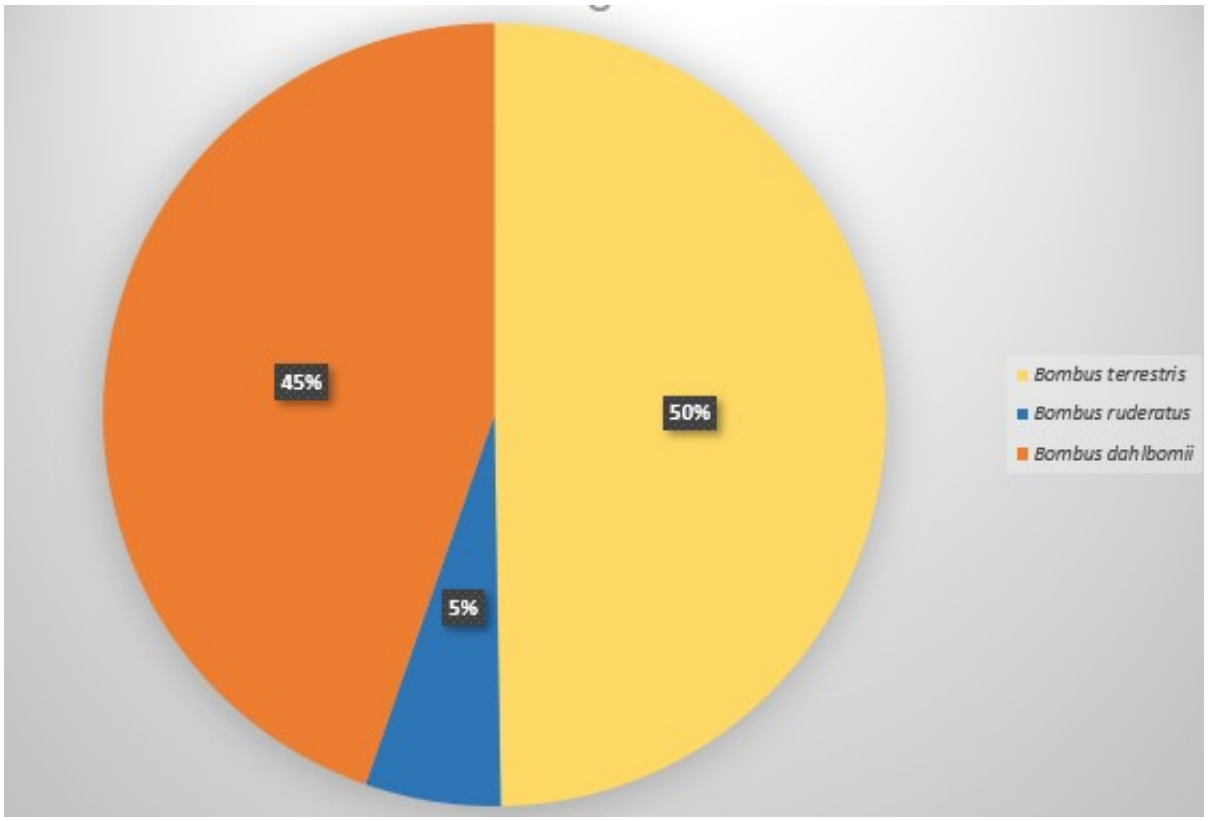
Rodrigo Barahona-Segovia (Chile), who has recently joined the BBSG, has studied the spread of *B. terrestris* in the desert regions of Arica and Parinacota in North Chile and its interactions with the native *B. funebris* (photo below). He found that *B. terrestris* and *B. funebris* greatly overlap both in distribution and in floral resource usage, they are more abundant in natural habitats, and their abundance are influenced by the summer rains in the

Altiplano. All of this information has been written up for a manuscript proposing that the category of *B. funebris* should be Endangered at a regional level, using the IUCN criteria.

In South Chile, continuing studies on apple pollination show that *B. dahlbomii* is only present in orchards in the Regions of 'Los Rios' and 'Los Lagos'. *Bombus terrestris* spend far less time (2.3 sec on average) in each apple flower compared to *B. dahlbomii* (8–10 sec) or other native pollinators, such as *Astylus trifasciatus*, *Corynura* spp., *Lasioglossum* spp., *Callistochlora* spp., *Syrphus* spp., *Platycheirus* spp, which may suggest a lower pollination efficiency by the introduced species.

Bombus funebris male, Ticnamar, Arica y Parinacota región, Chile. (Photo: Rodrigo Barahona.)

The civil initiative launched in 2014, *Salvemos Nuestro Abejorro* ('Save our bumblebee'), one of the first citizen-science long-term projects in Chile, has to date >8000 members, and >4000 valid bumblebee records (chart below). José Montalva, founder and Chair of *Salvemos Nuestro Abejorro* will be defending his master's thesis this coming summer at Oklahoma University, USA. José is using citizen-science data to evaluate the distributional patterns of the endangered native bumblebee *B. dahlbomii* and the introduced bumblebees *B. ruderatus* and *B. terrestris*.



Relative occurrence of bumblebee reports by species in Chile, reported to 'Salvemos nuestro Abejorro' (2014-2020). More than half of all records belong to European invasive species (B. terrestris and B. ruderatus). Source: Salvemos nuestro abejorro, graph provided by José Montalva.

In the context of the international the consortium SURPASS (https://bee-surpass.org/), the Argentine members of the BBSG, Carolina Morales and Marina Arbetman, have carried out, together with Chilean colleagues, a large scale survey of bumblebee abundance, distribution, and floral use covering the whole Patagonian Region of Argentina and Chile, together with the central region of Chile. During this survey they also collected specimens of the invasive *B. terrestris* and *B. ruderatus* for analyses of molecules and parasites. The results of this study will provide an update on the extent of invasion by *B. terrestris* and *B. ruderatus,* on *B. dahlbomii* conservation status, as well as providing new insights into the roles of parasites, genetic variability, and ecological factors.

Surveys carried out in the 2019–2020 austral summer extended to some localities in Central and North-West Argentina, where *B. terrestris* has not yet arrived, and therefore may provide a baseline for the pre-existing native bumblebee fauna. During these surveys, *B. opifex* and *B. atratus* were recorded. In particular, *B. opifex* seems to be quite common in mountain areas of Central and North Argentina.

Public outreach

Cecilia's team gave four talks oriented towards members of the civil society and politicians on the importance of native pollinators, with emphasis on *B. dahlbomii*. The talks have had thousands of visits (https://www.facebook.com/watch/?v=424986641797770, https://www.facebook.com/MoscardonRevive/, http://aumen.cl/2020/2-mate-cientifico/). The IEB, with the support of the initiative *Moscardón Revive* ('Bumblebee Revive'), have designed outreach material for Instagram (Inst. Ecología y Biodiversidad on Instagram: "¿Conoces a nuestro abejorro nativo, el más grande del mundo? Te invitamos a mirar más

de cerca al (bombus dahlbomii), un polinizador clave…"). Moreover, they have supported two educational projects using literature and dance (https://www.youtube.com/channel/UC4JqrSXOfnGVKOPLYJZxNMw). The citizen-science initiative *Salvemos nuestro Abejorro* continues to gather information on bumblebees while providing education on the importance of native bumblebees.

In Argentina, *B. dahlbomii* was portrayed in an outreach publication to commemorate the *International Day of Nature Protection* from the INIBIOMA Institute. Marina participated in outreach activities with artists and educators, including the construction of a kite representing a native bumblebee, while Carolina was invited to give a talk focused on the native bumblebee *B. dahlbomii* for a course on naturalists and scientific illustration, by scientist and artist Julian Rouaux.

Policy engagement

Based on Rodrigo's studies (described above), Chilean researchers proposed categorizing *B. funebris* as Endangered at the national level. Although the Environmental Ministry of Chile had decided to categorize this species as Vulnerable, arguing that this species is also present in other South American countries (Colombia, Ecuador, Perú, Bolivia y Norte de Argentina), the Endangered categorization recognizes the close relationship between the status of *B. funebris* and the invasion of *B. terrestris* (see: https://clasificacionespecies.mma.gob.cl/procesos-de-clasificacion/17o-proceso-de-clasificacion-de-especies-2020/propuesta-de-clasificacion-preliminar-del-17o-proceso-de-clasificacion-de-especies-silvestres/).

Cecilia Smith and her team have had meetings with public institutions in the agricultural sector to advance the incorporation of protocols for environmental ethics into the approval of projects and plans for apiculture and for agriculture with commercial colonies of *B. terrestris*.

In the context of continuing studies on apple pollinators, Rodrigo's team has worked on education plans to link children, teachers, and the entire community with native pollinators in apple orchards. This work aims in the short term to generate confidence in native pollinators facing a 'pollination crisis' as the alternative for maintaining food security and the local economy (below).

In Argentina, Marina, Carolina and collaborators provided technical assistance to national legislators to submit a Project to the Executive Power, asking them take actions in relation to the impact of continuing importation of *B. terrestris* into Chile and Argentine, in order to implement national and binational policies (OD 212/20 (S 940/19).

There is no news to report from other South American countries at present. This may be partly because 2020 has been an unusual year with the COVID19 pandemic. However, we have huge gaps in knowledge for bumblebees in most parts of South America. We stress the need to support bumblebee research, education, and conservation in other South American countries that host even richer and less well known bumblebee faunas.

Floral visitors in apple trees and the importance of the forest for pollination – educational material on native pollinators visiting apple orchards in Chile.

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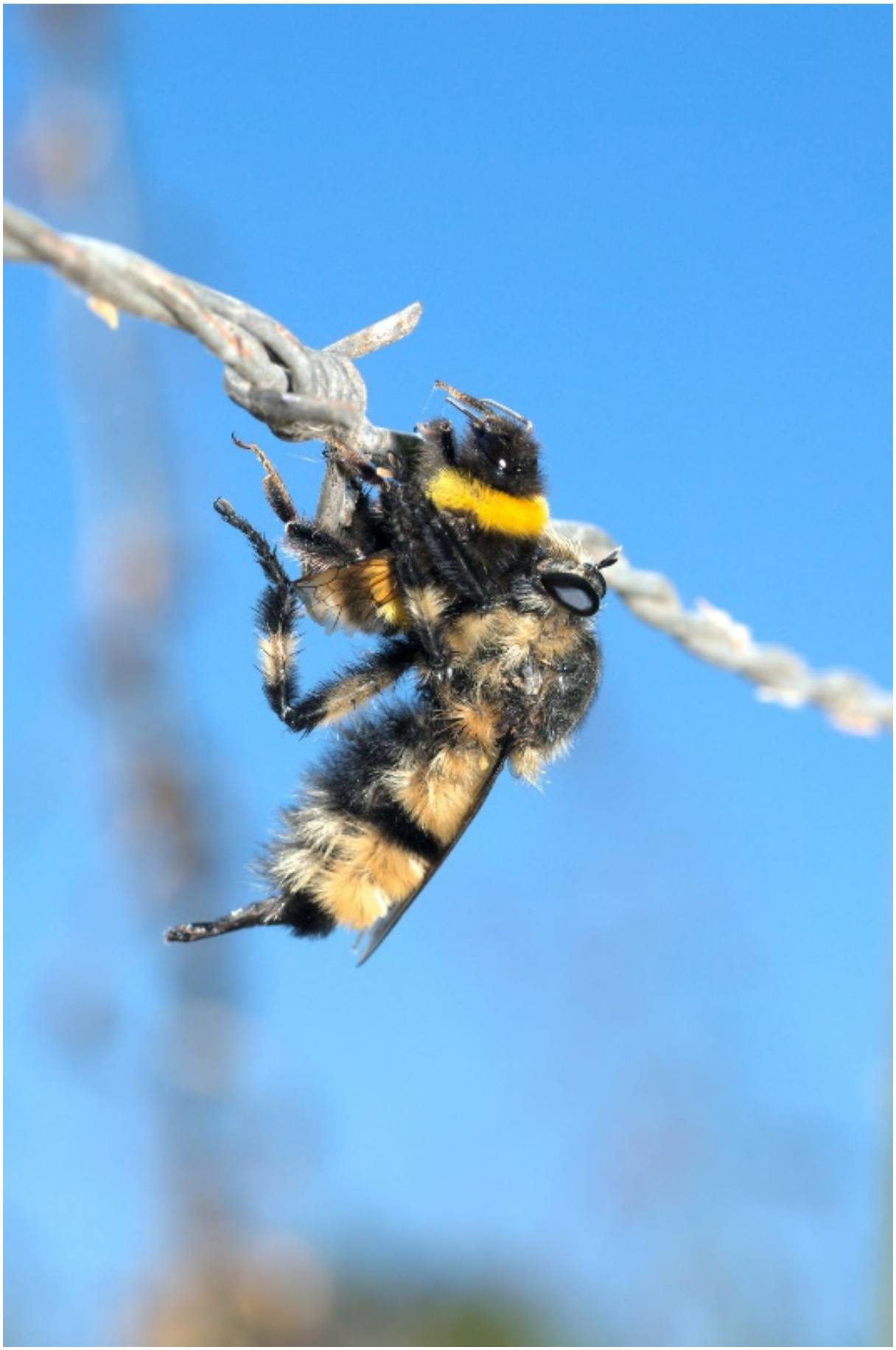


Obelophorus terebratus (Asilidae) hunting B. terrestris in the Metropolitan region. (Photo: Claudio Arancibia.)

NORTH ASIA

Approximately 68 species are recognised. No species have yet been assessed for Red List status within North Asia. Of the total, only two species are currently considered endemic. Low endemism may in part reflect the region's position at the crossroads among several other regions. Within North Asia, distributions are being recorded and databased, so that Red List assessments should be possible in the next few years.

North Asia Region in 2020

Alexandr Byvaltsev

Unfortunately the North Asia team is unable to report any progress for 2020. All of the plans for mapping bumblebee distribution in Russia had to be suspended because of the pandemic.

JAPAN

Approximately 14 species are currently recognised. No species have yet been assessed for Red List status within Japan. Of the total, only one species is currently considered endemic, so 13 will need to be assessed beyond Japan. There are many records now in databases.

Japanese Region in 2020

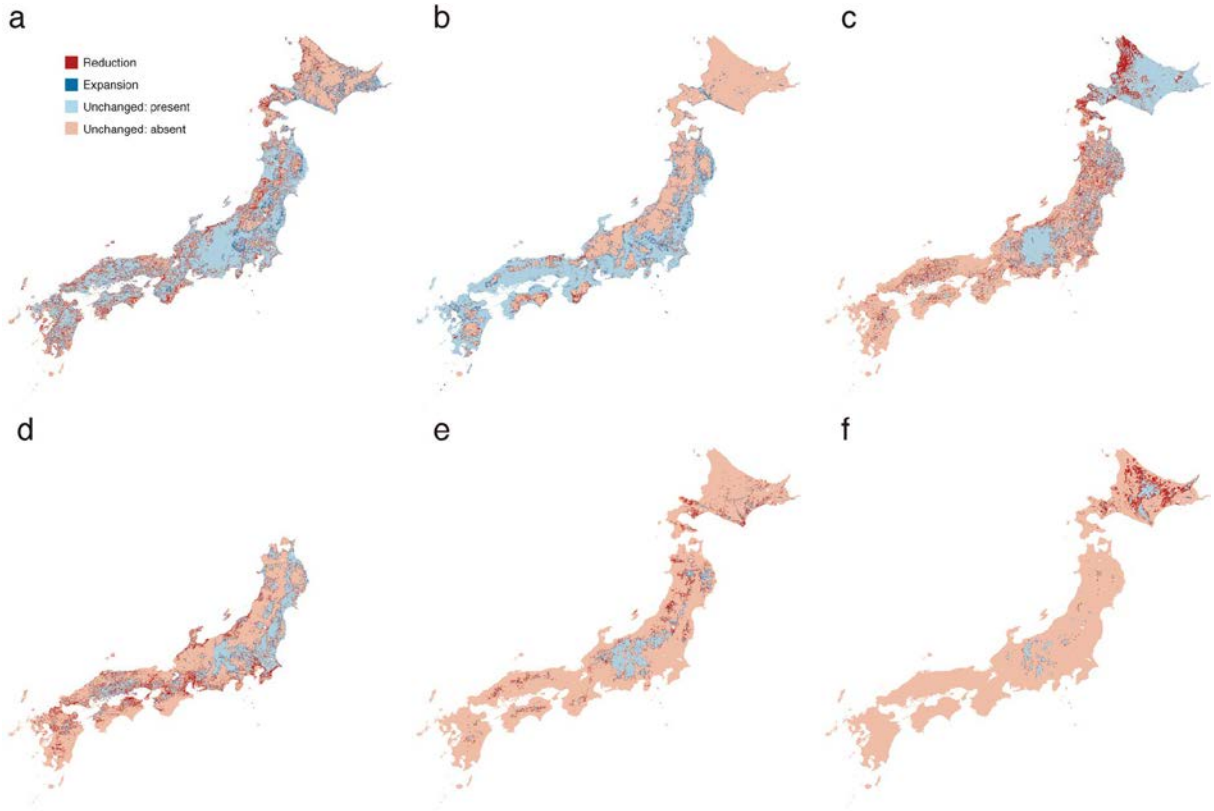
Koichi Goka for Japan

A research team from Tohoku University has been studying the distribution dynamics of bumblebees in Japan from 2013 to 2019, and the results of the data analysis were published in 2020 (Ohono-Suzuki *et al*. 2020).

The team spent five years collecting over 5,000 photos of bumblebees from all over the country. The photos were taken by enthusiasts across the country. From those photos, 16 species of bumblebees, including one alien species, were identified. The alien species was *B. terrestris*. The distribution of the alien bumblebee continues to expand in Hokkaido, although it has rarely been observed in the field in the southern islands (Honshu, Shikoku, Kyushu and Okinawa Islands).

It is difficult to collect data on some species restricted to Hokkaido, especially *B. yezoensis* and *B. schrencki*, which are mainly distributed in inland and mountainous areas. Further surveys are needed.

Using the geographical data for six species (*B. diversus, B. ardens, B. hypocrita, B. ignitus, B. honshuensis*, and *B. beaticola*) identified from photographs taken between 2013 and 2015, the distribution of these species in 2013-2014 and in 1987 were estimated using MAXENT, and compared with the mapped distributions. As a result, it was estimated that the distribution of the five species other than *B. ardens* may be shrinking due to global warming. On the other hand, the distribution of *B. ardens* was estimated to be expanding. The estimated area of shrinkage was considered to be mainly near the lower elevation limit of the distribution area. The distribution range of the *B. ignitus* was estimated to be shrinking near the coast of Honshu and Shikoku.



*Possible range shifts for (**a**) B. diversus, (**b**) B. ardens, (**c**) B. hypocrita, (**d**) B. ignitus, (**e**) B. honshuensis, and (**f**) B. beaticola. Blue and red represent estimated range reduction and expansion, respectively. Sky blue indicates no difference in estimated present areas, whereas pink indicates no difference in estimated absent areas. For details see Ohono-Suzuki et al. (2020).*

The species in Hokkaido were estimated to have shrunk in distribution by a greater extent. In particular, we estimated that the degree of distribution contraction in Hokkaido was greater for *B. hypocrita*, which prefers relatively low temperatures and habits with gently sloping areas in Hokkaido, and *B. beaticola*, which prefers low temperatures and inhabits mainly higher elevations in Hokkaido. Land use change was also estimated to reduce the distribution, but while global warming affects the entire country, land use change has only a localised effect.

As a whole, the distribution range of bumblebees in Japan has been decreasing, and global warming and land use change are presumed to be the causes. In the future, it will be necessary to investigate the influence of various factors such as alien species, parasites, diseases and pesticides.

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WEST ASIA

Approximately 73 species are currently recognised. No species have yet been assessed for Red List status within West Asia. Of the total, 10 species are considered endemic, so 63 need to be assessed beyond West Asia. Within West Asia, the fauna of Turkey is already well mapped (many species shared with Europe) and good progress is being made in Iran. In

Central Asia there are many records in collections and in the literature that could be mobilised if funding were available.

West Asia Region in 2020
Ahmet Murat Aytekin for Turkey

We have had many difficulties in the region, because of the loss of researchers and the decline in research funds in 2019 and 2020. Fortunately these problems have mostly subsided, but then the pandemic affected us strongly, especially for field work. For nearly half of the spring and summer, travel was restricted by government policies. Despite this, we decided to continue studies in our home areas by making relatively short trips, which did succeed in allowing us to continue to collect data.

Studies in Turkey have continued this year more on commercial rearing and on integrated taxonomic studies of bumblebees. We had two new students working on bumblebees, especially in the Marmara region, in which we have only relatively limited number of old data. During the 2020 pandemic we focused our studies and field trips mostly in the Middle Anatolian and Marmara regions. I hope that in 2021 we will have many more data because I hope to return to academic life again after a long struggle. I also received many letters from amateurs and gardeners this year, who have taken good photos of bumblebees in their gardens, perhaps because many people were mostly at home and became more interested in nature. This is a relatively new kind of observation as people become much more aware of bumblebees and their roles.

Field-work photographs were taken by PhD student Burcu Daşer-Özgişi, all in the Middle Anatolian region during 2020.

Bombus niveatus in Afyon Province.

Bombus zonatus in Ankara Province.

Bombus terrestris in Kayseri Province.

Bombus lapidarius from Eskişehir Province.

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Alireza Monfared for Iran

This has been a difficult year for most people around the world because of the pandemic. This was more difficult for entomologists, especially taxonomists, in a vast country like Iran, because of the travel ban to control the spread of the disease. Under these conditions, it was not possible to collect samples and add new bumblebee distribution records. However, I have collaborated in research with European and American researchers, so that Iranian bumblebees were part of joint research for the conservation of globally threatened bumblebees. Articles with the results of this research will be published soon. For example, some species of Iranian bumblebees are included for two research collaborations for integrated taxonomy.

I have also established a private research center in Yasouj for studying solitary and social pollinators in Iran, especially bumblebees. This has had the financial support of the Vice President for Science and Technology of Iran.

The rearing of these species will be for the pollination of greenhouse crops, for other biological studies, and for the conservation of Iranian bumblebees. In particular, we intend to rear some species so that we might release them back into the wild, specialising in the rare or endangered species. We are also working on the potential for commercial rearing of

Iranian species. The pictures below show images of the research center, the rearing room, and some of the bumblebees reared.

The new research center in Yasouj, showing the rearing room and some reared bumblebees.

While studying the rearing of *B. terrestris*, I came across an interesting phenomenon. Some of the queens obtained in our reared colonies from the original source material had different color patterns. A queen and some other casts of *B. terrestris* had a large portion of white hairs instead of yellow on sides of T_1. Discussing this with Paul, we guessed that possible causes might include that it had arisen from damage during the pupal stage, which can interfere with the enzymes that develop the colour pigments after emergence. This can happen through thermal shocks and do doubt by other means as well. Such changes will not breed true. On the other hand, it could be a genetic mutation, in which case it might be expressed in later generations. We thought that rearing colonies might help us, so we reared a colony from this queen and the results were normal offspring (below).

Queen with different color pattern reared and offspring were normal in first generation.

Because it was not possible to sample from the field, we examined the specimens in the 'Iranian Pollinator Insects Museum' of Yasouj University, looking for the presence of associated mites. We prepared slides of the mites, which we will be sending to experts abroad for species identification.

We completed some research we had carried out some years ago, concerning the mites associated with a nest of *B. niveatus* that we had excavated from Ardabil province. With the help of Pavel Klimov, we identified five species of mites for a paper that is now ready for publication. The following photos show the excavation of the nest. We collected mites from this subterranean nest (80 cm below ground level) of the snowy bumblebee *B. niveatus* in the Sabalan Mountains, Iran. Six species of mites were identified.

Excavation of a nest of B. niveatus in the northwest of Iran. After some years, we are about to publish the results on the mites associated with this nest with the help of Pavel Klimov (Michigan University, USA.).

EAST ASIA

Approximately 124 species are currently recognised, although several species groups are being revised, with the promise that more species will be added soon. No species have yet been assessed for Red List status within East Asia. Of the total, 23 species are considered endemic, so 101 need to be assessed beyond East Asia (some species just crossing the border into the Himalaya region or to the South East Asia region). Within East Asia, much effort has been put into recording and databasing distributions, so that Red List assessments should be possible within the next few years.

East Asia Region in 2020

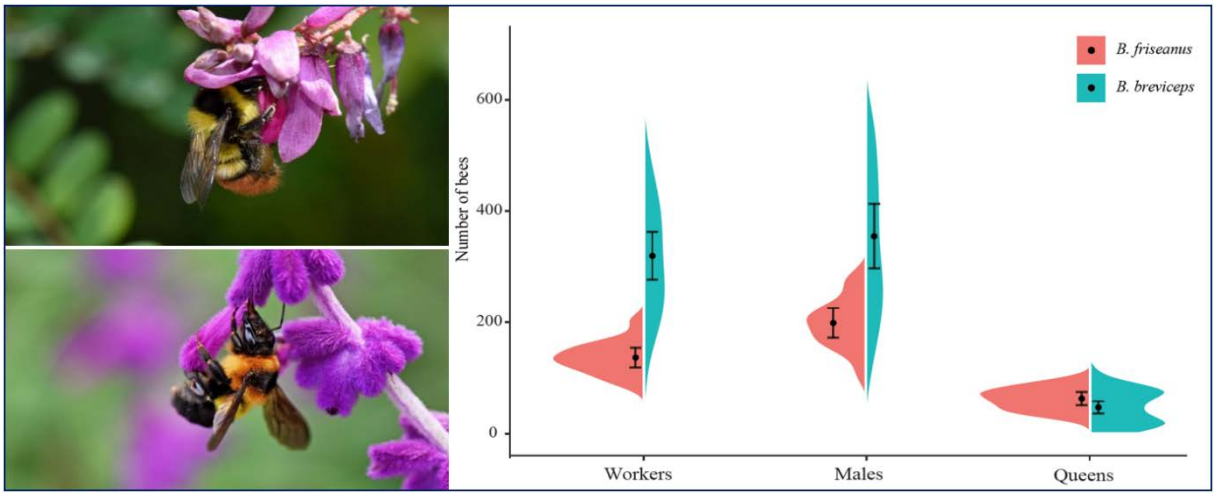
Jiandong An / Jiaxing Huang / Yanjie Liu / Guiling Ding / Cheng Liang

During 2020, more bumblebees from southern China had been added in the IAR collection. We also designed several studies on ecological adaptation, potential domestication and commercial application of Asian bumblebee species. The specific targets of the studies were designed to investigate the genetic basis for adaptation to low and high elevation environments, and the colony-development-pattern characteristics of two bumblebee species of the Oriental region.

We studied the genetic basis for ecological adaptation by comparing transcriptomes of six bumblebee species from the high-altitude Tibetan Plateau and two bumblebee species from low-altitude North China Plain, to identify common regulatory factors contributing to high-altitude adaptation. The analysis showed 19 genes are commonly upregulated in the six bumblebee species inhabiting the Tibetan Plateau. Three genes Rac1, AAC2 and Pfk1 (among the 19 genes) enhanced glycolysis with Pfk1 enriched in multiple glycometabolic pathways, which are the main energy pathways in bees. These upregulations enhanced the aerobic and anaerobic glycolysis processes to produce more ATP molecules to supply energy for high-altitude bumblebee flight under severe cold and hypoxic conditions. On the other hand, we were interested to understand why some bumblebee species occupy both low and high elevation environments. To answer this, we selected *B. pyrosoma,* one of the most abundant bumblebee species distributed in areas of very varied geomorphology and vegetation in East Asia (photos below). Again, we compared transcriptomic and metabolomic data of *B. pyrosoma* from the low-altitude North China Plain and the high-altitude Tibetan Plateau. Results showed that energy metabolism and innate immunity of the high-altitude *B. pyrosoma* is enhanced to adapt to the extreme environment of hypoxia and low temperature, compared to the low-altitude *B. pyrosoma*.

Bombus pyrosoma queen (left), worker (middle) and male (right) in North China. (Photos: Jiaxing Huang.)

To evaluate the potential for domestication and commercial application, we compared the characteristics of two bumblebee species *B. friseanus* and *B. breviceps* from southern China. The results showed that although *B. friseanus* and *B. breviceps* have different life cycles and colony development patterns, both species have high foundation rates (95.5% in *B. friseanus* and 86.5% in *B. breviceps*). *Bombus friseanus* develops large colony size in a shorter period than *B. breviceps*, although *B. breviceps* produces a higher number of workers and males than *B. friseanus*. The two species have no significant difference in mating rate, although the copulation duration of *B. breviceps* (1.5 min) is much shorter than that of *B. friseanus* (27.4 min), which is the shortest reported for the mating duration among any bumblebee species known.



Bombus friseanus (above) and B. breviceps (below) and their colony sizes.

These studies help us to understand better the ecological adaption of different bumblebee species as well as the potential species for agricultural pollination application in East Asia.

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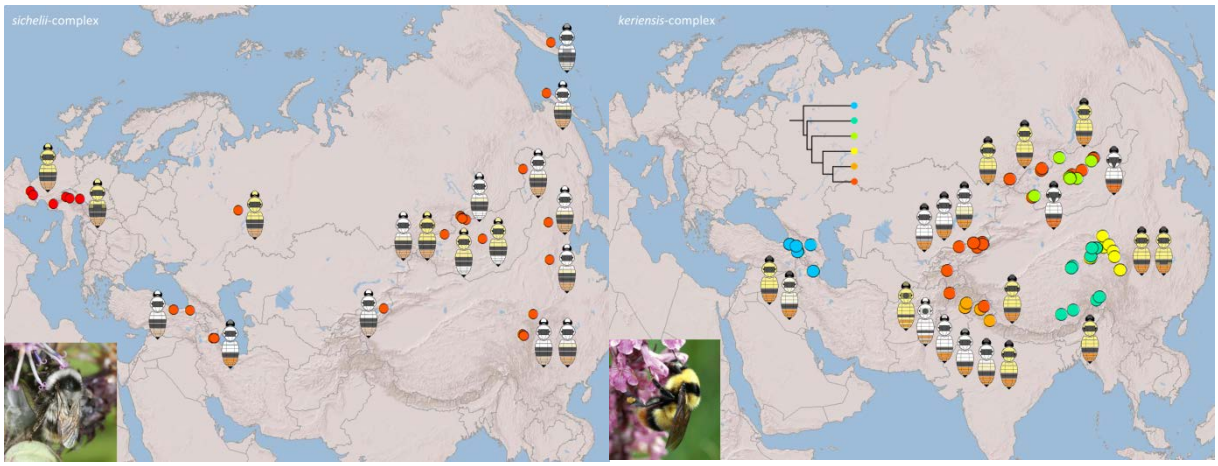
Taxonomic revision of Asian bumblebees continues in 2020
Paul Williams

An international consortium of 16 authors (representing Belgium, Bhutan, China, Georgia, India, Indonesia, Iran, Italy, Mongolia, Pakistan, Russia, and the UK) working over 10 years helped bring together a global revision of the large bumblebee subgenus *Melanobombus* (Williams *et al*. 2020). Although this group is perhaps best known in the literature for the widespread European *B. lapidarius*, most of the 25 species occur in mountains in many parts of Asia, including the world's largest bumblebee, *B.eximius*. Best practice methods for revisionary studies are reviewed.

A major advance by the study is that it provides well-supported solutions for distinguishing between widespread polytpic species (e.g. *B. sichelii*: below left) and complexes of local and often cryptic species (e.g. the *keriensis*-complex: below right), a problem that has been unresolved for more than a century. It is likely that greater fragmentation of *keriensis*-complex populations in habitats at higher elevations than *B. sichelii* has contributed to more speciation within the *keriensis*-complex.



Colour-pattern variation within the sichelii-complex (left), which is supported as a single variable species, and within the keriensis-complex (right), which is supported as six often cryptic species (Williams et al. 2020).

This study has resulted in the description of two new cryptic species from the Qinghai-Tibetan Plateau (*B. tibeticus, B. qilianensis:* below) that were previously considered to be parts of a single widespread species, *B. keriensis s. l.*. In total, the revision changes the status of 18 taxa.

Type specimens of two new cryptic species from the Qinghai-Tibetan Plateau (B. tibeticus left, B. qilianensis right), to be deposited in the collection of the Institute of Zoology, Beijing. (Photos: NHM.)

Reference

Williams P.H., Altanchimeg D., Byvaltsev A., De Jonghe R., Jaffar S., Japoshvili G., Kahono S., Liang H., Mei M., Monfared A., Nidup T., Raina R., Ren Z., Thanoosing C., Zhao X. & Orr M. (2020) Widespread polytypic species or complexes of local species? Revising bumblebees of the subgenus *Melanobombus* world-wide (Hymenoptera, Apidae, Bombus). *European Journal of Taxonomy,* 719: 1-120. https://europeanjournaloftaxonomy.eu/index.php/ejt/article/view/1107/2849

HIMALAYA

Approximately 53 species are currently recognised. No species have yet been assessed for Red List status within the Himalaya. Of the total, nine species are considered endemic, so 43 need to be assessed beyond the Himalaya (most in East Asia). There are many records in collections and in the literature that could be mobilised if funding were available, but field surveys are urgently needed.

Himalaya Region in 2020

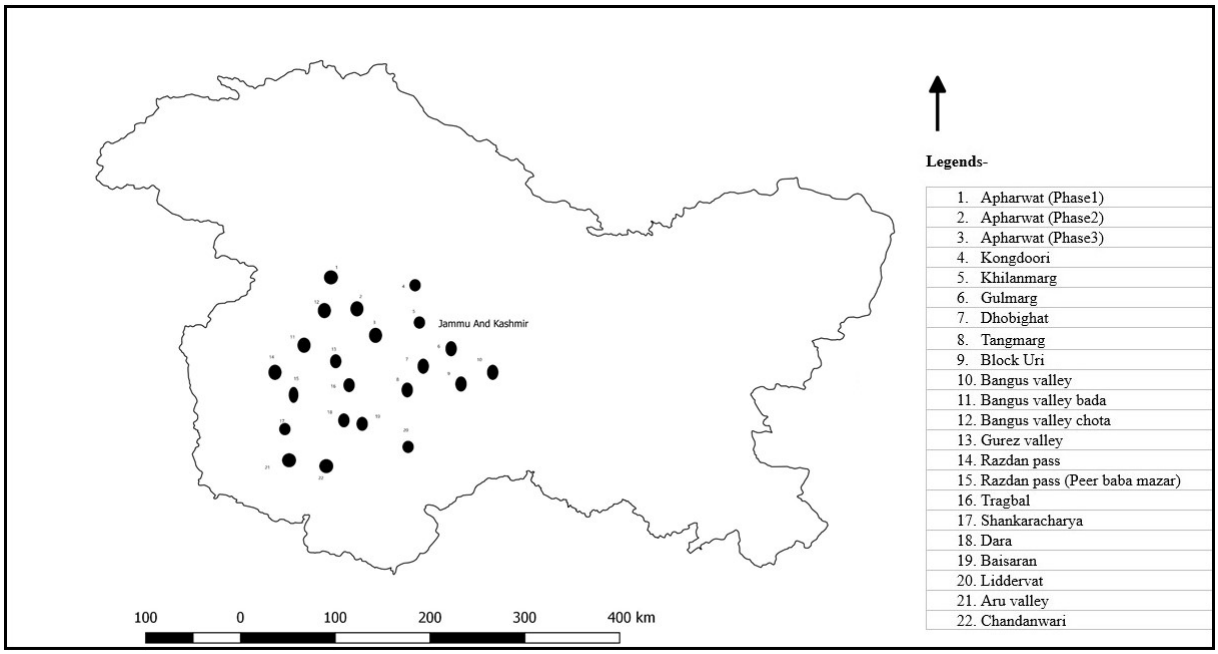
Rifat Raina / Malkiat Saini

The new survey of Himalayan bumblebees

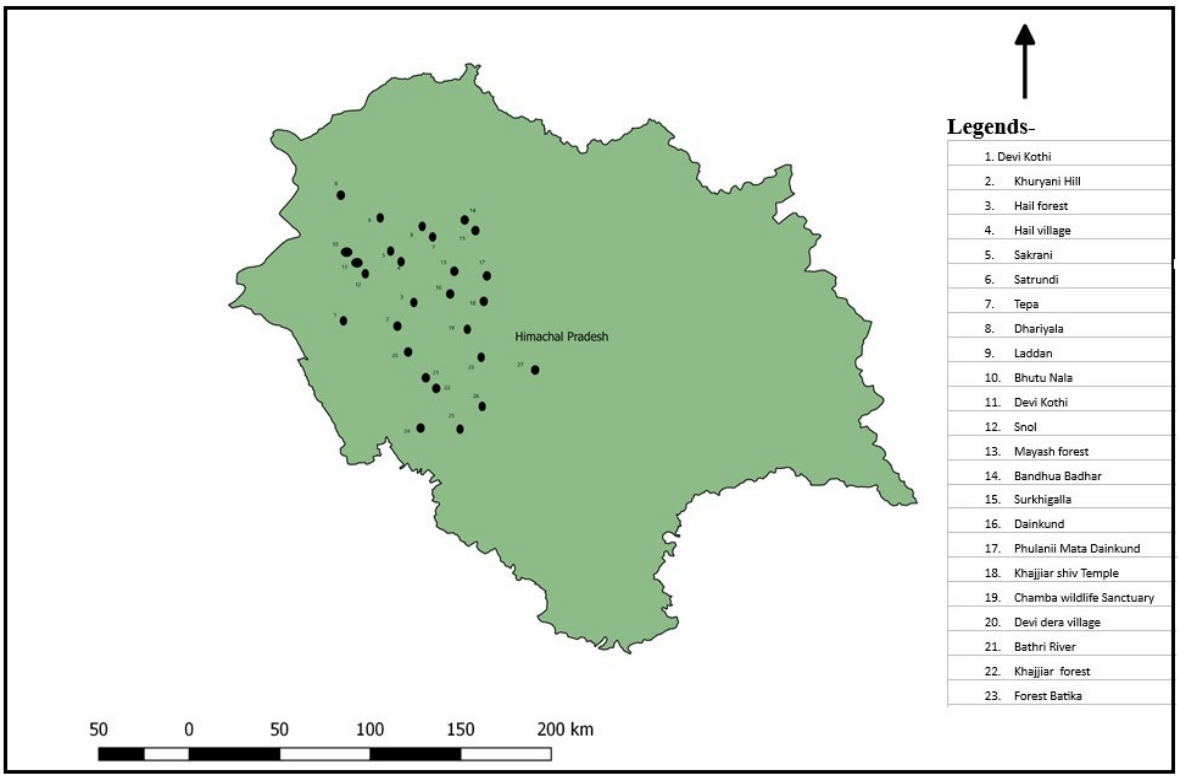
At present, 53 species of bumblebees are recognized from the Himalaya. Nine species of bumblebees are endemic to the region: *B. abnormis*, *B. mirus*, *B. pressus*, *B. parthenius*, *B. luteipus*, *B. tunicatus*, *B. jacobsoni*, *B. simillimus*, and *B. miniatus.* The remaining species need to be assessed urgently.

The new Himalayan bumblebee survey (*National Survey on Indigenous Mountain Pollinators of IHR*), led by Rifat Raina of the Zoological Survey of India and funded by the Indian National Mission on Himalayan Studies, started in the Indian Himalayan Region during September and October 2020. The aim was to record bumblebee populations and their food plants, using opportunistic sampling methods. The surveys were made by the Project Fellows Babu Sadam, Aejaz Parray, and Purnima Pathak. A total of 1472 bumblebee specimens were collected from 45 localities (maps below) in: (1) five districts of Jammu & Kashmir (Srinagar,

Anantnag, Bandipora, Baramula and Kupwara); and (2) two districts of Himachal Pradesh (Chamba and Kangra).



Localities surveyed in Jammu & Kashmir, western Himalaya.



Localities surveyed in Himachal Pradesh, western Himalaya.

Global positioning system (GPS) handsets were used to record the coordinates of the different habitats within the study sites. Species distribution records were databased so that assessments can be updated and kept current over the next few years as surveys continue. This database of identified bumblebees is being prepared for future study and research. During 2020, 172 specimens have already been examined and identified to 10 species: *B.*

melanurus, *B. rufofasciatus*, *B. miniatus*, *B. albopleuralis*, *B. tunicatus*, *B. ferganicus*, *B. simillimus*, *B. asiaticus*, *B. jacobsoni*, and *B. keriensis*. The rest of the collection is now being identified to species.

The new survey was made within the elevational range 970 – 4414 m (asl). No bumblebees were encountered at Saach pass (4414 m) in Chamba District. Abundance of bumblebees was highest between the elevations of 2000 – 3800 m, but below 2000 m the bumblebee population seemed to decrease. This was probably in part because of deforestation, lack of wild flowers, high pesticide use in agriculture crops, and other human activities. The highest abundance of bumblebees during the survey period was recorded in the area near Chenni pass (around Hail village) in the Bairagarh forest division, Chamba District of Himachal Pradesh; as well as at Kangdoori in the Jammu & Kashmir valley. Streams, many flowering plants, wild flowers, and less anthropogenic activity (including use of pesticide), high elevation, and favorable climate are the main factors favouring high bumblebee species richness around the Chenni Pass and Kangdoori.

The annual decline phase of bumblebee activity started between September and October, following a decrease in food resources. The wild flowers fed on by bumblebees were already becoming scarce before the beginning of the harsh winter season.

It is not yet possible to produce adequate data to characterize the distribution of all of the Himalayan bumblebee species and the Red List status of each of them cannot yet be evaluated.

Bombus albopleuralis (queen).

Bombus melanurus (queen).

Khurandi Hill, Chamba (Himachal Pradesh) 2480 m.

Bhutu Nala, Chamba (Himachal Pradesh) 2208 m.

Kongdoori (Kashmir) 2898 m.

Dawar (Gurez Valley) 2800 m.

Area surveyed from September to October, 2020.

A talk on Himalayan bumblebees was given by Paul Williams (available at youtu.be/nAFrzFbvruo) for the *Indian Pollinator Initiative* (https://www.ncbs.res.in/events/indian-poll). A freely downloadable species-identification guide to *The Bumblebees of the Himalaya* with an updated list of species to support the new Himalayan bumblebee survey will be published during 2021.

SOUTH EAST ASIA

Approximately 27 species are currently recognised. No species have yet been assessed for Red List status within South East Asia. Of the total, five species are considered endemic, so 22 need to be assessed beyond South East Asia. Many of these non-endemic species are restricted to the border regions with the East Asia region. Within South East Asia, plans are being made for recording and databasing of bumblebee distributions.

South East Asia Region in 2020

Panuwan Chantawannakul / Jonathan Koch / Pham Hong Thai / Chawatat Thanoosing / Hliang Minoo / Paul Williams

During 2020, restrictions on mobility for the pandemic have impeded our research in Southeast Asia. However, we have continued our research on the biodiversity of bumblebees and we plan to expand to include other wild bee species residing in the region.

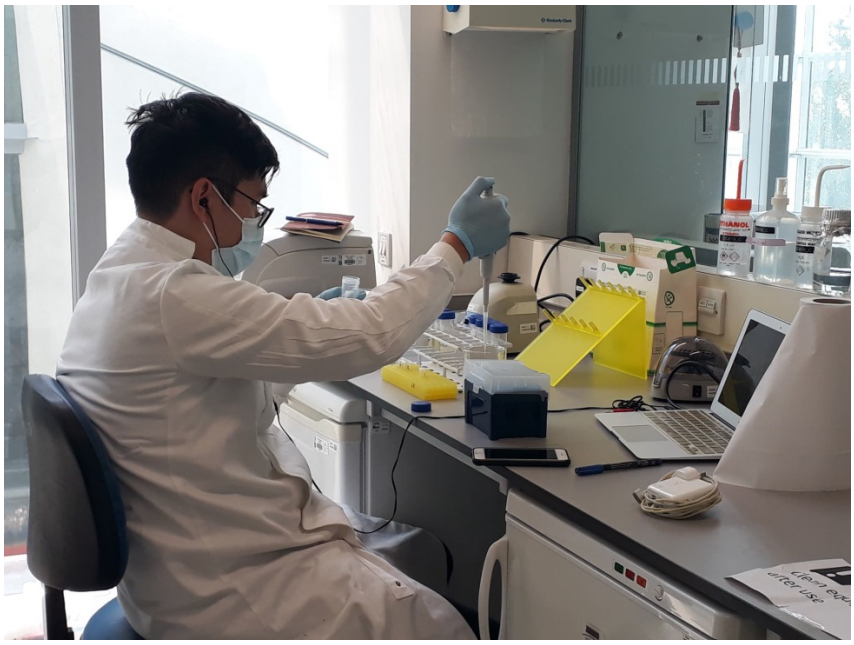
Jonathan Koch has published an interesting paper on the observation of a Philippine bumblebee, *B. irisanensis*, in the iNaturalist database. Only two species are currently found in the Philippines (*B. irisanensis* and *B. flavescens*). This emphasizes the importance of citizen-science-generated data for the conservation of bumblebees and for the protection of their habitats.

Chawatat Thanoosing has also been working together with Prof. Dr Pham Hong Thai to study the diversity of food plants used for pollen by bumblebees in Vietnam (photo below). This work shows the importance of bumblebees for pollination services in Southeast Asia and one role of molecular techniques in this research. Currently, laboratory work and data analyses are being conducted at the Natural History Museum, London (photo below).

Reference

Wilson JS, Pan AD, General DEM, Koch JB (2020) More eyes on the prize: an observation of a very rare, threatened species of Philippine bumble bee, *Bombus irisanensis* , on iNaturalist and the importance of citizen science in conservation biology. *Journal of Insect Conservation*, https://doi.org/10.1007/s10841-020-00233-3

A colony of B. haemorrhoidalis was collected from the field and kept in a wooden box (Apis cerana hive) in a garden for observation of behavior at Trung Son Commune, Yen Son District, Tuyen Quang Province, Vietnam. (Photo: Pham Hong Thai.)



Chawatat Thanoosing working on bumblebee-food-plant relationships in August at the NHM molecular laboratory, after the museum had been closed for five months due to the pandemic. (Photo: Angelina Ceballos-Escalera Fernandez.)

The BBSG is making progress with species assessments in much of the world, but much still remains to be done, especially in some of the most species-rich regions. This is a good time to share experiences on how best to overcome problems in applying IUCN Red List criteria to bumblebee data. We are especially looking forward to exploring ways to combine our quantitative analyses from different regions into global Red List assessments for the widespread species. As ever, let us know what you need and we will try to find a way to help.

London 15 February 2021