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The American Resin bee *Megachile* (*Chelostomoides*) *otomita* Cresson, 1878 established on Tenerife, Canary Islands (Spain) (Hymenoptera, Anthophila)

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Zusammenfassung

Tim Strudwick, Bernhard Jacobi: Nachweis der amerikanischen Blattschneiderbiene *Megachile* (*Chelostomoides*) *otomita* Cresson, 1878 auf Teneriffa (Hymenoptera, Anthophila). Die ursprünglich in Amerika beheimate *Megachile otomita*, konnte 2015 auf Teneriffa nachgewiesen werden. Die Art konnte an weiteren Fundorten festgestellt werden und gilt somit als indigen.

Summary

Megachile otomita, originating from the Americas, has been discovered on Tenerife in 2015. The species has since been recorded in other locations on the island and can thus be regarded as established.

Resumen

Megachile otomita, originaria de las Américas, se ha descubierto en Tenerife en el año 2015. La especie se puede considerar establecida dado que se ha registrado en diversos lugares de la isla.

Introduction

Because many Megachile bees are nesting in pre-existing cavities in woody materials, they are especially prone for accidental transport by trade to places they are not native to.

A well known example is the Giant Resin bee *Megachile* (*Callomegachile*) *sculpturalis* from East Asia (Japan, China). It was first reported from North Carolina, USA by Mangum & Brooks (1997), from where it has expanded its range considerably since (e. g. Parys et al. 2015).

In 2008 it was first recorded for Europe in Southern France (Vereecken & Barbier 2009) and has successfully spread to several neighbouring European countries since (Westrich et al. 2015).

Less known is the case of *Megachile* (*Callomegachile*) *rufipennis* (Fabricius, 1793), brought across the Atlantic from West Africa to the West Indies, most likely with slave ships (Genaro & Franz 2008). While there are several European Megachile species having successfully colonized parts of America, *Megachile* (*Pseudomegachile*) *ericetorum* Lepeletier, 1841 may serve as a fairly recent example (Canada: Sheffield et al. 2010; USA: Jacobi & Stafford 2012), accidental colonization in the opposite direction has not been recorded so far. A first case is reported in this paper.

Taxonomic history

The taxonomic history of the species was compiled by Raw (2004), some details below were taken from the original descriptions.

Cresson (1878) described the species *Megachile otomita* from 4 male specimens originating from Mexico.

Friese (1916) [possibly correctly 1917, because of delayed publication during World War I] described *Megachile squamosa* based on 2 female specimens from Costa Rica and 1 male from Colombia.

Fig. 1: *Megachile otomita* ♀ collecting pollen from *Andira inermis* (Fabaceae) , Costa Rica, 12.2.2009 (photo: R. Coville).

Fig. 2: *Megachile otomita* ♀ collecting pollen from *Andira inermis* (Fabaceae) , Costa Rica, 11.2.2009 (photo: R. Coville).

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Cockerell (1919) described *Megachile knabi* based on male specimen(s?) from Mexico. Mitchell (1930) declared both *M. squamosa* and *M. knabi* synonyms of *M. otomita*.
Snelling (1990) used the genus name *Chalicodoma* for *Megachile otomita*, while Gonzalez in his unpublished Ph. D. thesis (2008) used *Thaumatosoma* for all species in subgenus *Chelostomoides*.

Geographical and altitudinal distribution in the Americas

According to Snelling (1990) and Asher & Pickering (2018) *Megachile otomita* is distributed from Mexico (vast majority of records) south of 22° N on both the Caribbean and Pacific slope through Mesoamerica (Belize, Costa Rica (Figs.1 and 2), El Salvador, Guatemala, Honduras, Nicaragua) to Colombia and Peru. We did not succeed tracing records from Panama and Ecuador, though, even if presence of *Megachile otomita* seems possible in these countries. From records accessible to us *Megachile otomita* has not been found in altitudes exceeding 2000 m above sea level.

Natural history data from natural habitats

Friese (1921) reports on the nesting behaviour after the observations of Schmidt, who used trap nests (lengths of bamboo) and documented the use of resin for cell partitions and closures and the existence of thin cocoons spun by the larvae. In one nest 8 brood cells were counted. There was no empty ante-cell. Eclosion from this nest occurred two months after final closure.
Raw (2004) summed up existing evidence on flower visitation. *Megachile otomita* seems to be a rather broad polylege, visiting flowers of several plant families: Fabaceae, Asteraceae, Labiatae, Polygonaceae.
R. Torres-Cervantes (in. lit.) observed pollen collection on *Wigandia urens* (Boraginaceae). The range of taxa used for pollen collection might be narrower, though, as we are unaware of any analysis of pollen loads or brood provisions.
Apparently, at least when the large area of distribution is considered, *Megachile otomita* seems to be active during all months of the year. Locally phenology might well be restricted to months with sufficient pollen and nectar sources, though.

Climate in natural range

The climate in the natural range of *Megachile otomita* varies from subtropical (parts of Mexico) to tropical (further south, e. g. Costa Rica), with the latter prevailing proportionally. So obviously *Megachile otomita* is euryoecious, having a rather broad spectrum of climatic conditions (temperature, precipitation among others) it can thrive in. Most likely *M. otomita* does not occur in the small patches of warm temperate climate in Middle-America, like on slopes of higher mountains.

Results

Records from Tenerife

In 2015 Tim Strudwick found a *Megachile* species on Tenerife, which he was unable to identify, as it did not agree with any of the *Megachile* species recorded from Tenerife nor from the remaining Canary Islands so far.
A request for identification was passed on to Bernhard Jacobi. Initially an Australian provenance was suspected, as several of the many *Megachile* (*Hackeriapis*) species, down under' look quite similar.
Gonzalez in his unpublished doctoral thesis (2008) highlights the morphological similarities between subgenera *Hackeriapis* (Oriental) and *Chelostomoides* (American).
Both Terry Griswold and Victor Gonzalez (in lit.) narrowed in the ID to the American subgenus *Chelostomoides* and suggested *Megachile* (*Ch.*) *otomita* as a possible ID judging from the very detailed photos taken by Strudwick from pinned specimens (Figs. 3, 4).

Natural history data from Tenerife

Strudwick (rec. 1) observed (both sexes?) of *Megachile otomita* visiting *Launea arborescens* (Asteraceae).
Petra Jacobi (rec. 2) observed and photographed two females (Figs. 5–8) entering the wooden sheathing of a building bordering a wooden window frame and ne-

Tab. 1: Records of *Megachile otomita* (# = specimen taken; * = photos taken)

rec. no.	locality/coordinates	date	rec. by	n/sex	behaviour
1	Costa del Silencio	May 2015	Tim Strudwick (TS)	♀#,♂#	visiting *Launea arborescens*
2	Candelaria 28°20'59.71"N 16°23'14.17"W	Nov. 05 – 26.2016	Petra Jacobi	2 ♀*	provisioning and closing nests
3	Puerto de la Cruz	Dec. 26. 2017	Christer Slotte	1 ♂*	nectaring from *Echium giganteum*

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sting probably inside that frame. Both females were seen entering and provisioning one nest each for more than two weeks. One of the females built a final closure of her nest from semi-transparent resin. Even though suitable pollen and nectar sources (*Lotus* sp., *Bituminaria bituminosa*, *Lavendula* sp.) grew near flower visits were not observed, nor could the resin source be identified. A possible resin source growing near was a planted *Pinus canariensis*.

C. Slotte (rec. 3) observed a male nectaring from flowers of *Echium giganteum*. Given the use of Boraginaceae for pollen collection in Mexico, it does not seem unlikely females will use *Echium* species on Tenerife as pollen sources.

Fig. 3: *Megachile otomita* ♀ from Costa del Silencio, Tenerife (rec.1), May 2015 (photo: T. Strudwick).

Fig. 4: *Megachile otomita* ♂ from Costa del Silencio, Tenerife (rec.1), May 2015 (photo: T. Strudwick).

Fig. 5: *Megachile otomita* ♀ resting on tiled balcony floor Candelaria (rec. 2), Tenerife, 22.11.16 (photo: P. Jacobi)

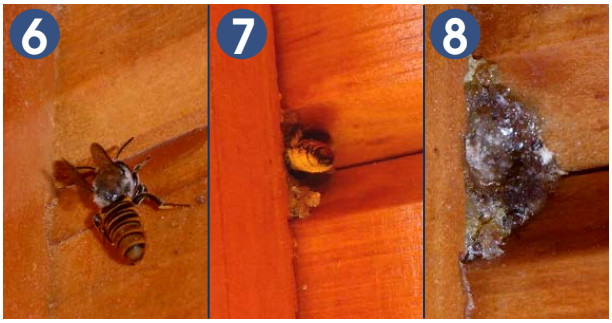

Fig. 6: *Megachile otomita* ♀ approaching her nest, 20.11.2016.
Fig. 7: another ♀ entering her obviously reused nest with pollen, 5.11.2016.
Fig. 8: same nest with final closure of resin, 20.11.2016 (photos: P. Jacobi).

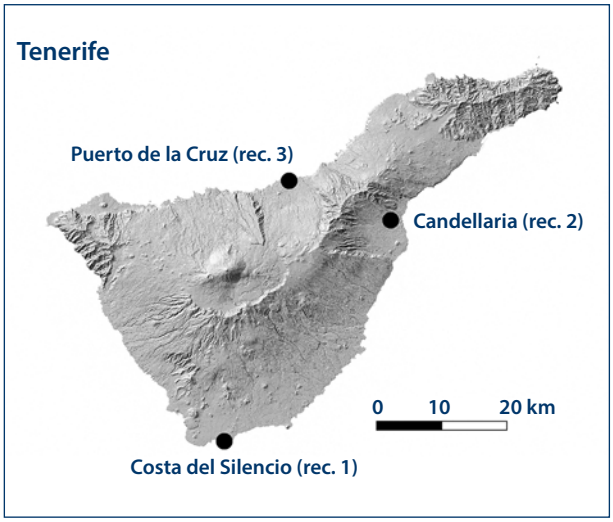

Fig. 9: Map of Tenerife with record sites of *Megachile otomita* (GRAFCAN 2018 Infraestructuras de Datos Espaciales de Canarias).

Discussion

Suitability of climate on Tenerife

Originating from subtropical to tropical climate *Megachile otomita* is confronted with the lower end of its temperature tolerance, at least in winter, on Tenerife. *Megachile otomita* is expected to restrict its further spread to low elevations on Tenerife, certainly avoiding higher elevations with the possibility of frost in winter. It seems to get along well with seasonal drought, encountered on Tenerife's south coast in the ‚piso basal' and has been found in Mexico under similar conditions. Within these limits *Megachile otomita* is expected to become a permanent part of the insect fauna of the Tenerife, possibly spreading further to other islands like Gran Canaria, which has a larger port, in Las Palmas, too.

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How did *Megachile otomita* arrive on Tenerife?

Probably *Megachile otomita* reached the island of Tenerife by means of transatlantic naval transport, for example by nests either in wooden casings of goods, bamboo lengths imported for horticultural purposes or hand-crafted decorative objects. As the species nests in pre-existing borings or tubular cavities in wood, these options seem quite plausible.

The biggest port on Tenerife suitable for containerships is Santa Cruz de Tenerife. There are two container piers in the port of Santa Cruz, Muelle Buffadero and Muelle de Contenedores with a (modest) storage capacity of 6000 and 5000 containers respectively.

Within the distributional range of *Megachile otomita*, six huge container ports might have served as a bridge-head(s) for the migration of *Megachile otomita* to Tenerife: Manzanillo (Mexico), Colon and Balboa (both Panama), Cartagena (Colombia), Guyaquil (Ecuador) and Callao (Peru). All of them are among the seven busiest (ranked by numbers of containers handled annually) container ports of Middle- and South America. Only the container port of Santos (Brazil) is larger still. Manzanillo, Balboa, Guyaquil and Callao are situated on the Pacific coast, so are rather distant potential places of origin, while Cartagena and Colon as Caribbean ports are closer. Travel time for a freight ship from Colon to the Canary Islands is less the two weeks on a direct route. According to Friese (1921) the time span from nest closure to eclosion of offspring is about 2 months, which gives ample time for transport even from a Pacific harbour like Manzanillo, through the Panama canal to Tenerife. With a bit of luck a single nest of *Megachile otomita* transported successfully to Santa Cruz de Tenerife would suffice to found a population of *Megachile otomita* there.

The distance between Santa Cruz de Tenerife and Candelaria (rec. 2) amounts to a mere 22 kilometres. Additionally the North-eastern trade wind could have supported any *Megachile otomita* having arrived in Santa Cruz or their offspring in covering that distance.

Costa del Silencio (rec. 1) is a further 45 km SW (downwind again) of Candelaria, so assuming migration to there from Candelaria does not seem unlikely, either. Most likely, on closer inspection, more locations with *Megachile otomita* presence will be found on the SE facing coastline of Tenerife.

Less easily explained is the find in Puerto de la Cruz (rec. 3) on the north coast of the island. Though there is small harbour, accidental road transport over a distance of less than 40 km in a western direction from Santa Cruz by road seems more likely.

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