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Field observations of the behaviour of the pollen wasp *Quartinia tenerifina* RICHARDS, 1969 (Hymenoptera, Vespidae, Masarinae) at flowers in Tenerife (Canary Islands, Spain)

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A b s t r a c t : The endemic pollen wasp *Quartinia tenerifina* was recorded from a sand habitat in Tenerife. The imagines visited flowers of four different plant families harvesting pollen at least from *Aizoon canariense* (Aizoaceae) and *Fagonia cretica* (Zygophyllaceae), indicating that the species is probably polylectic. Pollen was removed directly from the anthers with the mouthparts. The position of the imagines in different flowers varied depending on flower morphology and flowering phase. Males were searching for females at their forage plants.

K e y w o r d s : Palaearctic, flower associations, male behaviour, Boraginaceae, Caryophyllaceae.

Introduction

The Canary Islands are inhabited by three endemic species of the pollen wasp genus *Quartinia*. *Quartinia canariensis* BLÜTHGEN, 1958 has only been recorded from Fuerteventura and Lanzarote, *Q. guichardi* RICHARDS, 1969 from Gran Canaria and *Q. tenerifina* RICHARDS, 1969 from Tenerife and La Gomera (RICHARDS 1969, GUSENLEITNER 1990, HOHMANN et al. 1993). While the bionomics of *Quartinia canariensis* was recently studied in detail by Mauss & Müller (2016) knowledge of the other species is still very limited.

Material and methods

A population of *Quartinia tenerifina* was studied on four days between 26 March and 1 April 2016 at Malpaís de Güimar, 0.5 km to the south of El Socorro, Tenerife (28°19.311'N 16°22.065'W (WGS 84); 65 m a.s.l.). For all documentations of observations the local time (= Greenwich Mean Time + 1h) was used (sun's zenith at 14h05). Flower preferences of imagines were studied by counting the number of sightings (= first observations) of flower visiting individuals at the flowering plant species independent of the number of flowers or plants visited by an individual during a single observed foraging incident (a foraging incident started with the sighting of an individual and ended when the individual came out of sight). Observations were made with a close-up bino-

cular (Pentax Papilio 8.5x21) and documented by using a Canon EOS 70D camera with a 180 mm macro lens, a 25 mm extension tube (scale more than 1:1) and macro flash-lights. Specimens of all plant species visited by the wasps were collected and preserved dried. The material was placed in the herbarium of the Staatliches Museum für Naturkunde Stuttgart (Herbarium STU). The plant taxa were identified following HOHENESTER & WELSS (1993).

Results and Discussion

The habitat of *Quartinia tenerifina* was situated in a semidesertic lava plain (mean annual precipitation 158 mm, mean annual air temperature 19.7 °C; GOBIERNO DE CANARIAS 2004) and consisted of a large sand area with lava embankments running through it. The sandy ground was covered moderately by therophytic vegetation and scattered shrubs (Fig. 1). Remarkable abiotic factors were a nearly continuous, fresh northerly wind and only moderate air temperatures that rose up to a maximum of 22 °C during the diurnal flight period of *Q. tenerifina* (mean maximum air temperature in March 21.7°C; GOBIERNO DE CANARIAS 2004). *Quartinia canariensis* also inhabits sand biotopes (MAUSS & MÜLLER 2016), which seems to be the rule for species of *Quartinia* (GESS & GESS 2010) but is quite uncommon for other pollen wasps (GESS & GESS 2010, MAUSS 2007).

The diurnal flight period of males and females of *Quartinia tenerifina* lasted about 4.5 h from 11h26 (earliest record) until 15h56 (latest record). The activity at flowers stopped immediately whenever the sun was obscured by clouds. Imagines of *Quartinia tenerifina* were observed to visit flowers at plants belonging to four different families (Tab. 1). At least during their visits to *Aizoon canariense* and *Fagonia cretica* both males and females definitely took up pollen (Fig. 2, 4). This is in congruence with the findings of HOHMANN et al. (1993), who recorded males and females of *Q. tenerifina* also at *Polycarpha divaricata*, and also at plants belonging to the Asteraceae, Frankeniaceae, Lamiaceae and Rubiaceae, indicating that *Quartinia tenerifina* is probably polylectic sensu lato with regard to its pollen source (following the classification by MÜLLER & KUHLMANN 2008). The closely related *Quartinia canariensis* from Fuerteventura is also polylectic sensu lato (MAUSS & MÜLLER 2016).

In the course of the diurnal flight period the imagines of *Quartinia tenerifina* changed over from visiting *Fagonia cretica* in the morning to *Aizoon canariense* in the afternoon in congruence with their flower opening times. The flowers of *F. cretica* were open in the morning and started closing at approximately 11h45 leading to the complete closure of all flowers within the following hour. The flowers of *Aizoon canariense* began to open at about 12h30 and were completely closed by 16h30. Visits to *Polycarpha divaricata* and *Heliotropium ramosissimum* were only observed in the afternoon between 13h30 and 15h30.

At the flowers of *Fagonia cretica* only pollen harvesting was observed. The position of the imagines of *Quartinia tenerifina* during pollen uptake varied depending on the degree of flower opening. In open flowers the wasps held onto the style and the filaments of the stamens head upwards, while they removed pollen from the anthers with their mouthparts using their fore tarsi as a counterforce (Fig. 2). Whereas when the flowers were nearly closed the wasps held on to the outside of the petals close to their distal ends



Figs 1-2: (1) Habitat of *Quartinia tenerifina* at Malpaís de Güímar, Tenerife (in the foreground sandy soil with patches of *Aizoon canariense* visited by the wasps; in the background a lava embankment covered by succulent bush [*Kleinio neriifolii*-*Euphorbietea canariensis*]). (2) Female of *Quartinia tenerifina* taking up pollen directly from an anther of a flower of *Fagonia cretica* the petals of which have already started to close (note that the left fore tarsus of the female is placed on the filament closely below the anther).



Figs. 3-6: (3) Male of *Quartinia tenerifina* taking up nectar from a flower of *Aizoon canariense* (note the protruded proboscis). (4 **a-b**) Female feeding on pollen directly from the anthers of *Aizoon canariense*. (5) Male of *Quartinia tenerifina* standing on the ground near a plant of *Aizoon canariense*. (6) Male resting on a nearly closed flower of *Fagonia cretica*. (median body length of females 3.3 mm of males 2.9 mm).

while they were, as before, taking up pollen directly from the anthers with the mouthparts (position of the imagines as in Fig. 6). During pollen uptake at flowers of *Aizoon canariense* males and females of *Q. tenerifina* stood on the petals or on parts of the androecium or gynaecium with their hind and mid legs while the head was orientated towards the stamens in the centre of the flower (Fig. 4). Pollen was removed directly from the anthers through manipulation with the mouthparts and ingested while the fore tarsi were often placed on the filaments working as a counterforce (Fig. 4b). For the uptake of nectar from flowers of *Aizoon canariense* the wasps were situated further outwards in the flowers holding adjacent leaves with some of their hind and mid legs. The

head was positioned well above the proximal half of a petal with the proboscis protruding down into the small gap between the petals and the central cone of the flower (Fig. 3). On one occasion a female was observed to switch from pollen gathering to nectar uptake in the course of her visit to a single flower of *Aizoon canariense*. During flower visits to *Heliotropium ramosissimum* the single female observed put her head into the corolla tube. Altogether, the imagines of *Q. tenerifina* are apparently able to adapt their flower visiting behaviour to different flower types and even flowering phases.

Several times males of *Quartinia tenerifina* were observed to alight on the ground close to flowering plants of *Fagonia cretica* and especially *Aizoon canariense*. On the ground the males adopted a characteristic posture with their antennae raised and spread at an angle of approximately 45° to the longitudinal axis and their wings longitudinally folded (Fig. 5). After a short time the males regularly took off again and patrolled along the plants in a rather rapid irregular flight close above the flowers, making abrupt changes in direction before they again alighted on the ground. Only a single copulatory attempt was observed. It was initiated by a patrolling male pouncing on a female that, during pollen uptake, was holding onto the nearly closed corolla of a flower of *Fagonia cretica*. The male alighted on the back of the female and immediately flew off again after a short interaction. Similarly, *Quartinia canariensis* has been observed to stand on the ground close to forage plants of the females and to perform patrol flights along the flowers of these (MAUSS & MÜLLER 2016). Furthermore, waiting and patrolling of males at floral resources is also common for afrotropical species of *Quartinia* (GESS & GESS 2010). Females of *Q. tenerifina* were observed to stand on the ground close to their forage plants as has been observed for *Q. canariensis* (MAUSS & MÜLLER 2016). This might be an adaptation to the comparatively low air temperatures or the high wind speeds in their natural habitats. In this regard it is interesting that *Quartinia poecila* VON SCHULTHESS, 1930 when visiting flowers of *Brownanthus* sp. (Aizoaceae: Mesembryanthema) on a cold windy day at Lüderitzbucht on the south-west coast of Namibia was seen to stand on the ground in the shelter of the plant and from there to fly up to the flowers (SARAH GESS pers. com.).

Table 1: Sightings of flower visiting males and females of *Quartinia tenerifina* at the flowers of various plant taxa at Malpaís de Güímar, Tenerife.

plant taxon	sightings	
	♀	♂
<u>Aizoaceae</u>		
<i>Aizoon canariense</i> L.	4	5
<u>Boraginaceae</u>		
<i>Heliotropium ramosissimum</i> SIEBER ex DC.	1	
<u>Caryophyllaceae</u>		
<i>Polycarpha divaricata</i> (AITON) POIR. Ex STEUD.	3	
<u>Zygophyllaceae</u>		
<i>Fagonia cretica</i> L.	3	2

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Zusammenfassung

Die endemische Pollenwespen-Art *Quartinia tenerifina* wurde auf Teneriffa in einem Sandhabitat gefunden. Die Imagines besuchten Blüten von vier verschiedenen Pflanzenfamilien, wobei mindestens an *Aizoon canariense* (Aizoaceae) und *Fagonia cretica* (Zygophyllaceae) Pollen aufgenommen wurde. Daher ist die Art wahrscheinlich polylektisch. Die Pollenaufnahme erfolgte mit den Mundwerkzeugen direkt aus den Antheren. Die Position der Imagines in der Blüte variierte dabei je nach Blütenform und Blühphase. Männchen suchten an den Blüten nach Weibchen.

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