THE FIRST ACCOUNT ON THE SPIDER WASPS OF BONAIRE (HYMENOPTERA: POMPILIDAE)

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Prior to the Bonaire Estafette Expeditie no records of Pompilidae were known from Bonaire. During the expedition several trapping methods were deployed, which yielded material of four species belonging to three genera: *Ageniella*, *Anoplius* and *Aporinellus*. The material of *Ageniella* likely belongs to two species new to science, that of the other two genera has been identified to species level. Especially pan traps proved important for collecting Pompilidae, although *Anoplius* has only been sampled using other methods. A checklist and key to the species of Bonaire is provided.

INTRODUCTION

During the Bonaire Estafette Expeditie (BEE) (Kalkman et al. 2025), which was held from October 2022 to March 2023, several participants collected Pompilidae (spider wasps). According to the Dutch Caribbean Species Register (Dutchcaribbeanspecies.org) no published records of Pompilidae are known from the ABC islands (Aruba, Bonaire and Curaçao). For the SSS Islands (Sint Eustatius, Sint Maarten and Saba) three species have been recorded: *Pepsis rubra* (Drury, 1773), *Pepsis ruficornis* (Fabricius, 1775) and *Anoplius lepidus* (Say, 1836) (Simon Thomas 1984). According to Fernández (2001) circa 800 species of this family occur in the Neotropics.

METHODS

The majority of the Pompilidae material was collected with the use of pan traps and malaise traps, with smaller numbers caught in pitfall traps. Relatively few spider wasps were caught manually and with a butterfly net. At least one specimen of *Anoplius americanus* was caught visiting flowers. Catching Pompilidae with a net is difficult as they move (by a combination of running and flying) on or just above the earth. Because of the uneven terrain, swiping close enough to the ground was often impossible, and putting a net over the wasp resulted in the wasp escaping between the net rim and the stony surface. Manually catching the wasp by placing a long tube over them proved to be a better method, although this takes a lot of patience and practice.

Of each species a number of specimens were pinned and additionally a number of the smaller specimens were mounted on cards. The rest of the material has been preserved in 70 % ethanol. Several specimens have been sampled for DNA sequencing and their barcodes will become available through ARISE (Arise-biodiversity.nl).

For identification we used Banks (1946), Evans (1966, 1969, 1973), Fernández et al. (2017), Pitts & Sadler (2019), Pitts et al. (2017), Waichert et al. (2012, 2018) and Wasbauer & Kimsey (1985). Identifications were subsequently checked by comparing the specimens with material present in the collection of Naturalis Biodiversity Center (Leiden, the Netherlands).

For nomenclature we follow Fernández et al. (2022). The mounted specimens will be stored in the Naturalis collection. Information on collection localities and dates will be inserted in the Collection Registration System of Naturalis and from there will become available on GBIF.

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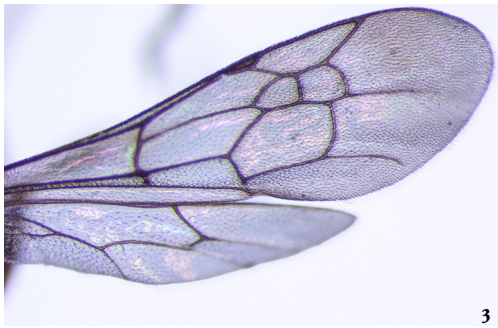

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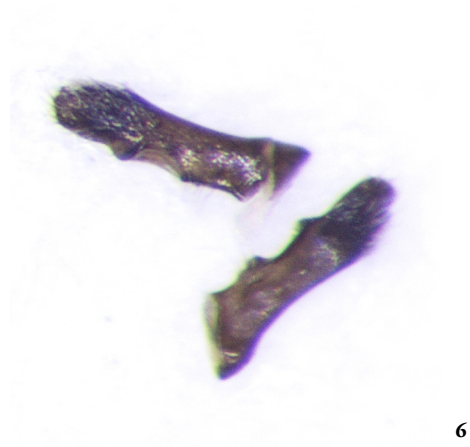

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Figure 1-6. *Ageniella* spec. 1, ♂, 1. lateral, 24-31.x.2022, Bonaire, Kas Sientífiko, 2. head and antennae, 29.x.2022, Bonaire, Lagadishi, RMNH.5155149, 3. *Ageniella* spec. 1, right wings, 29.x.2022, Bonaire, Lagadishi, RMNH.5155146, 4. *Ageniella* spec. 1, apex abdomen, 21.II.2023, Bonaire, Kas Sientífiko, 5. *Ageniella* spec. 1., genitalia, 29.x.2022, Bonaire, Lagadishi, RMNH.5155149, 6. *Ageniella* spec. 1, parameres, 29.x.2022, Bonaire, Lagadishi, RMNH.5155149. All photos Jan Wieringa & Aglaia Bouma.

RESULTS

During the BEE a few dozen specimens of Pompilidae were collected, belonging to three genera. Two of these were identified to (sub)species level (*Anoplius americanus ambiguus* (Dahlbom, 1845) and *Aporinellus apicipennis* (Brèthes, 1910) while the other two could only be identified to genus level (*Ageniella* spec. 1 and *Ageniella* spec. 2).

Anoplius americanus ambiguus

This red and black species (fig. 17) was only recorded twice, at the sewage works of Kralendijk, a largely man-made habitat, near the end of the BEE (27.II & 2.III.2023). The phenology of this species possibly overlaps with the expedition only during this last month of the BEE.

Aporinellus apicipennis

This species is distinguished from the other spider wasps found on Bonaire by the absence of a red or orange pattern on the abdomen. Instead, they have a pattern of mottled grey bands (fig. 18-19). It was caught on three occasions: two individuals in a malaise trap (1-6.XI.2022, Kralendijk), a single specimen caught by hand at the Sewage Works at Kralendijk (20.II.2023) and 12 specimens in a pan trap (21.II.2023, Kas Sientífiko).

Using the key to the Mexican and Central American species (Evans 1966) these specimens key-out as *A. yucatanensis* (Cameron, 1893), a species known from the United States to Costa Rica (Evans 1966, Fernández et al. 2022). However, the male genitalia do not match with the illustration of the genitalia of *A. yucatanensis* provided by Evans (1951, fig. 199 as *A. sinuatus*) as in our material the parameres are acute and not truncated as in *A. yucatanensis*, have straight instead of wavy hairs on the apex and lacks club-shaped hairs (or any other hairs) on the inner side of the digitus. In addition to the *Aporinellus* species occurring in Mexico and Central America, two more species are known from South America (Fernández 2022). *Aporinellus apicipennis* described from Argentine (Brèthes 1910) and *A. fucatus* (Kohl, 1905), only known from Chile. The last species shows interrupted grey bands on its first three abdominal segments (Kohl 1905).

Fernández et al. (2017) mention the occurrence of *Aporinellus* in Colombia, but abstain from identifying it to the species level. *Aporinellus apicipennis* has been recorded from Bolivia and Brazil (Fernández et al. 2022, based on Banks 1947). However, the Naturalis collection also contains 14 specimens of this species from Zanderij (Surinam), two of which identified by Evans. They strongly resemble our specimens, including a more acute paramere and straight hairs on the apex of the digitus. There seems to be a slight difference in the shape of the parapenial lobes compared to those of the Surinam specimens. In the specimens from Bonaire the lobes are broader than in those of Surinam. Future research on more material should establish whether more than one species is present in northern South America, and to which the name *A. apicipennis* applies. That is, if it applies to any of these, since the type is from Buenos Aires and might as well represent an exclusively temperate South American species. For now, we tentatively assume all records to belong to a single widespread species and we use the name *Aporinellus apicipennis* for the species occurring on Bonaire.

Ageniella

The majority of Pompilidae collected belong to the genus *Ageniella*. No less than 74 species of this genus occur in the Neotropics (Fernández et al. 2022), of which 42 are found in Brazil (Waichert et al. 2018, Rapoza & Waichert 2022).

In the Bonaire material, the males can be split into two groups most likely representing two different species. The differences lie in the colouration. No differences were found in the genitalia.

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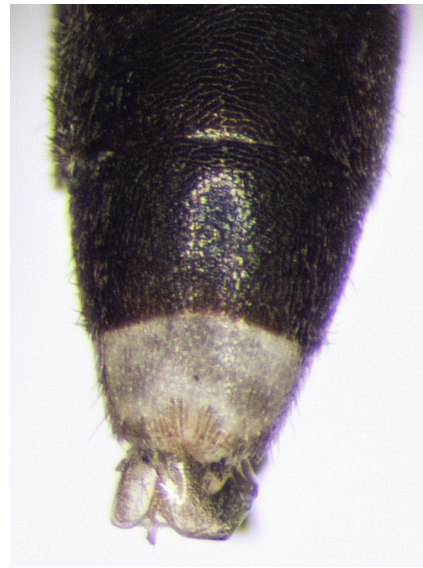

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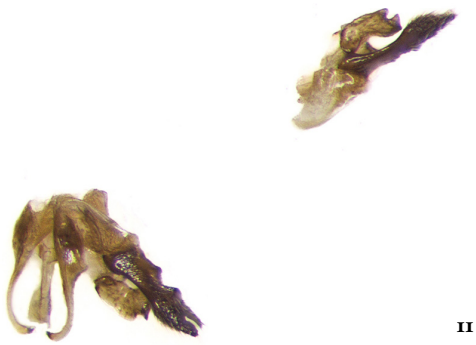

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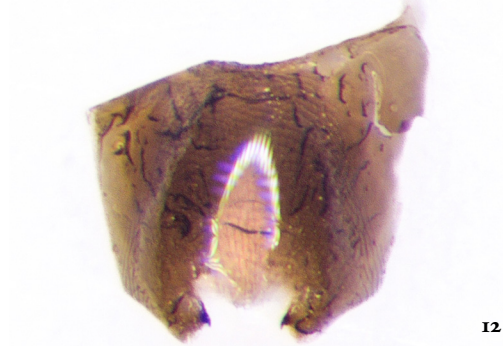

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Figure 7-12. *Ageniella* spec. 2, ♂, 7. 29.x.2022, Bonaire, Lagadishi, 8. head and antennae, 29.x.2022, Bonaire, Lagadishi, 9. right wings, 29.x.2022, Bonaire, Lagadishi, 10. apex abdomen, 29.x.2022, Bonaire, Lagadishi, 11. genitalia, 29.x.2022, Bonaire, Lagadishi, 12. sixth sternite, 24-31.x.2022, Bonaire, Kas Sientífiko.

Ageniella spec. 2 is generally paler than *Ageniella* spec. 1. It could be that these differences are simply related to maturation, with *Ageniella* spec. 2 referring to specimens that have not yet reached full colouration. However, in *Ageniella* spec. 2 the black is always absent in the same areas where they are present in *Ageniella* spec. 1 (black band between the eyes, propodeum, mid femur) and it shows a larger white area in the last tergite. Such differences in colouration have been used in South America to distinguish between species and for that reason we deem it likely that two species are involved.

The collected females are all similar but cannot be linked to either of the two male groups. Since we only have a few females, it is possible that only females belonging to one of the two male groups have been collected. We aim to link the females to the groups using DNA.

We are currently not able to name them to species, likely they are new to science. These two species seem closely related and may have evolved from a common ancestor. Both *Ageniella* species were collected, sometimes simultaneously, at different occasions at Lagadishi and Kas Sientífiko. These species seem to be confined to xerotherm scrubland. A full analysis of the phenology and specimen details will be published in a future paper where these species will be formally described.

A morphological description of the males of the two species of *Ageniella* and one for the collected females is provided below.

***Ageniella* spec. 1, ♂ (fig. 1-6)**: head orange with a dark band between the eyes over the ocelli, sometimes interrupted between the ocelli. Antennae dark dorsally, lighter (dirty orange) below, with the apical 4-7 elements completely dark. Wings fairly clear with a smoky apex and a very vague band in the zone of the submarginal cells. Front legs orange, femur darker dorsally. Middle legs: coxae and femur black, sometimes paler near the knee, tibia and tarsi orange and more or less tinged with black, spurs dirty white. Hind legs: coxae and femur black, coxae with a pale apical lobe, knees often paler, tibia and tarsi fairly dark, spurs dark brown. Propodeum usually black, but in some specimens orange or partly orange. Gaster black, except the last visible tergite which is white in the centre with black side and hind margins. Paramere in profile with two teeth, the apical one formed by an elevated ridge that continues toward the base in a horseshoe-shaped lower ridge that ends in a sharp 'peak', the second tooth. Parapenial lobe pale with darkened tip, curved circa 80-90°, apex broadening, flattened and sharp.

***Ageniella* spec. 2, ♂ (fig. 7-12)**: head orange without a dark band between the eyes. Antennae dark dorsally, lighter (orange) ventrally, the last 2-3 segments darker at the apex. Wings fairly clear with a smoky apex and a very vague band in the zone of the submarginal cells. Front legs orange, femur darker dorsally. Middle legs: coxa black, with a pale apical lobe, femur brown, with a longitudinal red spot outside at base and paler near the knee, tibia and tarsi orange more or less tinged with black, spurs dirty white. Hind legs: coxa and femur black, coxa with a pale apical lobe, knees sometimes somewhat paler, tibia and tarsi fairly dark, spurs dark brown. Propodeum red. Gaster black, except the last visible tergite which is white with black side margin. Paramere in profile with two teeth, the apical one formed by an elevated ridge that continues toward the base in a horseshoe-shaped lower ridge that ends in a sharp 'peak', the second tooth. Parapenial lobe pale with darkened tip, curved circa 80-110°, apex broadening, flattened and sharp.

***Ageniella* ♀ (fig. 13-16)**: head orange without a dark band between the eyes. Antennae orange, darker near the apex, especially dorsally. Wings with three distinct smoky bands, visible with the naked eye: an apical band, one over the submarginal cells and one along the Rs, M, cu-a veins. Front legs orange, femur darker dorsally. Middle legs: coxa brown, dorsally more orange, femur

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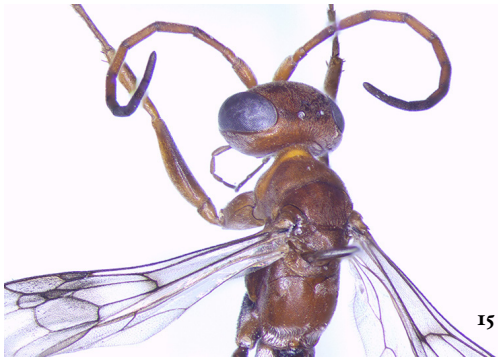

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Figure 13-16. *Ageniella* spec., ♀, 13. dorsal, 29.x.2022, Bonaire, Lagadishi, 14. lateral, 29.x.2022, Bonaire, Lagadishi, RMNH.5155152, 15. head and thorax, 29.x.2022, Bonaire, Lagadishi, RMNH.5155152, 16. right wings, 29.x.2022, Bonaire, Lagadishi, RMNH.5155152.

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Figure 17. *Anoplius americanus ambiguous*, ♂, 20.II.2023, Bonaire, Sewage Works Kralendijk.

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Figure 18-19. *Aporinellus apicipennis*, ♀, 21.II.2023, Bonaire, Kas Sientífiko, 18. lateral, 19. left wings.

brown, with a longitudinal red spot outside at base and paler near the knee, tibia and tarsi orange more or less tinged with black, spurs brown. Hind legs: coxa brown, dorsally more orange, femur brown, knees sometimes somewhat paler, tibia fairly dark, spurs dark brown, tarsi orange. Thorax including propodeum red. Gaster black, apex of last visible tergite somewhat paler.

KEY TO THE POMPILIDAE OF BONAIRE

Liris spec. which belongs to the Crabronidae is included in the key as its general habitus and its behaviour make it easy to confuse with a spider wasp.

1 Body totally black. Ridges on frons form an M. ..... ***Liris*** (Crabonidae)
– Body orange with black, red with black or mottled black with grey. Frons lacking ridges 2

2 Body black with mottled grey bands. Pronotum grey with a central shiny black band ..... ***Aporinellus apicipennis***
– Body black with red or orange (and some white). Pronotum either black with a white line or partly orange 3

3 Body mainly black, the apical ¾ of the first, the entire second, and the anterior half of the third abdominal tergite red. Head black, face with silvery hairs. Pronotum with a fine white line just before the posterior margin, shortly interrupted in the middle. Middle tibia with black spurs ..... ***Anoplius americanus ambiguous***
– Body orange and black. Most of the head, the fore tibia and the pronotum orange. No white line present on the pronotum. Middle tibia with white spurs 4

4 Females ..... ***Ageniella*** spec.
Males 5

5 Head orange with a black band between the eyes ..... ***Ageniella*** spec. 1
– Head orange ..... ***Ageniella*** spec. 2

DISCUSSION

During the fieldwork spider wasps were collected with five different methods: pan traps, malaise traps, pitfalls, a butterfly net and manual capturing using a tube. Both *Ageniella* and *Aporinellus* were collected with pan traps and malaise traps. *Ageniella* was collected in pitfall traps as well. All *Anoplius* and some *Aporinellus* were collected with the use of a tube or a butterfly net. Manually catching with a tube also yielded a large number of Crabronidae belonging to the genus *Liris* (Klein 2024). This species looks and behaves like a spider wasp resulting in several hymenopterologists having mistaken them for spider wasps. For this reason, we have included it in our key.

The above shows that a combination of methods, biotopes and temporal ranges is needed to get a proper overview of the Pompilidae fauna. The fact that one of the species, *Anoplius,* was only found in one location in the last weeks of fieldwork using a single method shows that it is likely that more species occur on the islands.

The four species recorded from Bonaire are the first records of spider wasps from the ABC islands and it is likely that at least some of these species can be found on Curaçao and Aruba as well. None of these four are known from the sss islands. There only *Anoplius lepidus* (Say, 1836) and two species of *Pepsis* are known. *Pepsis* is a genus that primarily hunts for tarantulas (Theraphosidae). Tarantulas are not recorded from the ABC islands (Crews et al. 2019) and it is therefore not likely that *Pepsis* is to be found on these islands. *Anoplius americanus ambiguus* however might very well occur on the sss islands, rendering it the only common element if found.

Almost nothing is known about the biology of the Pompilidae occurring on Bonaire and no observations were made on the species of spiders caught by the spider wasps. With the collecting methods used the prey of the wasps cannot be assessed.

ACKNOWLEDGEMENTS

We would like to thank the crew of Stichting Nationale Parken Bonaire (STINAPA) for their support and the use of their field station.
To Cecilia Waichert we express our gratitude for fruitful discussions regarding neotropical Pompilidae. All other BEE teams worked hard to gather specimens, resulting in a precious time series of specimens.

LITERATURE

Banks, N. 1946. Studies of South American Psammocharidae. Part I. – Bulletin of the Museum of Comparative Zoology 96: 311-525.

Banks, N. 1947. Studies of South American Psammocharidae. Part II. – Bulletin of the Museum of Comparative Zoology 99: 371-486.

Brèthes, J. 1910. Himenópteros Argentinos. – Anales del Museo Nacional de Buenos Aires 20 (= s.3, t.13): 205-316.

Crews, S.C., A.O. Debrot, G. van Hoorn, W. Galvis & L.A. Esposito 2019. The arachnids (Arachnida) of Aruba, Bonaire, and Curaçao. – Caribbean Journal of Science 49: 125-140.

Evans, H.E. 1951. A taxonomic study of the Nearctic spider wasps belonging to the tribe Pompilini (Hymenoptera: Pompilidae). Part iii. – Transactions of the American Entomological Society 77: 203-330.

Evans, H.E. 1966. A revision of the Mexican and Central American spider wasps of the subfamily Pompilinae (Hymenoptera: Pompilidae). – Memoirs of the American Entomological Society 20: 1-442.

Evans, H.E. 1969. Studies on Neotropical Pompilidae (Hymenoptera). v. *Austrochares* Banks. – Psyche 76: 18-28.

Evans, H.E. 1973. Studies on Neotropical Pompilidae (Hymenoptera). IX. The genera of Auplopodini. – Psyche 80: 212-226.

Fernández, F. 2001. Checklist of genera and subgenera of aculeate Hymenoptera of the Neotropical Region (Hymenoptera: Vespomorpha). – Biota Colombiana 2: 87-130.

Fernández, F, V. Castro, J. Rodríguez, C. Waichert & J.P. Pitts 2017. Avispas cazadoras de arañas de Colombia (Hymenoptera: Pompilidae). – Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá. [Fauna de Colombia 6]

Fernández, F., J. Rodríguez, C. Waichert, B. Decker & J. Pitts 2022. Twenty two years later: An updated checklist of Neotropical spider wasps (Hymenoptera: Pompilidae). – Zootaxa 5116: 451-503.

Kalkman, V.J., J. Sarpong, J. van Blerk & J. van der Ploeg 2025. Bonaire Estafette Expeditie, an inventory of the terrestrial invertebrates of Bonaire. – Nederlandse Faunistische Mededelingen 64: 1-21.

Klein, W. 2025. The digger and sand wasps of Bonaire (Hymenoptera: Spheciformes). – Nederlandse Faunistische Mededelingen 64: 125-134.

Kohl, F.F. 1905. Hymenopterentypen aus der Neotropischen Fauna. – Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien. 55: 338-366.

Pitts, J.P. & E.A. Sadler 2019. Redescription of *Neanoplius* Banks (Hymenoptera: Pompilidae). – Zootaxa 4568: 571-580.

Pitts, J.P., C. Waichert & E.A. Sadler 2017. Review of the Neotropical spider wasp subgenus *Anoplius* (*Dicranoplius*) Haupt (Hymenoptera: Pompilidae), new comb. – Zootaxa 4311: 537-550.

Rapoza, M. & C. Waichert 2022. Two new species of *Ageniella* Banks, 1912 (Hymenoptera: Pompilidae) from Brazil and updated keys. – European Journal of Taxonomy 787: 71-85.

Simon Thomas, R.T. 1984. Notes on the Hymenoptera Aculeata from St. Martin, Saba, and St. Eustatius. – Studies on the fauna of Curaçao and other Caribbean Islands 67: 92-97.

Waichert, C., C.D. von Dohlen, J. Rodríguez & J.P. Pitts 2012. The spider wasps (Hymenoptera: Pompilidae) of the Dominican Republic. – Zootaxa 3353: 1-47.

Waichert, C., W.D. Colombo, C.D. von Dohlen & J.P. Pitts 2018. Taxonomic contributions to *Ageniella* Banks, 1912 (Hymenoptera: Pompilidae) from Brazil. – Zootaxa 4403: 133-153.

Wasbauer, M.S. & L.S. Kimsey 1985. California spider wasps of the subfamily Pompilinae. – Bulletin of the California Insect Survey 26: 1-130.

SAMENVATTING

Eerste bijdrage aan de kennis van de spinnendoders van Bonaire (Hymenoptera: Pompilidae)
Voorafgaand aan de Bonaire Estafette Expeditie waren geen spinnendoders (Pompilidae) bekend van Bonaire. Tijdens de expeditie zijn verschillende verzamelmethoden toegepast die materiaal opleverden van vier soorten uit drie genera: *Ageniella*, *Anoplius* en *Aporinellus*. Het materiaal van *Ageniella* behoort waarschijnlijk tot twee nog onbeschreven soorten. Dat van de twee andere genera is gedetermineerd tot soortniveau, alhoewel dat van *Aporinellus* mogelijk tot een soortcomplex behoort. Het materiaal is verzameld met vlindernetten, bodemvallen, malaisevallen, kleurvallen en handmatig met buisjes. Vooral kleurvallen bleken zeer geschikt voor het verzamelen van Pompilidae, maar *Anoplius* is hiermee niet bemonsterd. Een checklist en sleutel tot de soorten van Bonaire worden gepresenteerd.

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