Report of a finding of Trichocera maculipennis in Antarctic Specially Protected Area 128

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Summary

This paper was prepared to report to the Consultative Parties and to the wider Antarctic community the finding of non-native *Trichocera maculipennis* (Diptera) imago individuals in the 2022/2023 austral summer season in Antarctic Specially Protected Area no. 128 in the Western Shore of Admiralty Bay, King George Island, South Shetland Islands.

Background

The boreal trichocerid fly *Trichocera maculipennis* is a species that is primarily known from the Northern Hemisphere, inhabiting the Boreal Zone (also found in Europe in caves or mines) as well as the sub-Arctic and Arctic Zones - Greenland, sub-Arctic islands, and Scandinavia (Petrašiūnas & Weber, 2013). In the boreal zone, these insects reproduce twice a year, whereas in the Arctic zone, they reproduce only once a year during the summer season. *T. maculipennis* has four larval stages, where pupation usually lasts only a few hours, and adults can even emerge through the snow layer (Hågvar & Krzemińska, 2008). It is believed that they were brought to Antarctica with supplies for science stations or with tourists. *T. maculipennis* flies are perfectly adapted to low temperatures, which allows them to spread to high latitudes. They mainly occur in the vicinity of human aggregates, preying on dead organic matter, including sewage systems (Carlsson, 1962). Adults are active at low temperatures, although they do not fly at temperatures below -10 °C. The development of eggs and the pupation of larvae is possible in the temperature range of -1.5 °C to 18.0 °C, and larvae are able to survive when frozen in ice (Dahl, 1969, 1970; Platcher, 1983). *T. maculipennis* larvae have been detected in nutrient-rich substrates, such as decomposing plant matter and excrement, or as pests in stored vegetables (Volonterio et al., 2013).

The first report documenting the presence of *T. maculipennis* on King George Island was from the Uruguayan Base Científica Antártica Artigas in 2006 (Volonterio et al., 2013). Subsequently, there have been reports of the fly within or in the surroundings of the following stations on the island: Artigas, Arctowski, Escudero, Frei, Fildes, and King Sejong. This species has established itself in natural areas, as well as within buildings such as sewage treatment plants, scientific research stations, military bases, and hydroponic installations (Hughes et al., 2005; Volonterio et al., 2013).

The non-native *T. maculipennis* fly was first reported at the Polish Antarctic Arctowski Station with live larvae and adult individuals in the sewage system in October 2017 (Potocka & Krzemieńska, 2018). Only a few adult individuals were observed outside the facility at a distance of less than 50 cm from the septic tank (Potocka et al., 2020). Since their discovery, their presence has been recorded on a regular basis. Imago individuals of *T. maculipennis* have been recorded at Arctowski Station throughout the year.

Since its first discovery, systematic monitoring and control measures have been carried out at the Arctowski Station to eradicate this invasive species. As the septic tank was considered to be the main breeding location, it was regularly emptied at least once every 14 days. Opening of the septic tank lid was accompanied by alcohol spraying to immobilize any individuals, which if present, were collected before the tank was emptied. Subsequently, the tank was cleaned using fresh water and then washed with a solution of hydrochloric acid at a concentration of approximately 2-3%. The internal walls of the protective box, lid, and available parts of the tank were sprayed with an insecticide containing lambda-cyhalothrin, e.g., Oxyfly or Solfac. Spraying was carried out according to the manufacturer’s instructions. Applications were performed only within the sewage system, and the chemical substances had an active period of up to 12 weeks, which subsequently decomposed into non-hazardous substances. Food stored at the station was regularly reviewed, with the storage rooms being cleaned frequently and any developmental stages of the flies present removed. Adhesive traps were installed in station infrastructure buildings, particularly in food storages, to identify population trends throughout the year. Traps were regularly checked and changed. An ultraviolet lamp was deployed in the main food storage area.

After the initiation of several control measures, the number of recorded individuals dropped significantly, with fewer than 10 individuals being observed during the summer season of 2019/2020. In the 2020/2021 season, 1 individual was found in the adhesive trap in a 4 °C storage container, and no flies were found in the septic tank or in the buildings. The number of individuals recorded on adhesive traps on station infrastructure increased to 33 individuals reported in two summer seasons combined: between November 2021 and the beginning of April 2023. No *T. maculipennis* was found in the septic tank during these seasons.

In the 2022/2023 austral summer season, a new sewage storage system together with a sewage treatment plant were implemented at Arctowski Station.

Monitoring and eradication of the fly are carried out continuously on the station's infrastructure and will be continued the next season.

Report on Trichocera sp. found in ASPA No. 128

In December 2022, imago individuals of the genus Trichocera were reported at two locations of ASPA no. 128 (attached figure). The first location includes a stream located near Llano Point where three live individuals of Trichocera sp. were observed on 23.12.2022, and none of the individuals were caught. Another observation took place within the analogous area on 30.12.2022, where a total of approximately 20 individuals were observed. Three individuals were caught. On the same day, 30.12.2022, on the opposite shore of the Glacier Ecology lagoon, in the Rakusa Point area, approximately 30 individuals were observed, and 6 individuals were caught. Later, single individuals were observed in the Rakusa Point area. The locations of sightings of the non-native species within ASPA no. 128 are indicated on the map attached to the report.

Follow-up activities planned for the 2023/24 season

Due to the finding of numerous individuals of Trichocera sp. in an Antarctic Specially Protected Area, in locations remote from the station infrastructure, detailed monitoring is planned for the next season, including an attempt to identify if the reproduction of T. maculipennis is taking place in the natural environment. We recommend that field inspections be also carried out by other stations in King George Island.

Mapa

Descripción generada automáticamente

Figure: Locations of reported individuals of *Trichocera* sp.