Definitive eradication of the presence of a Lepidoptera at Carlini Base

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**Information document submitted by Argentina and Germany**

***Summary***

In December 2020, specimens of a non-native Lepidoptera were detected in the Dallmann Laboratory's food storage facility at Carlini AFB. The species was confirmed to be the Flour Moth (*Ephestia kuehniella*; Zeller, 1879). Upon detection, specimens of different stages of the life cycle (eggs, larvae, pupae and adults) were recorded. Through the application of the Response Protocol and eradication and control measures, the definitive eradication of the species was achieved.

***Early detection and initial response***

During ATCM XLIII (2021), through IP 098, Argentina and Germany notified that in December 2020 the presence of a non-native species (NNS) of insect (Lepidoptera) in different stages of its life cycle was detected in the food storage facilities of the Dallmann Laboratory at Carlini Base (-62.23°S, 58.66°W). Immediately the scientific staff of the Argentine Antarctic Institute (IAA) brought the episode to the attention of the staff of the Environmental Management Program of Argentina to coordinate measures to be taken for the initial response according to the Response Protocol of the Non-Native Species Manual (CEP, 2019).

Imagen que contiene interior, vivo, cuarto, madera

Descripción generada automáticamente

Figure 1: Image of the initial moment when the moth specimens were detected in the Dallman Laboratory food storage room.

A detailed inspection of the rest of the station was carried out and the presence of this species was not recorded in the different buildings or outdoors. A first taxonomic classification was made by means of photographs and larvae and adults were preserved to be sent for their definitive taxonomic determination (Figura 1).

In order to immediately eradicate the population present in the warehouse researchers from the Patagonian National Center (CENPAT) in the city of Puerto Madryn (Argentina) and the Instituto Nacional de Tecnología Agropecuaria (INTA) from Río Gallegos, were consulted on the actions to be taken. All the specimens found were collected in bags, as well as all the packets of flour that were in the deposit. The entire place was disinfected, and all the material collected was subsequently incinerated to ensure the elimination of the eggs present in the flour packages.

***Immediate Eradication***

Based on consultations with CENPAT and INTA specialists and confirmation of NNS status, the station´s scientific staff were told what immediate measures were necessary for eradication. In this way, all packages of flour contaminated with the presence of the moth were introduced into closed bags to ensure that they do not continue to colonize the depot. The entire depot was then cleaned and disinfected by collecting all the material and put it in the bags along with the contaminated flour bags for incineration.

To ensure the elimination of all specimens and stages of the NNS, the depot's heating was shut down for more than a month so as to achieve the drastic decrease of the temperature of the site below the known values for the survival of the specimens of this species (Pakyari et al, 2018). The specialists consulted suggested that this was the most environmentally appropriate measure as it did not involve the use of chemicals (insecticides) and therefore the environmental impact was non-significant (Annex I of the Protocol on Environmental Protection to the Antarctic Treaty (the Protocol)).

The specialists consulted ensured that at a temperature below 7 to 10°C, the species does not develop its life cycle and would therefore affect the specimens of this species present in the facility. For this reason, it was decided to extend the shutdown of the facility's heating for more than a month to ensure the full effect of the measure. This thermal stress was considered especially sufficient to eliminate, the eggs and larvae found in the storage facility. As for adults it is considered that there is no oviposition at less than 7°C and the latest published results indicate that the lower limit for immature stages is 9°C (Pakyari et al, 2018).

***Biological classification and characteristics***

Subsequently the material collected and preserved at the Carlini Base was sent to Instituto de Ciencias de la Tierra y Ambientales (INCITAP) of La Pampa, Argentina, where the samples were analyzed. The result of the biological classification confirmed that the observed species belonged to the Order Lepidoptera and within this, to the Family Phycitidae (Figura 2). The species was identified as *Ephestia kuehniella*, known as "flour moth". According to INTA manuals, this species is catalogued as a Lepidoptera harmful to food. The species is frequently found in flour, grain and in places where starchy products are stored. It is a lepidopteran widely distributed in all temperate, tropical and subtropical regions of the world.

Imagen que contiene alambre, grupo, tabla, parado

Descripción generada automáticamente

Figure 2: Morphology of the collected specimens. 1. Female adult. Wing venation. 3. Male genitalia, ventral view. 4. Aedeago. (Result of specimen processing in the Instituto de Ciencias de la Tierra y Ambientales (INCITAP) from La Pampa, Argentina)

Adults are moths measuring 18 to 25 mm in wing expansion. The forewings are leaden grey, being transversely furrowed by dark zigzag lines, and there are also some inconspicuous dark maculae. The hind wings are greyish white, bordered with visible hairs. The eggs are deposited on the food of future larvae or in places close to them, in a number of approximately 200; a week later they hatch and at their maximum development reach 15 mm in length, have a whitish or pinkish colour; they have in the prothorax and in the last urothorax a darker colour than in the rest of the body. After weaving the cocoon, they pupate and remain in this state for 10 to 15 days. It takes 8 to 10 weeks to reach the adult stage.

***Long-term eradication***

Based on what was suggested by the specialists and the measures implemented (collection, cleaning, incineration and lowering the temperature), these actions are feasible in the medium and long term to ensure the eradication of the NNS found. If the presence of this species may be recurrent in the reservoir, INTA personnel have suggested the use of some insecticides that may eventually be used. However, depending on continuous measures of low or no environmental impact, the use of chemical products was not implemented waiting to verify that the species has not been observed again in the Station.

After the initial actions, control and biosecurity measures were coordinated with the German Environmental Agency, in addition to consultations with INTA personnel in Argentina, the UBA in Germany was informed that the following long-term control measures were established, since it is considered that it is not possible to detect the presence of eggs in the flour in advance:

(1) Permanent control and cleaning of the warehouse facilities where the moths were found.

(2) Control and surveillance of the areas and buildings surrounding the Dallmann Laboratory to ensure that no specimens of this species are observed,

(3) Installation of glue traps for early detection of specimens of this or other insect species (this action was eventually not necessary).

More than a year after the initial record of moths was made, and as a result of periodic monitoring of the facilities and the environment, no new specimens of this species have been detected in any of the stages of their life cycle. Therefore, it can be affirmed that the eradication efforts and the permanent control and biosecurity measures have been successful.

***Conclusion***

Non-native species discovered in the Antarctic Treaty Area may be imported anthropogenic species (associated with human activities). In accordance with Annex II of the Protocol, human-introduced species must be eradicated, while natural populations and long-term residents must be protected.

The detection at Carlini Station of a possible and then confirmed *allochthonous* species (*Ephestia kuehniella*), was notified to the national authorities and this allowed coordinating the necessary tasks for an immediate response, immediate eradication, preservation and identification of specimens, long-term eradication and monitoring and control of the detection site. The main task is the establishment of mitigation measures that will be incorporated into logistical procedures to prevent the reintroduction of this or other food-associated species. The species has not been observed again in the station facilities and we consider it to have been eradicated, although periodic control tasks will continue to be carried out.

***Bibliography***

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