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# Introduced Fishmoths identified from South Atlantic Tristan da Cunha Island

(Thysanura: Lepismatidae)

With 2 figures

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## Summary

Two cosmopolitan Lepismatidae species found at Tristan da Cunha in the South Atlantic have been identified. These provide evidence that members of the Order Thysanura (Fishmoths or Silverfish) were imported to the Island. Thysanura do not feature amongst the naturally occurring insect faunas of the Tristan da Cunha archipelago or other islands to the south of it. In contrast, the presence of several Fishmoth species on St. Helena and Ascension Islands are noted in context of the geographical, political and social ties those Islands hold with Tristan da Cunha. Human mediation is known to be the key vector for the translocation of Fishmoths. In the Tristan scenario the increase in visitation frequency is regarded as a compounding factor. To combat the problems associated with alien imports to Tristan, a quarantine system needs to be implemented that is applied to all traffic embarking for entry into the territory.

## Zusammenfassung

Zwei weltweit verbreitete Lepismatidae-Arten, die auf der Süd-Atlantischen Insel von Tristan da Cunha gesammelt wurden, sind identifiziert. Damit wird bestätigt das Vertreter der Ordnung Thysanura (Borstenschwänze) dorthin eingeschleppt worden sind. In der Fauna des Archipels Tristan da Cunhas und anderer, weiter südlich liegenden Inseln, sind einheimische Thysanura-Arten nicht bekannt. Im Gegensatz hierzu existieren einige Arten auf den Inseln St. Helena und Ascension. Deren geographische Lage sowie deren politische und soziale Verbindungen zu Tristan da Cunha stehen mit der Ausbreitung im Zusammenhang. Borstenschwänze werden hauptsächlich durch den Handel verbreitet. Im Falle von Tristan da Cunha verstärkt der zunehmende Tourismus die Einschleppung. Um weitere Probleme durch Import fremder Arten zu verhindern, wird der Aufbau eines Quarantänesystems vorgeschlagen, dass für den ankommenden Schiffsverkehr zuständig sein sollte.

## Key words

Thysanura, Lepismatidae, *Lepisma*, *Ctenolepisma*, Fishmoth, Silverfish, Tristan da Cunha, Gough Island, South Atlantic, introduction.

## Introduction

The Tristan da Cunha archipelago comprises four principal islands in the mid South Atlantic Ocean. Situated at latitude 37° S; longitude 12° W, Tristan da Cunha Island (hereinafter referred to as 'Tristan') is the largest with an area of almost 100 km<sup>2</sup> and the only one with a permanent settlement. Gough Island, lying to the South-east at lat. 40° S; long. 09° W, is the second biggest with an area of some 65 km<sup>2</sup> (see Fig. 1 in conjunction with locality map and description in

HÄNEL & HEYNE, 2008). Falling under the jurisdiction of the Tristan Administrator, who represents the governor (resident at St. Helena) and is advised by the Tristan Island Council, the Tristan archipelago together with the two more northerly islands of St. Helena and Ascension is classed as an Overseas Territory of the United Kingdom. By agreement, South Africa has maintained a continuously staffed weather station on Gough Island since 1956. With regular supply trips to the Island, this arrangement opened up possibilities for additional project work to be carried out there and accordingly increased scientific and other visits to the islands (HÄNEL, 2008). In terms of entomological research, Gough, followed by Tristan, have been the subjects of most surveys. In contrast, Nightingale and Inaccessible, the other two islands of the Tristan group, have been largely neglected. This situation together with an extant anonymity regarding information from collections already made, in particular with respect to the non-insecta components, are amongst the basic reasons why big gaps in the knowledge about the archipelago's invertebrate fauna still exist.

Towards filling some of the gaps with respect to the less well studied northern islands, a brief invertebrate project was conducted in 2005 as part of a larger program "Empowering the people of Tristan da Cunha to implement the CBD" (HÄNEL, 2005). An insect collection was made that included members of the order Thysanura, commonly known as Fishmoths or Silverfish.

In this paper we report on the findings of the Fishmoths, being the first positively identified Thysanura recorded from the Tristan Archipelago, indicating that they are introduced species alien to the territory.



Fig. 1: Locality of the United Kingdom's Atlantic Overseas Territory Islands: The Tristan da Cunha group (encircled), with St Helena and Ascension Islands to the north, in relation to the Southern Ocean Islands Marion, Crozet, Kerguelen, Heard, McDonald (Indian Ocean), Antipodes and Macquarie (Pacific Ocean). Map drawn by Christine Hänel.

## Methods

Fieldwork was conducted between February and April 2005. The majority of the time was allocated to Tristan and a period of two weeks was spent at Nightingale. Sampling was random, but focused on covering the major habitat types represented. The principal methods employed included Malaise trapping; sweep netting, hand searches and Tullgren extractions. 'Casual observa-

tions' also contributed to locating specimens, specifically in the case of the Fishmoths whose findings were due entirely to the keen observations by local Tristanians. In total only two individuals were collected. Both were caught within relative close proximity of each other, being the hospital complex in the settlement area on the North western side of Tristan. The first specimen was found on the 5<sup>th</sup> February 2005 on the outside wall of the doctor's house, between the wooden slates. The second specimen was found approximately a month later, on the 10 March in the vicinity of the hospital's dental laboratory, which is adjacent to the doctor's house. The former individual was pinned and preserved dry, while the latter was preserved in 70 % Ethanol. The post-project taxonomic work was later pursued by the authors in their voluntary capacity. Both specimens were identified by JI and returned for lodging in the collection of the Agriculture and Natural Resources Department on Tristan da Cunha.

## Results

The identifications reveal that the specimens are two different species of the family Lepismatidae. The dry pinned individual being a female *Ctenolepisma longicaudata* ESCHERICH (see Fig. 2), while the wet preserved individual is a male *Lepisma saccharina* LINNAEUS. Both are well known domestic species that are typically found in association with households, inhabiting cupboards, sitting behind pictures on walls or in between books. Being omnivores whose diet consists of dry organic matter, these species can cause much damage when feeding on paper and glue from bindings. Their characteristically flattened torpedo-shaped bodies measure between 4-15 mm in length, and are covered by a dense coating of tiny overlapping scales (similar to the scenario in fish), which give them a smooth texture and shiny metallic appearance. They can run swiftly and slip away in small cracks, where these nocturnally active insects may remain unseen during the day. Despite the fact that Fishmoths are flightless (wing formation is totally absent in the Order), they are found in most parts of the world, including many oceanic islands. However, the fact that only domestic species have been recorded from latitudes higher than about 45° (IRISH, 1990), and always in association with human habitation, indicates both their preference for warmer climates, and the propensity of domestic species to readily spread through commerce. Their ability to live on a totally dry diet and, at least in some species, satisfy their water requirements by absorbing vapour from atmosphere that is sufficiently high in humidity (EDNEY, 1971), is a major factor in their ability to survive.

Judging by non-domestic records and the distribution of related species, *L. saccharina* originates from the western Mediterranean region (MENDES, 1988). Its current global spread probably paralleled the historical expansion of European influence,



Fig. 2: Dorsal view *Ctenolepisma longicaudata* ESCHERICH. Photograph by John Irish.

and it is futile to speculate on the origin of particular populations. In South Africa, its preference for moister climates manifests in it being restricted to the South-western Cape only (IRISH, 1990). By contrast, *C. longicaudata* has a wider climatic tolerance, and is found throughout southern Africa (IRISH, 1987). Phylogenetically, the species' origins also point to the Mediterranean area, but it had similarly been spread worldwide at an early date, as evidenced by the curious circumstance that it was first described from material collected in central South Africa in the 1890's (ESCHERICH, 1905).

## Discussion

From the available information and literature accessed it is evident that no Fishmoths have featured amongst the naturally occurring invertebrate faunas of the Tristan archipelago or other islands to the south of it. The colder latitudinal positions and absence of potential parent populations upstream of the territories' prevailing oceanic currents make the occurrence of indigenous Thysanura on the more southerly islands highly unlikely. The first and only published record found in which the occurrence of a member from the *Thysanura* is listed as present in this region appears in Holdgate's faunal summary of the Tristan da Cunha archipelago (HOLDGATE 1965, Appendix B: 394). Under the Order Thysanura is given an unidentified "gen. et. sp." present at Tristan and Gough Islands; rated as "species of doubtful status". No further details are given nor could the source for this record be located. One other collection of some unidentified Lepismatidae is known to have been made at Tristan during an 18 day investigation by Gillian Key in 2000 (unpublished data, Plant Protection Research Institute [PPRI], Pretoria,), but neither the specimens nor the details relating to their find could be traced.

In the case of the two Fishmoths found during 2005, the probability that they were imported to Tristan via material transferred from a vessel by human mediation is high and the most plausible explanation for their presence on the Island. This is supported by their status as cosmopolitan anthropophiles (domestic or human commensal species). In the absence of any further evidence or Fishmoth material obtained from the Island in 2005, and the fact that species have the ability to survive for a long time (up to five years (DELANY, 1957)), it has not been possible to determine when the introductions may have occurred, and whether the specimens were from an established colony on the Island or newly imported "vagrants". However, given that the 2005 collecting efforts did not include the settlement area in its targeted habitat sampling regime, it would seem unlikely or an unbelievable co-incidence for the only two chance findings to have both been cases involving freak strays and of different kinds at that. Especially in the light of the 1965 and 2000 records indicating the presence of at least one foreign species on the island. Moreover, the scenario of their having been introduced with the recent traffic to the Island was not apparent.

South Africa having serviced Gough and Tristan on a regular basis ever since commencing meteorological observations at Gough, alien introductions to these Islands are often assumed to be via the supply vessel, and thus to have their origins from South African territory. This avenue and source cannot be discounted in the case of the Fishmoths, given the presence of the two species in the Cape, being the province with the harbour used by the supply vessel. However, it is interesting to note that the same vessel and port have also been used to supply Marion Island, yet no evidence could be found of any Fishmoth occurrences at Marion. Indeed Thysanura appear to be absent from all the major oceanic Islands below the latitude of Gough which have been subjected to multiple human visitations. Viz. South Africa's Marion Isl. (HÄNEL,

1999; HÄNEL et al., 1999; FRENOT et al., 2005); the French Islands: Kerguelen (SCHERMANN-LEGIONNET, 2007) and Crozet (FRENOT et al., 2005); New Zealand's Antipodes Isl. (MARRIS, 2000); and Australia's Heard and Mac Donald Isle's. (FRENOT et al., 2005), as well as Macquarie Isl. (GREENSLADE, 2006), in spite of the fact that both *L. saccharina* and *C. longicaudata*, are present in Tasmania as introduced species (MALICK & DRIESSEN 2006), and that the port used by the supply vessel servicing those Islands (bi-annually in the case of Macquarie) has been Hobart in Tasmania.

On the other hand St. Helena Island (situated at lat. 15° 56' S; long. 5° 42' W, some 2,400 km to the North of Tristan and as such the nearest inhabited landmass to Tristan), as well as Ascension Island (which in turn lies around 1,300 km to the North-west of St. Helena at lat. 7° 57' S; long. 14° 22' W), (see Fig. 1), both harbour several types of Fishmoths. In the case of St. Helena, a total of five species have been recorded, of which at least one, a *Lepisma* sp. was already well established more than 130 years ago. In his description of the latter, MELLISS (1875: 200) writes: "This creature is best known by the appellation of 'The Mackerel Moth.' It is abundant all over the Island, and most destructive to books, clothes, papers, &c. It is generally found in houses, but I have also seen it amongst the barren rocks on the sea coast, at Egg Island and in its neighbourhood." By the end of the 1965-1967 survey conducted at St. Helena by a Belgian expedition, four species were recorded from there (WYGODZINSKY, 1970; MENDES, 1981). These included both *C. longicaudata* and *L. saccharina* as aliens, as well as the endemic *Afrolepisma wygodzinskyi* (MENDES, 1981) and *Ctenolepisma sanctaehelenae* WYGODZINSKY, 1970. The presence of endemic *Thysanura* on St. Helena has been explained by rafting from Southwestern Africa, where their nearest relatives occur, and which is compatible with ocean current directions (IRISH, 1987). In the case of Ascension Island, three species of Lepismatidae have been recorded, all of which are non-native to the Island and also include *C. longicaudata* (ASHMOLE, 1997).

## Conclusion

The finding and identification of the Fishmoths from the 2005 Tristan collection provides definitive evidence of the Thysanura Order being present at the Island, not only in the form of one but two alien species. This points to a human mediated situation, facilitated through shipping activities, the only route of access and transport of goods to the Island. And whilst this practice has taken place ever since the discovery of the Island more than 500 years ago, visits were notably infrequent until commercial interest in the territory was aroused in the 1950ties and regular supply trips were inaugurated to service the weather station on Gough. With one or two visits a year instilled to satisfy the latter, additional visits to the territory began to increase, particularly after the 1961 volcanic eruption that saw Tristan become "world famous". This augmented further interest in the island group giving rise to an exponential increase in visits from ships all over the world. Running in parallel to this increased contact with the 'outside world' have been the findings of alien introductions to the archipelago; the recorded Fishmoths being another case in point, indicating how alien invertebrates can become established on the Island. While the species found can be troublesome in households, they are unlikely to spread beyond human habitation, or significantly affect Tristan's indigenous biota. However, another case might not be so benign. In order to combat the problems associated with foreign imports, an effective quarantine system needs to be implemented and applied to all traffic embarking for entry into the territory as a matter of priority.

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