

TRANS-OCEANIC DISPERSAL OF INSECTS TO NEW ZEALAND

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It has been known for a long time that some Australian insects such as the Blue Moon and the Painted Lady Butterflies arrived in New Zealand on rare occasions, and under exceptional circumstances. Recent observations, however, have revealed that in fact, many species of butterflies and moths arrive in New Zealand regularly, and in large numbers, and often over a wide front, with simultaneous records of a migrating species occurring from as far apart as North Auckland and Westport. Most of these arrivals are after long periods of strong west to north-west winds and it is apparent that such winds are a major factor in the arrival of the insects here. To give some idea of the abundance of these records the species recorded in the past 5 years are listed below.

MIGRANT LEPIDOPTERA FOUND IN N.Z. 1968-1973

(1) Frequent invasions: **Hypolimnas bolina nerina** (Blue Moon), **Cynthia kershawi** (Painted Lady), **Agrotis ypsilon ancituma** (Greasy Cutworm), **Agrotis infusa** (Bogong Moth), **Helicoverpa punctigera**, **Achaea janata**, **Ectopatria aspera**; 7 species. (2)

Occasional invasions: **Lampides boeticus** (Long Tailed Blue), **Danaus chrysippus petilia** (Lesser Wanderer), **Prodenia litura**, **Plusia oxigramma**, **Dasypodia selenophora**, **Dasypodia cymatoides**, **Utetheisa pulchelloides vaga**, **Plusia argentifera**; 8 species. (3) Rare occurrences: **Precis villida calybe** (Meadow Argus), **Melanitis leda bankia** (Evening Brown) **Anomis vitiensis**, **Cosmodes elegans**, **Spodoptera exempta**, **Spodoptera mauritia**, **Hypocala deflorata**, **Psara licarsisalis**, **Mithimna loreyi**; 9 species. Total: 24 species in all.

The study of migratory insects is a very inexact science. One has to make all sorts of assumptions on a few isolated records and weather conditions at the time. Many of the so called migrants are known to breed in New Zealand. Thus, when one records an Australian insect it is often difficult to tell whether this is in fact an immigrant, or a locally bred specimen.

Direct sightings are almost unheard of, due to the lack of lighthouses and shipping off our western coasts, and so when the Sedco oil-rig was drilling off the Taranaki coast I got some records of insects, and the weather conditions prevailing at the time. These proved that **Agrotis ypsilon**, the Greasy Cutworm, migrated to New Zealand in large numbers from January through till April. We also recorded a specimen of **Psara licarsisalis**—a Pyralid moth which is a pasture pest of paspalum, and this was a first ever record for New Zealand.

We know that the individuals of **Agrotis ypsilon**, a common and established species in New Zealand, came from Australia because the records were made when there was a 20-30 knot westerly wind blowing, and it is considered that the average speed of a migrating insect is about 10 m.p.h. It would therefore be very difficult for them to fly even the 25 miles from the Taranaki coast under such conditions. In addition, I have seen hundreds of **Agrotis ypsilon** flying in over the sea, with the westerly wind, both in Taranaki and on the west coast of the South Island. Dissection of the abdomens of the specimens from the oil rig revealed immature ovaries, as are the ovaries of migrating populations of this species between Egypt and Europe, and the ovaries of aestivating colonies of the closely related **Agrotis infusa** (Bogong Moth) in Australia.

Influxes of insects of a given species occur at a remarkably constant time each year, and I would call these influxes migrations, and refer to the arrivals as migrants. It could be said that these are not true migrants, but insects merely blown here by the wind, their movements not under their own control, and not therefore migrations in the strict sense of the word. However, the species arriving in this country are known migrant species, and one explanation is that they were on a migration flight within Australia, and got blown off course by the wind. Alternatively one could postulate that this was a true migration initiated when the wind was in a

favourable direction. If the insects were merely passively blown to New Zealand, how is it there are no more records of non-migratory species?

Other factors influencing the arrival of insects in New Zealand from Australia, are large bush fires in Australia, when presumably many insects get swept up in strong updraughts of hot air and then caught in the prevailing westerly winds. Smoke from Australian bush-fires and immigrant insects are often recorded simultaneously. Others have been recorded after cyclones have passed over New Zealand, and on occasions there have been records after several windless days, when there have been large masses of hot humid stationary air in the Tasman, indicating that perhaps insects can get here without the help of the wind.

Recent investigations by Tomlinson (elsewhere in this issue) have shown in some detail how insects could become airborne and then transported to New Zealand. His hypothesis could account for many of the migrant records, but it does not explain why many specimens were recorded at sea level on the oil rig, or have been seen coming in over the sea, and I do not see why they did not simply fly here with a favourable following wind.

What happens to migrating insects when they get to New Zealand? Some find the climate suitable and the host plant available and have bred and established themselves here, e.g. The Monarch, The Yellow Admiral, The Convolvulus Hawk Moth and species of the genera **Agrotis**, **Helicoverpa** and **Pseudaletia** to mention but a few. Some of these successful colonists have presumably only been able to breed here since the coming of the Europeans and the introduction of their foodplants for horticultural purposes, e.g. **Dasypodia** species feeding on acacias.

Some species seem to have established themselves only in small areas of New Zealand, e.g. **Ectopatria aspera** in Nelson and North Auckland, and **Lampides boeticus** in Nelson, New Plymouth and Auckland. The restricted distribution may be just accidental, or may be due to the fact that these places are relatively warmer or more sheltered than other places.

However, **L. boeticus** has been noticed by several observers to be on the wing after heavy frosts in May. When I was on a collecting trip in Queensland last July I was most surprised to find that there were frosts nearly every night even as far north as Rockhampton in the tropics. As the day warmed up, and by about mid-day the temperature had reached 65°F - 70°F, insects started to appear and were active on the wing. Species that have been recorded in New Zealand such as **Danaus chryssipus petilia** — the Lesser Wanderer, **Hypolimnas bolina nerina** — the Blue Moon, and **Utetheisa pulchelloides vaga** were often seen. It would thus appear that contrary to what has been said over the

years that New Zealand is too cold for the establishment of these tropical or sub-tropical species, it is in fact not too cold, but not warm enough—a distinction I feel which is very important.

Some species breed, or have bred, in New Zealand in the summer months and then seem to disappear, e.g. **Cynthia kershawi** and **Agrotis infusa**. Could it be that these species attempt to migrate home again in the autumn, just as they have a return migratory flight within Australia? **Cynthia cardui** offspring in Europe migrate back to North Africa in the autumn.

Other species seem to be in the process of colonising New Zealand. **Helicoverpa punctigera** seems to be appearing in increasing numbers and in the absence of strong winds is found commonly in Taranaki, and the same applies to **Plusia oxygramma** which is commonly found in Nelson and North Auckland, and **Plusia argentifera** which has been found feeding on tobacco in Nelson. **Achaea janata** seems to crop up every autumn and larvae have been found feeding on Castor Oil plants (**Ricinus communis**) in the Auckland district.

Still other species such as **Utetheisa pulchelloides vaga** and **Cosmodes elegans** seem to appear some years in large numbers and then die out despite an abundance of their foodplant. These could be examples of species that do not survive because our winters are not sufficiently warm.

Two tropical pests that seem to eat almost anything are beginning to occur more frequently—namely **Prodenia litura** and **Spodoptera exempta**. I can see no reason why these species should not become established here provided the winters are warm enough. **Anomis vitiensis**—a rare immigrant which feeds on Hibiscus could possibly colonise North Auckland.

Such tropical species as **Hypocala deflorata** are unlikely to establish themselves being restricted to host plants only found in the tropics.

Of the migrant butterflies **Danaus chrysipus petilia** has been found quite recently breeding in Wanganui and Rotorua and the Blue Moon has been reported breeding in Hamilton. **Precis villida calybe**—the Meadow Argus—can withstand the winters in Southern Australia and feeds on plaintains, and so could conceivably establish itself here.

This paper deals mainly with Lepidoptera for it is only in this group that there is any definite and recurring evidence of migration to this country. I believe there may be some evidence for the dispersal by wind of Aphids from Australia, but I feel that the remarks made about Lepidoptera could also be applied to other migratory insects such as locusts, dragonflies, Coleoptera—especially lady-birds and water beetles, Ichneumonidae, other Hymenoptera, and several other groups.