

Winter-emerging moths of New Zealand

Brian Patrick

Wildland Consultants, Christchurch

Email: brian.patrick@wildlands.co.nz

Introduction

It is characteristic of temperate regions that a small number of moth species emerge as adults exclusively over the coldest months. Often these moth species have short-winged and flightless females.

There are several advantages for species that emerge as adults in winter in temperate regions;

- Winter is often the calmest time of year, with frosty mornings which have particularly still air, ideal for fragile and weakly flying adults
- Parasitoid adults are at their lowest numbers so eggs laid and young larvae are exposed to less mortality
- Predators of adult moths are in comparatively low numbers

But there are a few disadvantages too;

- A lack of nectar sources on which to feed
- A danger of freezing to death if severe weather events occur

New Zealand emergence patterns

The New Zealand moth fauna is highly seasonal, particularly in southern and upland areas, with many species, particularly those with one generation per year or less, emerging as adults at a particular time of year. The genus *Meterana* (Noctuidae) with at least 24 New Zealand species is species-rich enough to display several emergence patterns that are also present in other New Zealand moth genera.

- A suite of species emerge from early spring (mid-August onwards) including *M. exquisita*, *M. inchoata*, *M. coeleno*, *M. levis*, *M. alcyone* followed by *M. pansicolor*, *M. decorata*, *M. merope*, *M. stipata*, *M. diatmeta* and *M. ochthistis*

- Summer emerging species include *M. praesignis*, *M. asterope*, *M. pascoi*, *M. pauca*, *M. pictula* and three undescribed species. *M. dotata* appears by late summer
- Still later there is a suite of autumn-emerging species; *M. tartarea*, *M. meyricki*, and *M. vitiosa* with *M. grandiosa* emerging from mid-April to June. Interestingly *M. vitiosa* has a trans-winter emergence pattern with some individuals emerging in early spring as well

Interestingly there is a suite of late autumn-emerging species across many families of moth that is particularly well-developed in the South Island high country. Many of these species are still emerging when the first snow arrives in May and June, but take advantage of the many sunny days till mid-June before winter tightens its grip. Typically these species begin emerging in late March and are finished by mid-June, and include species such as the ghost moths *Cladoxycanus minos* and *Heloxycanus patricki*, both inhabitants of mossbogs from sea-level to low alpine fens. Interestingly on the West Coast of the South Island *C. minos* emerges in June and July – a true winter species.

Definition of winter-emerging

Officially the New Zealand winter begins 1 June and is finished by 31 August, but naturally the coldest sustained period varies considerably from year to year.

Here I include moth species that regularly have a winter-emerging generation, with some confined as adults to this season.

Winter-emerging groups in New Zealand

1. Family Geometridae: Ennominae

The geometrid *Zermizinga indocilisaria* sometimes referred to as “the winter moth” is widespread from coastal to inland areas (Clark, 1935). There are three generations, one of which emerges in winter from June to August.

The grey speckled species has an extremely short-winged and flightless female, but fully winged male. It is interesting that neither sex feeds as an adult so is suited to a winter emergence when few nectar sources are available in its natural habitat (Clark, 1935). Despite its flightless female

the species appears to be quite mobile, perhaps males transport the female during copulation?

Indigenous larval hostplants include matagouri, *Ozothamnus*, deciduous small-leaved *Olearia* species such as *O. adenocarpa*, and *Carmichaelia* species. Introduced hosts include lupin, clovers, briar rose and radiata pine. A serious outbreak on the Balmoral radiata pine plantation in North Canterbury is reported by Clark (1935).

2. Family Geometridae: Oenochrominae

Although rarely seen, the enigmatic and fragile geometrid *Theoxena scissaria* is mostly found over the cooler months of May-July (Hudson, 1939; Patrick, 1994a). Its life history is not known for sure but two closely related species in the genus *Samana* have larvae feeding on *Carmichaelia* (Fabaceae). A second generation emerges over the summer months but more research is required to understand this moth's apparent rarity.

3. Family Noctuidae

Coastal sand dunes nationwide are home to a suite of noctuid moths in the genus *Agrotis*. This group of apparently closely related species are endemic, in contrast to other species belonging to this genus found in New Zealand. There are two named species and possibly up to two other undescribed species as follows:

- *Agrotis innominata*; coastal North Island and west coast of South Island. Females are fully flighted
- *Agrotis ceropachoides*; Type Locality is coastal Mid Canterbury near Southbridge north of Rakaia River and the species is found north to the Marlborough coastline. Female is short-winged and flightless (Patrick, 2013).
- *Agrotis* new species; Known on coast of Dunedin and south to Brighton. Female is short-winged and flightless (Patrick & Green, 1991)
- *Agrotis* new species; Known from coastal dunes of southern Southland. Female is short-winged and flightless (Patrick, 1994b)

The peak flight period of the adults of all of these species is from June to August, with much lesser numbers found till October. This suite of species are true winter moths and during that time in favoured habitats

such as Kaitorete Spit are by far the most numerous moths found at light traps. Despite being medium-sized noctuid moths, they fly when air temperatures are as low as 8°C.

As noted above two species in the genus *Meterana* can be regarded as winter-emerging; both *M. grandiosa* and *M. vitiosa* emerge just prior to winter but regularly continue to emerge into June.

A forth-coming revision of this moth family by Dr Robert Hoare of Landcare Research, Auckland will elucidate the systematics of the endemic *Agrotis* species.

4. Family Psychidae

Species in several genera of this family signal the beginning of spring with their emergence as adults. This includes many species in the genera *Grypotheca*, *Reductodermes*, *Mallobathra* and *Liothula*. But several species emerge as adults strictly over the winter months.

Many species in the genus *Reductodermes* emerge as adults in winter and early spring, each occupying a different part of the country. All have wingless females that cling to the outside of the larval case on emergence, and signal their presence to passing males by emitting a distinctive pheromone. Larvae in this genus construct cases composed of algae and silk and move about on algae-covered rock faces and tree trunks. Many of the winter-emerging species remain undescribed and one in particular is found in Central Otago, the most inland region of New Zealand's South Island at altitudes of 140-300m, and having the most severe winter climate of lowland New Zealand (Patrick, 1994a). The males fly on the calmest frosty days from mid-June to mid-July when the ground is often frozen for weeks, but when there are clear sunny skies and little wind. These are tiny fragile male moths searching out their wingless females clinging to the bottom of their larval case hidden on nearby lichen and algae encrusted rock faces.

Other places also have undescribed winter-emerging species; inland eastern Otago has a species that emerges between mid-May to mid-July; the smallest species of the genus, with smoother cases that are usually in aggregations on rock faces, emerges between 10 July and mid-October;

coastal Otago-Southland has a larger species that emerges from 10 August; Southland's forests have a purplish male emerging from mid-July onwards; and the forests of eastern Otago have a species that flies throughout July and August. While most species are undescribed, Riccarton Bush, Christchurch has *R. microphanes* that emerges on the frostiest winter mornings. There is room for much more discovery of other species all over New Zealand and some are possibly already in collections awaiting description.

Probably all parts of the country have local species in the genus *Grypotheca* with their characteristic curved larval cases found on branches, tree trunk surfaces and leaf litter. In Riccarton Bush, Christchurch on the frostiest mornings between July and September flies the locally endemic species *Grypotheca pertinax* seeking out their wingless females which are clinging to the bottom outside of the larval cases often on a bryophyte-covered tree trunk or branch. Further south, all over Otago flies *G. araneosa* behaving in much the same way over the same months (earliest record of adults 21 June). These are tiny fragile speckled grey moths that only the enthusiast will encounter, especially if they, like the moths are early risers.

5. Family Oecophoridae

Within the genus *Atomotricha*, several species emerge in winter or from winter into early spring. Surprisingly it is in Central Otago, with perhaps the severest winter climate experienced by New Zealand towns, that *Atomotricha lewisi* adults emerge between May and July (Patrick, 1994a). Like most of the species in this genus the females are short-winged and flightless. The life-history of this genus is essentially unknown but believed to involve soil-inhabiting larvae.

6. Family Tortricidae

At least eight species, with just three of them described, form a compact group of small diurnal moths characteristic of upland to low alpine seepages and wetland edges in the South Island high country between 500-1500 m (Patrick, 1982; Barratt & Patrick, 1987). Although the described species ("*Cnephasia*" *ochnosema*; "*C.* *paterna*"; "*Eurythecta*" *leucothrinca*) have been placed in various genera, as a whole they constitute a distinct taxonomic group that require a new genus name. All

emerge as adults from late March well into June and have short-winged flightless females that crawl on the ground.

Another undescribed genus and species emerges in May and June in southern South Island alpine areas such the mountains of Central Otago and Southland. It too is day-flying and has a flightless female. The grey-speckled adults are most often found from 800-1000 m in low alpine shrubland.

7. Crambidae

One species *Scoparia apheles* is typically late autumn-winter-emerging in damp upland grasslands of the central South Island mountains between 600-950 m. The adults emerge from late April till mid-June and can be locally abundant. The female is unknown so may be short-winged and flightless. The species is often found in the same wetlands as the new genus of tortricids noted above.

8. Hepialidae

While several large and impressive species in the genus *Aoraia* can sometimes be found in early June, this suite of species which includes *Aoraia dinodes* and *A. rufivena* is essentially late autumn-emerging with a peak flight period in April and May. Typically they have large-bodied winged but flightless females. In Otago-Southland wetlands from sea-level to alpine areas two species *Cladoxycanus minos* and *Heloxycanus patricki* emerge between mid-April to early June. The latter species is interesting in that it only emerges in odd-numbered years, having a two-year life cycle.

Only western South Island populations of the widespread wetland hepialid *Cladoxycanus minos* are truly winter moths with adults found in both July and August. In contrast populations in the southern North Island and the rest of the South Island emerge in the period April to early June.

Summary

At least 29 indigenous New Zealand moth species are here noted as emerging over the New Zealand winter months. There will be more winter-emerging species particularly in the Psychidae, the casemoths. Most of this New Zealand moth fauna only emerges at this time of year

with only one species (*Zermizinga indocilisaria*) having a winter-emerging generation amongst its three annual generations.

The result of this relatively species-rich assemblage of winter-emerging moths is that there is no rest for the lepidopterist, particularly in the South Island. Every month of the year brings an exciting suite of new moths to discover and research.

References

Barratt BIP, and Patrick BH. 1987. Insects of snow tussock grassland on the East Otago Plateau. *New Zealand Entomologist* **10**: 69-98.

Clark AF. 1935. The winter moth (*Hybernia indocilis* Walker). *The New Zealand Journal of Science & Technology* **17**: 541-549.

Hudson GV. 1939. *A supplement to the butterflies and moths of New Zealand*. Ferguson and Osborn, London. 97 pages and 10 colour plates.

Patrick BH. 1982. The Lepidoptera of Danseys Pass. *New Zealand Entomologist* **7**(3): 332-336.

Patrick BH. 1994a. Valley Floor Lepidoptera of Central Otago. *Miscellaneous Series* **19**. Department of Conservation, Dunedin. 54 pages.

Patrick BH. 1994b. Lepidoptera of the southern plains and coast of New Zealand. *Miscellaneous Series* **17**. Department of Conservation, Dunedin. 44 pages.

Patrick BH. 2013. Investigation of a data deficient taxon *Agrotis ceropachoides*. *The Weta* **46**: 28-37.

Patrick BH, and Green K. 1991: Notes on *Agrotis innominata* Hudson (Noctuidae). *New Zealand Entomologist* **14**: 32-36.