Taxonomy of the Boulder Copper butterflies (*Lycaena boldenarum* s.l.): Report on progress, November 2024

R.J.B. Hoare

Brian and Hamish Patrick recognised 10 provisional species in the Boulder Copper (*Lycaena boldenarum*) complex (Patrick & Patrick 2012), four named and six unnamed, as follows:

North Island Boulder (*L. boldenarum* White); Milford Boulder (*L. ianthina* Salmon); West Alpine Boulder (*L. caerulea* Salmon); Canterbury Alpine Boulder (*L. tama* Fereday); Canterbury Boulder; Central Otago Boulder; Central Alpine Boulder; Waihemo Boulder; Chrystalls Beach Boulder; Tiwai Boulder.

I undertook to dissect out and slide-mount genitalia of 3 males and 1 female from each putative species to see whether characters could be found to support the proposed taxonomy or an alternative scheme. (The males of Lepidoptera in general show greater interspecific variation in genitalia than the females, so it is usual to focus on males in developing an initial morphology-based classification.)

Early on in the course of this project, I realised that populations from the northern South Island (Nelson, Marlborough, Kaikoura) were not mentioned by Patrick & Patrick (2012), so the identification of these is not addressed by their classification. They also do not unambiguously address populations from the Otago Lakes area and some other southern South Island populations. Since my dissections were taking less time than expected, I decided to include specimens from at least some of these areas amongst my dissections, so that as far as possible the full range of the species / species complex was covered. Initial dissections have all been from the existing collections at NZAC, which are incomplete. So far, 14 dissections have been made, all male specimens.

The following putative species are represented in NZAC: *L. boldenarum* (North Island), *L. caerulea*, *L. tama*, Canterbury Boulder, Central Otago Boulder and possibly Tiwai Boulder (if Philpott's old specimens from the probably extinct population at New River, Invercargill are referable to this). Males from all these areas, as well as Nelson, Marlborough and Otago Lakes have been dissected in my preliminary run of dissections. I have already arranged to visit Otago Museum on Monday 25th November to select specimens from the remaining putative species to loan out for dissection.

The dissections made so far do reveal a few characters that vary across the geographic range of the species / species complex. There appears to be a tendency for the second abdominal sternite (plate on the underside of the second abdomen segment) to be longer and more triangular in northern populations (North Island plus Nelson and Marlborough) and shorter and more rounded in populations south of this. Since this part of the abdomen is not likely to be involved in courtship or mating, it is doubtful whether this on its own would count as a species-level character. There is also variation in the length of the male valvae (pair of structures used to clasp the female during mating). Some central North Island specimens have very short, stout valvae compared to specimens, e.g., from Invercargill. However, unexpectedly, a male from the southern North Island coast (Te Kawakawa Point), theoretically belonging to *L. boldenarum* in the strict sense, also proved to have more elongate valvae, and there appear to be intermediates.

The length of the male phallus also varies, and, when longer, it sometimes has a more or less distinct bend near its base (as in the New River, Invercargill specimen dissected). A male from the Desert Road, central North Island, has a remarkable, very distinct kink in the phallus base, differing in this respect from all other specimens dissected so far, including others from nearby central North Island localities; I suspect it is probably an aberration! I have not yet found obvious characters unique to particular populations / regions, but patterns may become clearer once more specimens have been dissected and it may be necessary to measure some of the variable structures in order to assess whether there are any distinct discontinuities in the variation. It seems clear that any speciation here will have been a geologically recent phenomenon, and characters may not be as distinct as one would find in older species. I have not yet investigated wing pattern characters to see how these vary across and within populations, but my impression is that the situation is less clear-cut than might seem at first; very similar forms seem to reappear in different populations rather than being confined to one. Complexity reigns and the research continues!

Reference

Patrick, B.H. and Patrick, H. 2012. *Butterflies of the South Pacific*. Otago University Press. 240 pp.