

Reinstatement of a New Zealand copper butterfly, *Lycaena rauparaha* (Fereday, 1877)

G. W. Gibbs

To cite this article: G. W. Gibbs (1980) Reinstatement of a New Zealand copper butterfly, *Lycaena rauparaha* (Fereday, 1877), *New Zealand Journal of Zoology*, 7:1, 105-114, DOI: [10.1080/03014223.1980.10423767](https://doi.org/10.1080/03014223.1980.10423767)

To link to this article: <http://dx.doi.org/10.1080/03014223.1980.10423767>



Published online: 16 Jan 2012.



Submit your article to this journal [↗](#)



Article views: 91



View related articles [↗](#)



Citing articles: 1 View citing articles [↗](#)

Reinstatement of a New Zealand copper butterfly, *Lycaena rauparaha* (Fereday, 1877)

G. W. GIBBS

Department of Zoology, Victoria University of Wellington,
Private Bag, Wellington, New Zealand

Previous confusion over the nomenclature and status of the New Zealand copper butterflies is reviewed. *Lycaena rauparaha* n. comb., which has been regarded as a variety of *L. salustius* in recent literature, is reinstated and adult, larval, and pupal characters are described. Its distinctions from *L. salustius* and *L. feredayi* are tabulated and a key to this species complex is given.

Keywords: Lepidoptera; Lycaenidae; *Lycaena rauparaha* new combination; taxonomy; life stages; identification.

INTRODUCTION

The 'common copper', *Lycaena salustius* (Fabricius, 1793), is one of the best known butterflies in New Zealand since it occurs in widely diverse habitats throughout the country. As portrayed in recent literature it is a variable species with a considerable degree of sexual dimorphism, and is distinct from *L. feredayi* (Bates, 1867), a more heavily marked monomorphic species. Fereday (1877) recognised that some varieties of *salustius* were more consistent than others, and proposed the specific names *maui* and *rauparaha* for two of these. However, not only did Fereday's proposals receive little support, but there was general confusion over the proper status and nomenclature of all the copper butterflies (excluding '*Lycaena boldenarum*', which is not discussed here). This paper provides evidence for reinstating *Lycaena rauparaha*, by showing it to be specifically distinct from both *L. salustius* and *L. feredayi*.

The Christchurch lawyer and lepidopterist R. W. Fereday published three papers which mentioned the species of *Chrysophanus* (= *Lycaena*) known to him. In the first (1872) he noted simply that three—if not four—distinct species of copper butterfly (excluding '*L. boldenarum*') occurred in New Zealand. In 1877 he reported on the basic features of a series of forms, labelled A-F, ". . . reserving for a future paper, [which duly appeared in 1878] a full description, to be accompanied by drawings . . .". However, the 1877 description of his forms E and F was diagnostic, and the proposed name was included, so the species *rauparaha* must date from 1877, not 1878. The important characters cited by Fereday for the male were "nervures same colour as dark markings; no violet pupils in the marginal macular bands [actually a female attribute]; under side of secondaries fuscous". The specimens were from Kaiapoi Bush and "in a lane near Christ-

church", and for them he proposed ". . . the name of *Rauparaha*, after the Maori chief Te Rauparaha, of the history of whose life the siege and capture of Kaiapoi Pa occupies a prominent part".

The initial confusion over the status and nomenclature of the copper butterflies was largely due to A. G. Butler's misunderstanding of the forms in which the undersurface of the hindwing can be wholly or partly brown. First (1874) he applied Bates's name *feredayi* to the species reinstated here, noting that it "differs from *C. salustius* in having the secondaries below clouded with brown . . . I doubt the distinctness of this species, I have not however seen it". He then (1876) redescribed *feredayi* Bates as *ensyii*. Perhaps the locality data for Fereday's material added to his confusion, because the type locality of both *feredayi* Bates and *rauparaha* Fereday was Kaiapoi Bush. Unfortunately Hudson (1898) followed Butler, thus perpetuating the erroneous name *ensyii*. Hudson went a step further and synonymised *rauparaha* with *salustius* (1898, 1928), creating a situation which has persisted to the present day and which this paper is intended to resolve. Although the correct status of both *feredayi* and *rauparaha* was pointed out by Hutton (1901), his comments did not attract the attention they deserved, and the *feredayi* versus *ensyii* debate was repeated by Longstaff (1912), Philpott (1928), and Wise (1966). The name *rauparaha* has not been mentioned in reference to a distinct species since Hutton's paper, although Philpott (1928) commented that the ". . . race of *Salustius* in which the undersides of the hindwings are uniformly brown . . . may ultimately prove to be a good species".

It is appropriate here to examine the fate of Fereday's other proposed species, *maui*. His descriptions (1877, 1878) and the type specimen in

the Canterbury Museum represent the form of *salustius* with a large, coppery male which occurs throughout the North Island (Fig. 1). This interpretation agrees with that of Hudson (1898, 1928). I think it might be significant to add that an unlabelled male and female of this form occur among the Banks Collection material in the British Museum, and that Dieffenbach's description of *edna* (1843) clearly refers to this same large North Island form. The whereabouts of the *salustius* type specimen is unknown, but since Butler synonymised *edna* with it (1869) there is a good chance that it too was of the same form.

Although the main aim of this paper is to re-describe *L. rauparaha*, some comparative data are tabulated for *L. salustius* and *L. feredayi* (these data are not available in the literature), and all three members of the species-complex are figured (Fig. 1-9).

The proper generic affinity of the *salustius-rauparaha-feredayi* complex is unresolved. Sibatani (1974) proposed that they be included in *Helleia* Verity, 1943, but supporting evidence is still lacking. It seems best to retain these New Zealand species in *Lycaena* (sensu lato) in the meantime.

For male genital measurements, 10 specimens of each species were examined, from a wide geographical range. Larvae were collected at Tangimoana and Waikanae Beach, both stabilised dune areas of the Manawatu district. Ova have not been looked at, and fewer than five specimens of larva and pupa contributed to the data presented here, so their features should be regarded as provisional. Names of colours are according to Kornerup & Vanscher (1967). Area codes for specimen localities follow the scheme suggested by Crosby *et al.* (1976), and abbreviations for institutional collections follow Watt (1979). In addition: GVH - G. V. Hudson Collection, National Museum; GWG - author, private collection; RCC - R. C. Craw, private collection; THD - T. H. Davies, private collection.

NOTES ON GENITALIA IN *Lycaena*

The following notes provide a background to the terminology I have used and a brief description of the morphology of the female system. Certain features of the latter are just as diagnostic as the male structures, a point of particular significance for the New Zealand species, of which the females can sometimes be difficult to distinguish on external features alone.

MALE GENITALIA (Fig. 10-21). The terms used by Klots (1970) and Sibatani (1974) are adhered to. In their standard terminology the ventral sclerite of the diaphragma is referred to as the juxta, a significant structure in *Lycaena* systematics. This sclerite is

termed the furca by Higgins (1975) and Miller & Brown (1979). A small but conspicuous spine on the extended vesica of the aedeagus in some species is referred to as a cornutus (Sibatani 1974) or cuneus (Higgins 1975); the former term is adopted here.

FEMALE GENITALIA (Fig. 26 & 27). A deeply invaginated mid-ventral genital chamber (sinus vaginalis) is weakly supported by variable areas of sclerotisation. Its posterior opening is a broad, curved slit about four times wider than high. The sinus tapers anteriorly to the heavily sclerotised, ornamented, funnel-like opening (ostium bursae) of the copulatory duct (ductus bursae). These sclerotised structures, although subject to considerable intraspecific variability, are nevertheless important elements for species diagnosis. The opening of the ductus is surrounded by a flange-like sclerotised rim (periostial flange), and sometimes bears a prominent posterior tongue (periostial protrusion) on its ventral side. A short, sclerotised cylinder which extends through the wall of the sinus vaginalis into the ductus bursae is referred to as the antrum. These posterior sclerotised elements may be collectively referred to as the sterigma (e.g., Miller & Brown 1979). At the anterior end of the antrum, the ductus seminalis enters the ductus bursae on its dorsal side. The extent of swelling of the ductus bursae in this region is a useful character in the New Zealand species. From the antrum, the ductus bursae is lightly sclerotised as far as a kinked portion (cervix bursae) marking the entry to the large, membranous corpus bursae. The spermathecal structures were examined in the New Zealand species but found not to vary significantly.

KEY TO THE *salustius-rauparaha-feredayi* SPECIES-COMPLEX

- 1 All wing veins marked with double black lines on uppersurface in ♂; double lines restricted to hindwing veins M and Cu in ♀..... *salustius*
—All wing veins marked with single black lines on uppersurface.....2
- 2 Hindwing undersurface partly or entirely brown.....3
—Hindwing undersurface uniformly banana-yellow with some indistinct markings; forewing uppersurface with triangular area formed by origin of veins M₃, CuA₁, and CuA₂ clear golden-yellow, without black scales..... *rauparaha*
- 3 Hindwing undersurface entirely brown.....4
—Hindwing undersurface yellow at base and along anal margin, with a conspicuous brown patch in centre contiguous with brown outer marginal band; forewing upper surface with triangular area formed by origin of veins M₃, CuA₁, and CuA₂ normally suffused with black scales..... *feredayi* (normal morph)

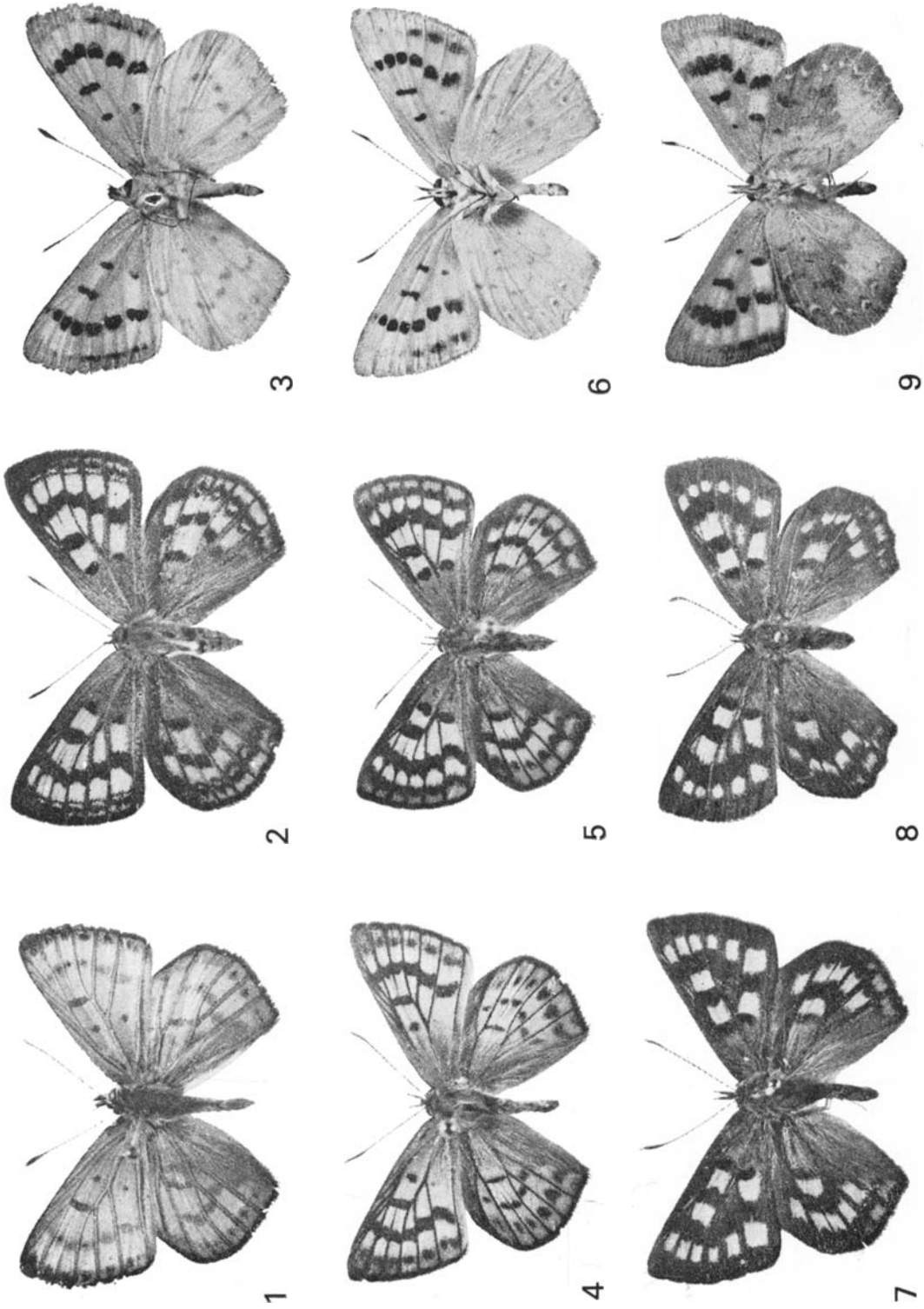


Fig. 1-9. The *Lycaena salustius-rauparaha-feredayi* species-complex: (1-3) *L. salustius*, Tangimoana; (4-6) *L. rauparaha*, Tangimoana; (7-9) upperside of ♂ on left, upperside of ♀ in centre, underside of ♂ on right.

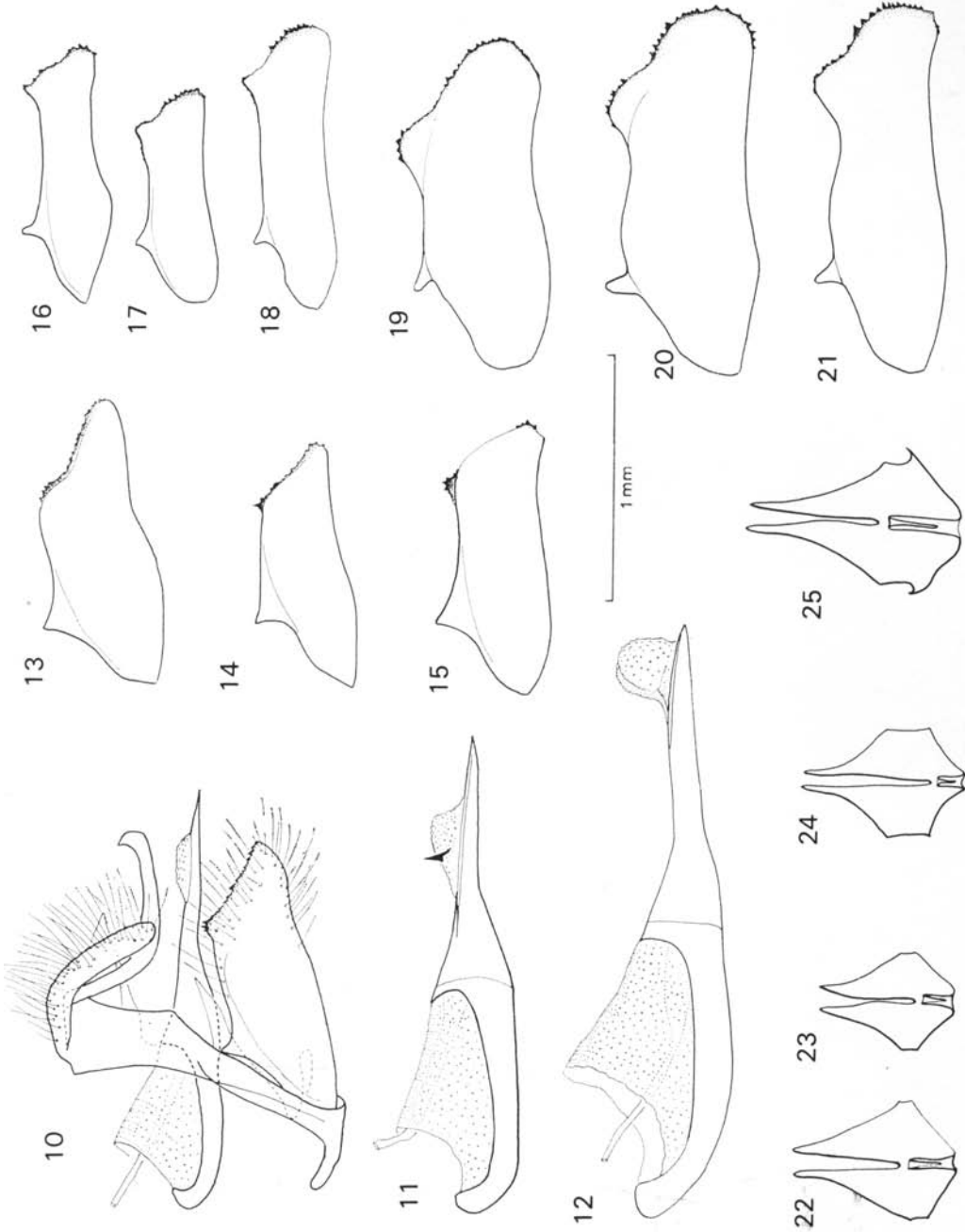


Fig. 10-25. Male genitalia of *Lycæna rauparaha*, *L. salustius*, and *L. feredayi*: 10, *L. rauparaha*, Glentui (side view; right-hand components of paired structures omitted); 11, *L. salustius*, aedeagus; 12, *L. feredayi*, aedeagus; 13-15, *L. rauparaha*, outline of left valve (side view) - (13) Picton, (14) Tangimoana, (15) Kaiaua; 16-18, *L. salustius*, outline of left valve (side view) - (16) Whataroa, (17) Palliser Bay, (18) Waikanae

Beach; 19-21, *L. feredayi*, outline of left valve (side view) - (19) Caroline Valley, Southland, (20) Wellington, (21) Morrinsville; 22-25, *L. rauparaha*, Glentui (same viewed from between the valves - (22) *L. rauparaha*, Tangimoana, (24) *L. salustius*, Waikanae Beach, (25) *L. feredayi*, Morrinsville.

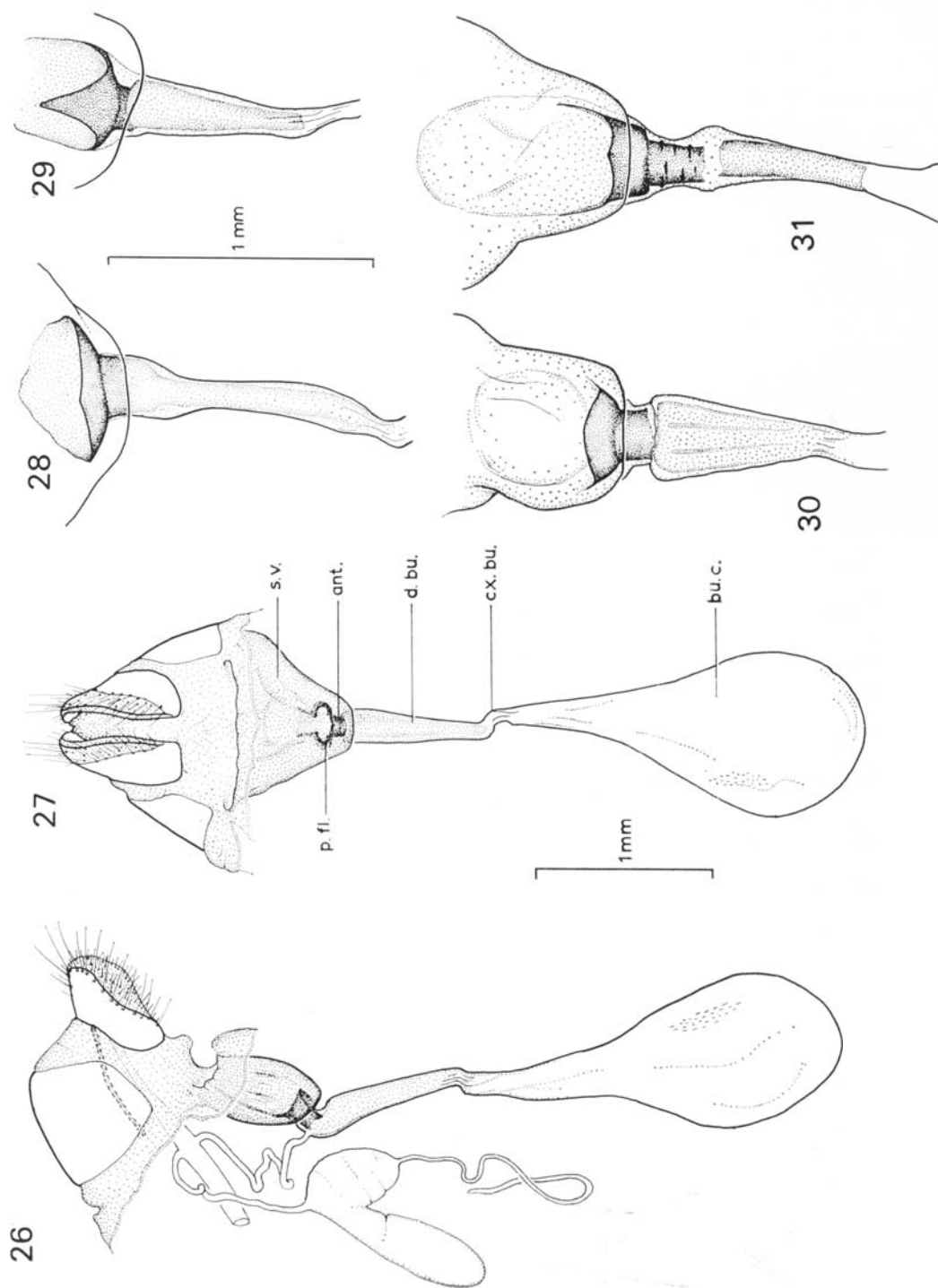


Fig. 26-31. Female genitalia of *Lycaena rauparaha*, *L. salustius*, and *L. feredayi*: 26-29 *L. rauparaha* - (26) side view, showing spermatheca and ductus seminalis, Tangimoana; (27) ventral view, same specimen; (28) detail of ostium and ductus bursae, ventral view, Kalapo Bush; (29) same detail, Waimamaku Beach; 30, *L. salustius*, detail of sinus

vaginalis, ostium, and ductus bursae, ventral view, Waikanae Beach; 31, *L. feredayi*, detail of sinus vaginalis, ostium, and ductus bursae, Waikanae Beach. ABBREVIATIONS: ant. - antrum; bu.c. - bursa copulatrix; cx.bu. - cervix bursae; d.bu. - ductus bursae; p.fl. - periostitial flange; s.v. - sinus vaginalis.

- 4 Hindwing undersurface spangled with pale yellow scales overlying brown ground colour; scales especially numerous towards base.....*rauparaha*
—Hindwing undersurface brownish-orange, without pale yellow scales.....*feredayi* (brown morph)

Lycaena rauparaha (Fereday) n. comb.

Fereday, 1877: 462; 1878: 255–6, fig. E & 4 (*Chrysophanus*).
feredayi (not Bates, 1867) Butler, 1874: 29; 1876: 154; 1878: 275, pl. XII fig. 7–9 (*Chrysophanus*).
salustius (Fabricius, 1793) (in part). Synonymy by Hudson, 1898: 116, pl. XII fig. 21, pl. XIII fig. 2; 1928: 36, pl. V fig. 24 & 25 (*Chrysophanus*).

TYPE DATA. **Holotype** ♂ (by original designation) in Canterbury Museum, labelled [handwritten] “Fereday collection”, “Rauparaha Fereday”, “Type”, and bearing a bright red label with “HOLOTYPE [printed] *Lycaena rauparaha* (Fereday), det. G. W. Gibbs 1979 [handwritten]”; it has no locality label. There is a strong possibility that the labels on Fereday’s specimens have been interfered with, because his 1878 description gives “Kaiapoi Bush, Canterbury” as the locality for the male. The Fereday collection also contains two females, one labelled “Kaiapoi Bush 1/1/66” and the other “Kaiapoi Bush 24/12/67”, but his description of the female says “one specimen taken at Kaiapoi Bush and one at Fendalltown, near Christchurch”. Hudson (1928) mentions that the original labelling of Fereday’s collection has been very much altered, so it is possible that the correct label for the holotype should indicate “Kaiapoi Bush 1/1/66”.

DESCRIPTION. **MALE** (Fig. 4, 6). Wing uppersurfaces principally golden-yellow, with all veins clearly marked with narrow black lines. Forewing triangular area formed by origin of veins M_3 , CuA_1 , and CuA_2 clear golden-yellow, without black scales. Hindwing undersurface ranging from bronze-brown through shades of mustard-brown to banana-yellow, with some indistinct markings in a slightly darker hue and a submarginal row of whitish lunules; whole area spangled with pale yellow scales overlying ground colour, these scales especially numerous towards base. Forewing length: holotype 15.8 mm; range 12.9–16.2 mm, mean 14.6 mm ($n = 49$).

Genitalia (Fig. 10, 13–15, 22, & 23). Valvae robust, simple, lacking any dorsodistal protuberance or internal teeth but with an irregular armature of distal teeth; length 1.10 mm (range 1.00–1.18 mm; $n = 10$), width at midlength 0.34 (0.29–0.39) mm; juxta with pointed posterodorsal processes of moderate length; aedeagus straight, 1.72 (1.61–1.85) mm long; vesica without cornutus.

FEMALE (Fig. 5). Forewing apex less acutely pointed than in ♂. Coloration as in ♂, except that black bands and spots on uppersurface are broader,

resulting in confluence of spots in submarginal series. Basal third of both wings heavily suffused with black scales on uppersurface. Forewing length: range 13.5–16.7 mm, mean 14.6 mm ($n = 18$).

Genitalia (Fig. 26–29). Sinus vaginalis weakly sclerotised; periostial flange and antrum strongly sclerotised, flange of very variable form but often (8 of 14 specimens) with an elongate posterior protrusion on the ventral side (Fig. 25); antrum very short, its length and width less than half width of periostial flange in ventral view; ductus bursae lightly sclerotised, narrower than periostial flange and tapering slightly to cervix; bursa without true signa, but with two faintly discernible patches of minute spines.

VARIATION. Males and females do not differ significantly in size, but there is consistent dimorphism in wing shape and black markings, the latter showing maximum divergence on the uppersurface of the hindwing, where the male’s submarginal row of spots is usually represented in the female as a continuous band with a scalloped outer edge.

The most variable character is the ground colour of the hindwing undersurface, which has been largely responsible for past confusion over the status of this species. At the yellow end of the range specimens approach *salustius* in colour, but at the brown end they approach a brown morph of *feredayi*. North Island specimens tend to be yellowish, whereas those from the South Island are brown.

MATURE LARVA reaching 15 mm total length. A typical onisciform *Lycaena* larva, but with fewer markings

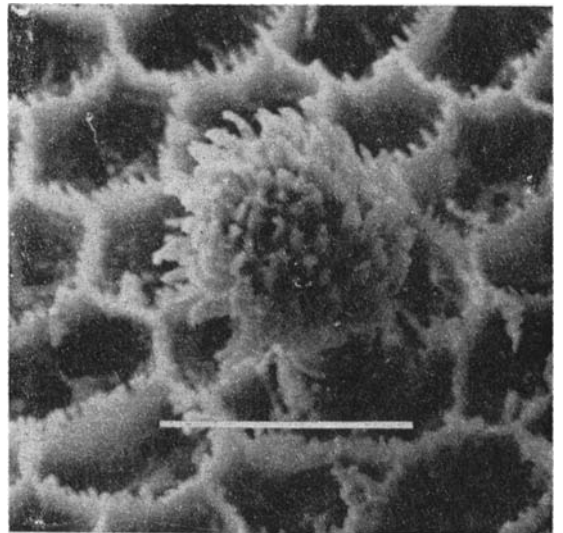


Fig. 32. *Lycaena rauparaha*, larval cuticle showing a ‘pom-pom’ seta. Scale line = 0.02 mm.

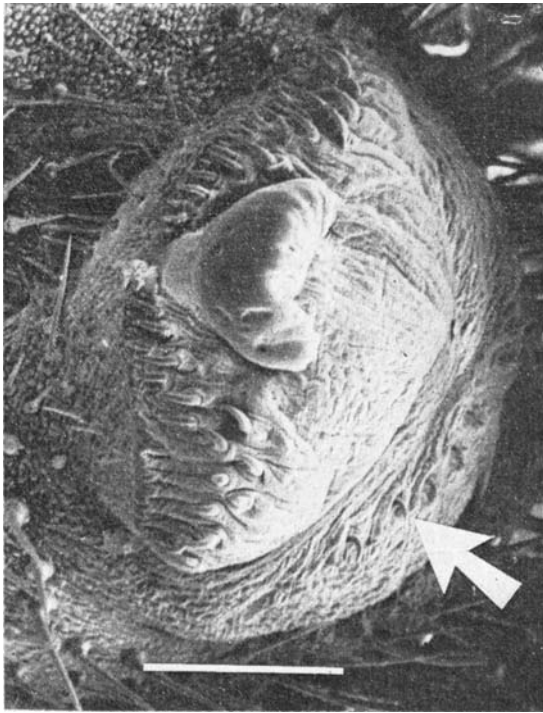


Fig. 33. *Lycaena rauparaha*, larval proleg showing inner crochets (left) and single row of outer crochets (arrow). Scale line = 0.2 mm.

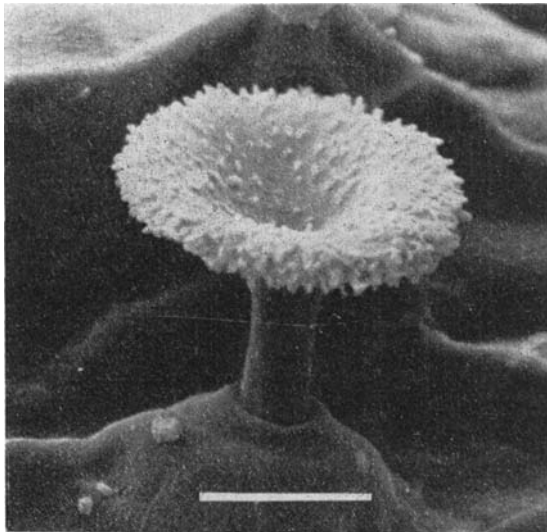


Fig. 34. *Lycaena feredayi*, pupal cuticle showing a 'golf-tee' seta. Scale line = 0.02 mm.

than *feredayi* or *salustius*. Bright, velvety green over entire uppersurface, paler beneath; mid-dorsal line poorly defined, especially on thoracic segments; prothoracic shield green. Integument sparsely clothed with short, brown setae and spherical 'pom-pom' setae (Fig. 32), the latter visible to the naked eye as minute, creamy-yellow spots. Ventral prolegs with 2 patches of large, hooked crochets on inner side and a row of 6–8 smaller, hooked crochets on outer side (Fig. 33).

PUPA. Length 10 mm. Pale yellowish-brown or pinkish-brown with bronzy-green iridescence on pupal wings and thorax; devoid of darker markings, or with indistinct brown speckling on thorax and abdomen, or with a variable number of small, black pigment spots along mid-dorsal line and on subspiracular line. Texture distinctly roughened owing to moderately dense covering of white 'golf-tee' setae (Fig. 34). Eye with a band of pale brown pigment.

HABITAT. The known localities for *L. rauparaha* in the North Island are open scrub and duneland areas close to the sea where *Muehlenbeckia complexa* is present. These sites may be in open farmland, on rocky coastal cliffs, or in lupin scrub on stabilised dunes. In the South Island the same habitat data may apply, but the species also occurs considerable distances inland along river banks, and even in thickly forested areas, such as around the reservoir at Picton. Fereday's original habitats around Christchurch have been destroyed, but R. C. Craw has found *L. rauparaha* in the Glentui Valley, 32 km from Kaiapoi.

FLIGHT SEASON. Specimens from the north of the North Island indicate that the flight period can extend from the end of August until April, but in the Manawatu district adults have not been seen before December nor after March.

DISTRIBUTION (Fig. 35). Coastal North Island (maximum 11 km inland), but excluding the east coast from East Cape to Cape Palliser. Also present on northern offshore islands, including the Three Kings, Whale Island, Coppermine Island (Hen and Chickens group), Little Barrier Island, Rangitoto Island, Waiheke Island, Great Barrier Island, Cuvier Island, and the Aldermen group. The north and east of the South Island, southward to the vicinity of Christchurch, both coastal and inland.

KNOWN FOODPLANTS. *Muehlenbeckia complexa* and *M. complexa/australis* hybrids (Polygonaceae).

MATERIAL EXAMINED. North Island. ND. 3♂, 2♀, Great I., Three Kings group (NZAC, AMNZ); 1♂, Te Werahi swamp (AMNZ); 1♂, Unuwahao (AMNZ); 1♂, Whareana Bay (AMNZ); 1♀, Whale I., C. Karikari (AMNZ); 5♂, 1♀, Bay of Islands (RCC);

Table 1. Main distinctions between *Lycaena salustius*, *L. rauparaha*, and *L. feredayi*.

CHARACTER	<i>salustius</i>	<i>rauparaha</i>	<i>feredayi</i>
Sexual dimorphism	considerable colour dimorphism	moderate colour dimorphism	monomorphic
WING UPSERSURFACE			
Black vein marking	♂ veins with double black lines; ♀ veins broadly marked in black, double lines only on hindwing cubital and medial veins	all veins with single narrow black lines	all veins with single broad black lines
Forewing triangular area at origin of veins M ₃ , CuA ₁ , and CuA ₂	clear golden-yellow	clear golden-yellow	suffused with black scales (in 90%; n = 156)
Blue submarginal lunules in ♀	present	absent	absent
WING UNDERSURFACE			
Hindwing colour	pale yellow or maize-yellow	banana-yellow through intermediate shades to bronze-brown	either maize-yellow with a large brownish-orange discal patch, or entirely brownish-orange
Spangling of pale yellow scales on hindwing	not relevant	present, overlying the brown ground-colour	absent
MALE GENITALIA			
Aedeagus length (mm); mean, and range for 10 specimens	1.88(1.55–2.06)	1.72(1.61–1.85)	2.26(1.97–2.48)
Cornutus on vesica	present	absent	absent
Valve length (mm); mean and range for 10 specimens	1.12(0.89–1.23)	1.10(1.00–1.18)	1.45(1.27–1.52)
Valve shape	4× longer than wide, with small dorsodistal protuberance	3.2× longer than wide, dorsal margin more or less straight	3.5× longer than wide, with prominent dorso-distal protuberance
Dorsal arms of juxta	moderate length, pointed	moderate length, pointed	elongate, pointed
FEMALE GENITALIA			
Periostial flange	without mid-ventral protrusion	often with mid-ventral protrusion (8 of 14 ♀ ♀)	without mid-ventral protrusion
Antrum length	moderate, about half width of flange	short, less than half width of flange	long, more than half width of flange
Ductus bursae	conspicuously swollen at posterior end, as wide as or wider than periostial flange	slightly wider at ductus seminalis than at cervix, but never as wide as periostial flange	sclerotised portion of ductus same diameter as antrum throughout
Junction of antrum with ductus bursae	contiguous	contiguous	with distinct break in sclerotisation
Signa of bursa copulatrix	represented by 2 patches of extremely small spines	represented by 2 patches of extremely small spines	represented by 2 patches of small but distinct spines
MATURE LARVA			
'Pom-pom' setae	white	creamy-yellow	creamy-yellow
Mid-dorsal line	distinct, brownish	indistinct	very prominent (especially on thorax), reddish-brown
Outer row of crochets on abdominal prolegs	6–8 crochets	6–8 crochets	12–16 crochets
PUPA			
Eye pigment	black or dark brown	pale brown	pale brown
General colour	yellowish	pinkish-brown or yellowish-brown	reddish-brown with darker wings
'Golf-tee' setae	sparse	numerous	quite dense, giving a rough, bark-like texture

1♂, Paihia (NZAC); 1♂, 2♀, Waimamaku Beach (NZAC); 2♂, 2♀, Waipoua S.F. (NZAC); 1♂, 4♀, Kawerua Beach (NZAC); 1♀, Coppermine I. (Hen & Chickens group) (NZAC). **AK.** 3♂, 2♀, Pakiri Beach (NZAC); 1♂, Takapuna (GVH); 20♂, 8♀, Auckland (AMNZ); 3♂, Bethel's Beach (AMNZ); 1♂, Piha (RCC); 1♂, Avondale (NZAC); 1♂, Rangitoto I. (NZAC); 3♂, Waiheke I. (NZAC); 2♂, Manurewa (AMNZ); 1♂, 2♀, Waiuku (NMNZ); 1♂, Wattle Bay, Manakau Harbour (NZAC); 4♂, 3♀, Orere Point (AMNZ); 2♂, Whakatiwai (AMNZ); 1♂, 1♀, Kaitiaki (GWG). **CL.** 7♂, 4♀, Little Barrier I. (NZAC, NMNZ); 1♂, 1♀, Great Barrier I. (AMNZ); 1♂, Cuvier I. (AMNZ); 3♀, Ruamahuanui I. (Aldermen group) (NZAC). **BP.** 1♂, Waihi Gorge (NMNZ); 1♂, 1♀, Tauranga (NMNZ, AMNZ); 8♂, 4♀, Mt Maunganui (NZAC, GWG); 1♂, Hick's Bay (THD). **TK.** 3♂, Okato Beach (NZAC); 3♂, New Plymouth (AMNZ, NMNZ). **WI.** 1♂, Wanganui (NMNZ); 1♀, Long Acre (AMNZ); 15♂, 6♀, Tangimoana (GWG); 2♂,

Pukepuke Lagoon (GWG). **WN.** 5♂, Levin (AMNZ); 1♀, Pekapeka Beach (RCC); 1♂, Waikanae Beach (GWG); 1♂, L. Pounui (RCC). **South Island.** **NN.** 3♂, 1♀, Onekaka (GWG); 1♂, Takaka (GVH); 1♀, Totaranui (RCC); 3♂, 2♀, Nelson (NZAC, GVH); 1♀, Pepin I. (NZAC); 1♂, Aniseed Vly (THD); 1♂, Fringe Hill (THD); 1♂, Rolling River (GWG). **SD.** 5♂, 1♀, Picton Reservoir (THD, GVH, GWG). **MB.** 2♂, Cannister Crk (RCC). **KA.** 1♀, Puhipuhi Reserve (RCC). **NC.** 1♂, Mt Grey (CMNZ); 1♂, Glentui Vly (RCC); 1♂, 1♀, Kaiapoi Bush (**type locality**) (CMNZ). **MC.** 1♀, Fendalton (CMNZ).

DISCUSSION

Table 1 provides a guide for distinguishing between the three species of New Zealand copper butterfly. With a little experience the adults can easily be recognised in the field, but difficulty may be experienced with the immature stages.

Although the variability of the hindwing underside of these copper butterflies has been a notable source of confusion to taxonomists, it nevertheless raises some interesting points to do with clines and polymorphism. The variation in *L. rauparaha* is geographic, yellowish forms occurring in the North Island and brownish ones in the South Island. *L. salustius* is consistently yellow on the hindwing underside, but *L. feredayi* is dimorphic, the common yellow-and-brown morph predominating over a rare brown morph at all localities except in central Southland, in my experience. Where brown morphs have been found in the North Island they have constituted no more than 10% of the population (e.g., Rangitikei Valley), often considerably less (e.g., Linden). At many places brown morphs of *L. feredayi* are unknown, but in the Oreti Valley, Southland, the entire population is of the brown form. The significance of these underwing colours, which are exposed when the butterfly is at rest, and the predominance of brown over yellow in the south, for two of the species, pose intriguing questions that remain to be investigated.

In many situations *L. rauparaha* coexists and flies with *L. salustius*, but to date no hybrids have been detected. This contrasts with the situations where *L. feredayi* and *L. salustius* fly together. Two male specimens which I have interpreted as *salustius/feredayi* hybrids have been found, one by R. C. Craw at Linden (WN) and one by myself at Reikorangi (WN). All three species of copper butterfly coexist and fly together on the stable dunes at Waikanae Beach (WN), where *Muehlenbeckia complexa*, *M. australis*, and *M. complexa/australis* hybrids are abundant.

ACKNOWLEDGMENTS

I am grateful to Mr R. A. Savill, Canterbury Museum, for the loan of Fereday's specimens. Other

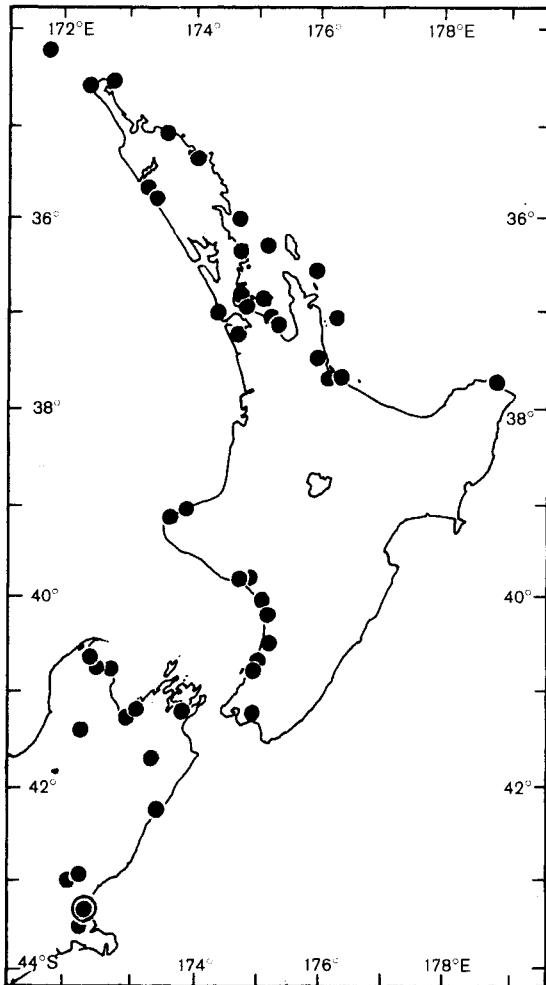


Fig. 35. Map locations of *Lycaena rauparaha* specimens mentioned in text; type locality ringed.

specimens and locality data were kindly made available by Mr T.H. Davies, Haumoana; Mr J.S. Dugdale, Entomology Division, DSIR; Dr K.J. Fox, of Manaia; Mr R.G. Ordish, National Museum, Wellington; and Mr K.A.J. Wise, Auckland Institute and Museum. Mr R.C. Craw has also loaned specimens, and provided critical comments on a draft of the manuscript.

REFERENCES

- BUTLER, A.G. 1869: *Catalogue of diurnal Lepidoptera described by Fabricius in the collection of the British Museum*, Vol. 4. Printed by order of the Trustees, London.
- 1874: Insects of New Zealand. Order Lepidoptera. Pp. 25–51 in J. RICHARDSON & J.E. GRAY (Eds), *Zoology of the Voyage of H.M.S. Erebus and Terror*, Vol. 2.
- 1876: List of the butterflies now known to inhabit New Zealand, with descriptions of a new genus, and a new species, in the collection of John D. Enys, Esq. *Entomologists' Monthly Magazine* 13: 152–4.
- 1878: On the butterflies of New Zealand. *Transactions & Proceedings of the N.Z. Institute* 10: 263–76.
- CROSBY, T.K.; DUGDALE, J.S.; WATT, J.C. 1976: Recording specimen localities in New Zealand: an arbitrary system of areas and codes defined. *N.Z. Journal of Zoology* 3: 69 + map.
- DIEFFENBACH, E. 1843: Annulose animals hitherto recorded from New Zealand with descriptions of some new species. Pp. 265–95 in *Travels in New Zealand*, Vol. 2. J. Murray, London.
- FEREDAY, R.W. 1872: Observations on a paper read by Mr A. Bathgate before the Otago Institute, 11th January, 1870, "On the Lepidoptera of Otago". *Transactions & Proceedings of the N.Z. Institute* 4: 214–18.
- 1877: Brief observations on the genus *Chrysophanus*, as represented in New Zealand. *Transactions & Proceedings of the N.Z. Institute* 9: 460–3.
- 1878: Supplementary description of species or varieties of *Chrysophani* (Lepidoptera Rhopalocera) inhabiting New Zealand. *Transactions & Proceedings of the N.Z. Institute* 10: 252–9.
- HIGGINS, L.G. 1975: *The Classification of European Butterflies*. Collins, Glasgow.
- HUDSON, G.V. 1898: *New Zealand Moths and Butterflies (Macrolepidoptera)*. West, Newman & Co., London.
- 1928: *The Butterflies and Moths of New Zealand*. Ferguson & Osborn, Wellington.
- HUTTON, F.W. 1901: Note on *Chrysophanus feredayi*. *Transactions & Proceedings of the N.Z. Institute* 33: 96–7.
- KLOTS, A.B. 1970: Lepidoptera. Pp. 115–30 in S.L. TUXEN (Ed.), *Taxonomists' Glossary of Genitalia in Insects* (2nd ed.). Munksgaard, Copenhagen.
- KORNERUP, A.; WANSCHER, J.H. 1967: *Methuen Handbook of Colour* (2nd ed.). Methuen, London.
- LONGSTAFF, G.B. 1912: On the nomenclature of the Lepidoptera of New Zealand. *Transactions & Proceedings of the N.Z. Institute* 44: 108–15.
- MILLER, L.D.; BROWN, F.M. 1979: Studies in the Lycaeninae (Lycaenidae) 4. The higher classification of the American coppers. *Bulletin of the Allyn Museum* 51: 1–30.
- PHILPOTT, A. 1928: Notes and descriptions of New Zealand Lepidoptera. *Transactions & Proceedings of the N.Z. Institute* 59: 481–90.
- SIBATANI, A. 1974: A new genus for two new species of Lycaeninae (s. str.) (Lepidoptera: Lycaenidae) from Papua New Guinea. *Journal of the Australian Entomological Society* 13: 95–110.
- WATT, J.C. 1979: Abbreviations for entomological collections. *N.Z. Journal of Zoology* 6: 519–20.
- WISE, K.A.J. 1966: Nomenclature of some butterfly species. *N.Z. Entomologist* 3: 18–20.