New Zealand Ichneumonidae

PAPER No. 1

The Genus *Netelia* Gray (*Paniscus* of Authors) (Tryphoninae: Phytodietini)

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[*Read before the Nelson Institute, June 19, 1950; received by the Editor, July 4, 1950.*]

THE systematics of the Ichneumonidae have in the past been rather confused, but the recent works of Dr. H. K. Townes and others have made considerable advancement, especially in the definition and arangement of the higher categories, into which the family is divided. In dealing with the New Zealand fauna the nomenclature of the higher groups will be based on the work of Townes, whose valuable contributions have clarified the systematics of the family considerably.

SYSTEMATIC POSITION AND NOMENCLATURE OF THE TRIBE PHYTODIETINI

Cushman (1924) in his revision of the Paniscini (= Netelini = Phytodietini) restricted the tribe to two genera *Paniscus* (= *Netelia*) and *Parabates*, on account of the type of egg and larval development, and transferred the tribe from its classical position near the Ophionini to a position near the Tryphonini. Townes (1938) agreed with Cushman, but considered that the tribe Netelini (Paniscini) showed even closer relationship with the genus *Phytodietus*, and for this reason he proposed that the genus *Phytodietus* be placed with the genus *Netelia* (= *Paniscus*) in the tribe Netelini. According to the rules of nomenclature the name of the tribe takes the name of the oldest included genus, which in the present case is Gravenhorst's genus *Phytodietus*, established in 1829. *Netelia* was established by Grey in 1860, accordingly, the tribal name will have to be Phytodietini.

Sub-family TRYPHONINAE

Two tribes are represented in the New Zealand fauna, which may be separated by the following Key:

KEY TO NEW ZEALAND TRIBES

Propodeum with both transverse and longitudinal carinae; legs stout	TRYPHONINI
Propodeum without carinae, or with a pair of transverse crests; legs slender	PHYTODIETINI

Tribe PHYTODIETINI

This tribe is characterised by Townes (1938, p. 173) as follows: Head transverse, eyes large, malar space short: clypeus separated from face, the apex truncated or emarginate; flagellum slender, tapering with 30 to 60 segments; scape twice as long on inner side as on outer side; prepectal carina ending about halfway up the mesopleuron; sternaulus wanting; mesonotum strongly convex; mesothorax deep and strongly developed; propodeum rather evenly convex, without carinae

or transversely striate on its basal half above and with a somewhat curved transverse carina on each side just above its middle; discocubital vein strongly curved basally; areolet triangular, usually higher than wide, subpetiolate or shortly petiolate, rarely absent; second intercubital with a bulla below; second recurrent strongly curved, interstitial or nearly interstitial with second intercubitus, a bulla at its top and another just below its middle; apex of front tibia evenly rounded, without a suggestion of a tooth; spurs of front tibia long and slender, the comb-bearing part occupying less than one half of its length; tibia and tarsi with many conspicuous bristles; tarsal claws densely pectinate, with eight to fifty long teeth; petiole straight, gradually enlarged towards the apex, its spiracles before the middle; glymma deep; abdomen more or less compressed beyond the third segment; epipleura well developed on all segments; ovipositor from about one-fifth as long, to as long as, the abdomen; the tip tapering, not notched; female subgenital plate not strongly developed; ovipositor sheath transversely ridged, densely clothed with rather long hair; penis compressed.

Townes (*loc. cit.*, p. 174) gives the following key for the separation of the two genera included in this tribe:

KEY TO GENERA

Lower tooth of mandibles as long as upper tooth; clypeus rather narrow; eyes not exceptionally large, weakly or or not at all emarginate at antennae; ocelli not large, lateral ocellus not close to eye; nervellus broken below middle; body less slender; ground colour usually black; inner surface of squama of male genitalia not specialised	*Phytodietus*
Lower tooth of mandibles much shorter than upper tooth; clypeus broad; eye very large and usually strongly emarginate at antennae; ocelli large, the lateral ocellus touching or close to the eye; nervellus broken above middle; body slender; ground colour tawny; inner surface of squama of male genitalia usually with special structures	*Netelia*

Only two species are known from New Zealand, belonging to the genus *Netelia*. One is endemic while the other is a widespread Australian species.

Genus NETELIA Gray, 1860

Cushman (1924, p. 21) has previously pointed out "The fact that *Ichneumon luteus* is the only species mentioned by Schrank in connection with *Paniscus* and is also the type of the genus *Ophion* would seem to make necessary the synonymising of *Paniscus* with *Ophion*." Under strict interpretation of the International Code of Zoological Nomenclature, *Paniscus* Schrank is isogenotypic, and therefore synonymous with *Ophion* Fabricius. Townes (1938) synonymised *Paniscus* Schrank with *Ophion* Fabricius, and used *Netelia* Gray for *Paniscus* of authors. Cushman (1947, p. 437) referring to Townes' action in synonymising *Paniscus* with *Ophion* states: ". . . although I feel that this action was too precipitate, and probably will not receive the support and following of the majority of the contemporary specialists on the Ichneumonidae, his action seems to have blocked the preservation of *Paniscus* in the sense sanctioned by well over a hundred years of usage, and I follow him in the use of *Netelia*." From the above remarks it will be at once apparent that there is no

alternative but to synonymise *Paniscus* with *Ophion* and to substitute for *Paniscus*, in the traditional sense, Gray's genus *Netelia*.

These insects, as are all Phytodietini, are external parasites on lepidopterous larvae. There is a reference in the New Zealand literature to one of our species parasitising locusts (Miller, 1919); this observation is probably an error and requires confirmation. The eggs are very large and are attached externally to the body of the host by a pedicel which is thrust through the skin of the host In oviposition the egg itself is not enclosed in the ovipositor, but is attached to it by the enlarged base of the pedicel. Structurally the ovipositor is rather unique; it is attenuated at the apex beyond a more or less distinct ventral enlargement. (Fig. 1.) This type of ovipositor occurs in all groups of ichneumonids that produce stalked eggs.

Generic Diagnosis

Occiput margined; lower tooth of mandibles much shorter than upper tooth; clypeus broad; eyes very large, and usually strongly emarginate at antennae; ocelli large, the lateral ocelli touching or close to the eyes; scutellum basally carinate on either side; spiracles of basal segment of abdomen placed distinctly before centre; areolet triangular; nervellus broken above the middle; ovipositor exserted; body slender; ground colour tawny; all tarsal claws pectinate.

The nomenclature of the New Zealand species of *Netelia* has in the past been rather confused. Although only two species are known at present from New Zealand, four specific names appear in the literature.

In 1876 Smith described a female from Otago which he named *Paniscus ephippiatus*. Cameron in 1898 described *Paniscus foveatus* from a female collected at Greymouth; this species is identical with Brulle's species *Paniscus productus* originally described from Tasmania in 1846. Smith in 1878 published another description of *Paniscus ephippiatus* from a female collected in Canterbury. Dalla Torre in his catalogue of 1901 considered that Smith had dealt with two species in his 1876 and 1878 description of *ephippiatus* and consequently raised the species described in 1878 to specific rank under the name *Paniscus smithii*. But there is no doubt that Smith's two descriptions refer to the one and the same species, as Hutton many years ago indicated in his Catalogue of Diptera, etc., published in 1881 Hutton in 1904 lists two species, *Paniscus productus* and *foveatus*, treating *ephippiatus* as a synonym of *productus*. Subsequent authors have confused the nomenclature and identity of the two species, as named specimens in the various collections have shown.

The two New Zealand species may be separated by the following Key:

KEY TO NEW ZEALAND SPECIES OF *Netelia*

Face and frons yellowish brown to pallid yellow; mesothorax and mesosternum uniformly brown; nervellus index from 1.79 to 2 08 ... *N. productus*

Face and frons brown; ocular area, mesothorax and mesosternum black or clouded with black; nervellus index from 2 40 to 2.92 ... *N ephippiatus*

Netelia ephippiatus (Smith)

Paniscus ephippiatus Smith, *Trans. Ent. Soc. Lond.*, 1876, p. 478, female; Smith, *loc. cit*, 1878, p. 3, female; Hutton, *Cat. N.Z. Diptera*, etc., 1881, p. 126; Cameron, *Mem. Manch. Soc.*, 42, pt. I, 1898, p. 35; Cameron, *Trans. N.Z. Inst.*, 33, 1901, p. 105; Dalla Tore, *Cat. Hymen*, III, pt. I, 1901, p 78.

Paniscus productus Hutton, *Index Faunae Nov. Zeal.*, 1904, p. 102; Miller, *N.Z. Journ. Agric*, 19, 1919, p. 203, fig.

Paniscus smithii Dalla Torre, *Cat. Hymen.*, III, pt. I, 1901, p. 80.

This species was first described by Smith in 1876 from a female collected in Otago, and two years later another female collected from Canterbury was described under the same name by the same author. Hutton gives both descriptions in his 1881 catalogue, but erroneously gives the locality for the 1878 specimen as Dunedin. Hutton was of the opinion that both descriptions referred to the one and the same species. Cameron records it from Greymouth (1898) and from Wellington (1901) Morley (1912) examined a specimen from Auckland.

Female

Head brownish-yellow or light brown; ocular area and tip of mandibles black; ocelli and eyes nigger-brown; antennae brown, the apical 24 joints of a darker greyish-brown; pronotum pale yellowish-brown; mesonotum with three wide longitudinal bands of black, separated by the notauli; mesostern black; legs yellowish-brown; spines brown to blackish-brown; claws nigger-brown; abdomen, first tergite basally light brown darkening to brown towards apex; second tergite and basal part of third tergite brown, remaining part of third tergite and the posterior tergite dark brown shading to black; ovipositor dark brown to black; wings hyaline, veins and stigma brown to dark brown.

Ocelli large, posterior ones sub-contiguous with eyes, anterior ocellus separated from eyes by its diameter, and the same distance from antennal scrobes; frons finely but distinctly striolated, bordered by a lateral carina, running parallel with the inner border of the eyes, nearly glabrous; face slightly wider than long, weakly convex in centre, clothed with fine whitish pubescence and finely punctate; clypeus more especially along anterior border; flagellum with 53 joints and all coarsely punctate and clothed sparsely with longish white bristles, entirely clothed with short and fine pubescence, the joints becoming gradually shorter, the apical joint is about a quarter the length of the third joint. Scutellum prominent, oblong, narrowed towards apex, lateral carinae present, the whole surface punctate; propodeum finely, transversely striolated, strong carinae along the lateral posterior borders terminating anteriorly in a prominent spine-like process; mesostern with median sulcus deep; pleural sclerites distinct; all tibiae spined, the spines short, sharply jointed, and are more numerous on posterior tibiae; claws with strong pectinations; abdomen, first tergite, long and straight, gradually widening towards apex, the spiracles placed about one-third from base; second tergite slightly more than one-half the length of the first and sub-equal to the third tergite in length; apical spurs of posterior tibiae long, the outer the larger of the two; gastrocoeli shallow and minutely punctate; wings with areolet triangular, with only a small gap at the base of the outer side (Fig. 9); nervellus index 2·40 to 2 92 (Figs. 6 and 5).

Affinities

This species is closely allied to *N. productus;* indeed, it is rather difficult to detect macroscopical structural details that will separate one from the other, except, of course, by colour, which is fairly constant in density and distribution.

Biology

Miller (1919, p. 203) records and figures this species under the name *Paniscus productus* as attacking the New Zealand flax grub (*Xanthorhoe praefectata*). There is no doubt that the species he refers to is *N. ephippiatus,* for in describing this insect he states: "On the back, behind the head, is a large blackish spot, and another beneath the thorax between the front and middle legs, while the abdomen darkens towards the apex, in some cases being almost black." The accompanying figure is undoubtedly this species. Miller (1930, p. 282) again referring to this species as attacking *Xanthorhoe praefectata* states: ". . . the parasite does not destroy the caterpillar until after pupation so that the injury by the caterpillars to the flax is not hindered." The same author also observed that *P. productus* does not confine its attacks to *O. praefectata* but infests other species of caterpillars as well.

Gourlay (1930, p. 5) does not record Miller's observations, and does not include *N. ephippiatus* in his list.

The females are far more abundant than males, which are extremely rare in collections. The females especially are attracted by artificial light.

Distribution

This species is probably generally distributed throughout both islands. Specimens have been examined from the following localities: Dunedin (type locality), Canterbury, Greymouth, Nelson, in the South Island, and Wellington, Paihia, and Auckland in the North Island and the Chatham Islands.

Seasonal Distribution

The relative seasonal abundance of adults of *Netelia ephippiatus* is shown in graphical form in Fig. 10. The data upon which this graph is based were obtained from information accompanying specimens in the various collections that have been made over the past thirty years. The total number of specimens from which data were obtained was 58.

Netelia productus (Brulle)

Paniscus productus Brulle, *Hist. Nat. Ins. Hymen.*, IV, 1846, p. 156 (female from Tasmania); Dalla Torre, *Cat. Hym.*, III, pt. I, 1901, p. 156; Hutton, *Index Faunae Nov Zeal.*, 1904, p 102; Gourlay, *Dept. Sci. and Industr. Res. Bull. 22*, 1930, p. 5.

Paniscus foveatus Cameron, *Mem. Manch. Soc.*, 42, pt. I, 1898, p. 36; Hutton, *Index Faunae Nov. Zeal*, 1904, p. 102; Dalla Torre, *Cat Hymen.*, III, pt. I, 1901, p. 78.

Brulle originally described this species from Tasmania in 1846. Cameron in 1898 described it as new under the name *Paniscus foveatus* from Greymouth, New Zealand.

Female

Head yellowish-brown tinge, especially behind eyes and on frons and caput: face usually a pallid-yellow; ocular area light brownish-red

or orange-brown; ocelli and eyes red-brown, eyes shaded with black; tips of mandibles black; antennae uniformly brown, not normally appreciably darkening apically, mesonotum brown, in some specimens faintly infuscated with darker brown; metanotum dark brown; abdomen red-brown, usually not appreciably darker towards apex; mesosternum brown; legs red-brown clothed with golden pubescence; claws dark brown; wings hyaline, veins and costa dark brown, stigma light to reddish-brown.

Frons finely but distinctly striolated, bordered by lateral carinae; face slightly wider than long and convex in centre; clothed with fine pubescence; face more closely punctured than clypeus; flagellum is usually 57 segmented; notauli grooves well marked; scutellum prominent, much narrowed towards apex, with strong lateral carinae and with the surface minutely punctured; propodeum finely transversely striolated, carinae posteriorly strong, terminating anteriorly in a prominent spine-like process; pleurae sclerites distinct; spines on tibiae as in *N. ephippiatus;* claws strongly pectinate; areolet of anterior wing triangular, usually more widely open along outer side (Fig. 8).

Male similar to female.

This species, at least in the case of the females, is slightly larger than *N. ephippiatus,* and differs from that species by the absence of black on the vertex, mesonotum and mesosternum, accompanied by a darkening of the apical portions of the abdomen. In the majority of specimens examined the propodeum may be slightly more convex and their lateral keels more distinct, and more deeply impressed at base, this depression being almost bifurcate, through the centre being raised. The lower part of the mesopleura is not depressed as it is in *N. ephippiatus,* also the stigma of the fore-wings is usually a lighter brown.

AFFINITIES

Very close to *N. ephippiatus.* A species described from Fiji (*Netelia fijiensis*) would appear to be also closely related to the forms described here.

BIOLOGY

Gourlay (1930, p. 5) records this species as parasitising *Melanchra composita* and *Aletia unipuncta,* the parasite attacking the host larvae, the parasitic larvae emerging from the host larvae to pupate. Given (1944) figures an egg of a *Netelia* species found on the larvae of the white butterfly (*Pieris rapae*) at Nelson. A female of this species taken at Nelson on March 27, 1950, when placed in a cage with a larva of *Cirphis unipuncta,* laid three eggs on the larva. One was placed about halfway up in the suture separating the head from the first thoracic segment, a second lower down in the suture between the meso- and metathoracic segments, and a third attached at the base of a mesothoracic leg. The eggs were of large size, black in colour with a relatively long pedicel, and were very firmly attached to the surface of the larva. Within twelve hours of being laid the eggs hatched, the young larvae remaining between the two halves of the egg case, the egg splitting longitudinally. Unfortunately the caterpillar died and further observations on the development of the parasite were not possible. Both the egg figured by Given and the present eggs show difference in size and shape compared with those of a *Netelia* figured by Vance (1927).

Seasonal Distribution

The relative seasonal abundance of adults of *Netelia productus* is shown in Fig. 11. As in the case of *N. ephippiatus*, collections made over the past thirty years were tabulated by months and the graph constructed from the resulting frequency distribution. The total number of specimens from which data were obtained was 47.

Distribution

Australia, Tasmania and New Zealand. It is generally distributed throughout both islands of New Zealand; adults have been recorded from the following localities: Canterbury, Westland, Nelson, and Marlborough in the South Island, and Paihia, Whangarei, Manguiti, and Taupo in the North Island.

Notes on the New Zealand Species of *Netelia*

The two species of *Netelia* occurring in New Zealand are easily distinguished by their colour; structurally they are very similar. Two characters that have been found to be fairly constant are the incompleteness of the outer border of the areolet (Figs. 8 and 9) and the relative lengths of the upper and lower portions of the nervellus in the hind-wing (Figs. 6 and 7). In respect to the second character, 32 specimens of *ephippiatus* and 39 specimens of *productus* collected from widely separated localities were measured and the results are presented graphically in Fig. 5; this character is easily observed and will serve in doubtful cases as a reliable criterion for the separation of the two species.

A species described by Brues (1922, p. 19) from Fiji, which is closely related to *productus*, shows sexual dimorphism in that the males have the aciculations of the propodeum more clearly indicated medially and by the white face and orbits as well as the larger ocelli, while the lower outer side of the areolet is more distinct. The size of the ocelli and the aciculations of the propodeum show slight variations in the New Zealand forms, but few constant differences can be detected between the sexes.

There are several specimens of *Netelia* that at present I am unable to place satisfactorily; in particular there is a large female collected at Manguiti, on March 8, 1916. This may be a distinct species, but I have refrained from naming it until further specimens are obtained. There are certain indications, from the material I have examined, that when more information on the biology and habits of the species of *Netelia* is available, the present species may possibly be conveniently separated into several well-marked sub-species, based on slight but more or less constant structural details associated with seasonal and host distribution within New Zealand.

In the case of *N. productus* it is of interest to record the manner in which the Nelson and Kaikohe material was collected. The Nelson specimens were collected from the windows of a house at night, the insects being attracted by the light. This material consisted of eleven females and two males. The Kaikohe specimens, comprised entirely of males, were collected by sweeping herbage and long grass during the evening just before dark. Dr. R. A. Cumber, who collected this material, observed these insects on or near the ground probably hunting for females.

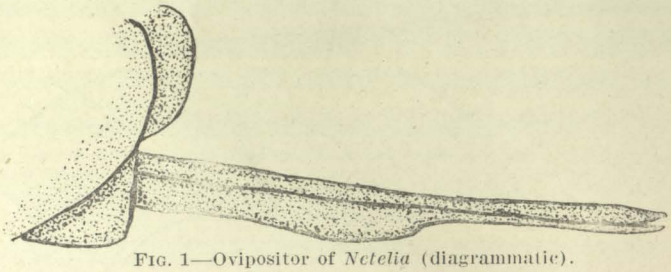

FIG. 1—Ovipositor of *Netelia* (diagrammatic).

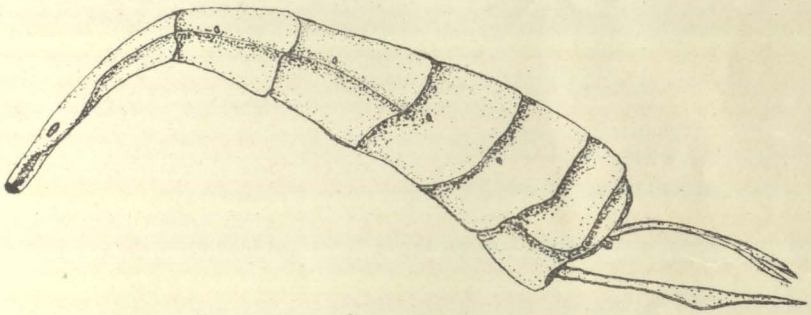

FIG. 2—*Netelia productus*. Lateral view of abdomen.

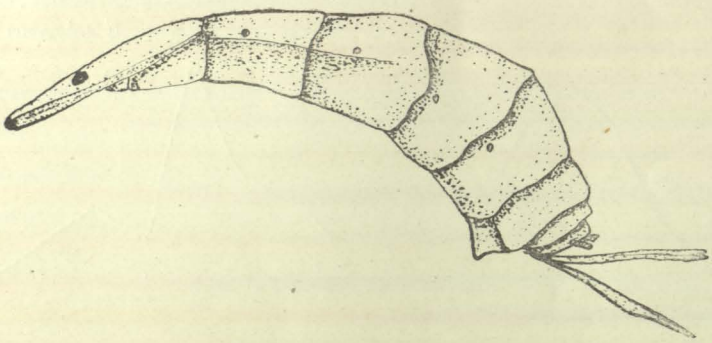

FIG. 3—*Netelia ephippiatus*. Lateral view of abdomen.

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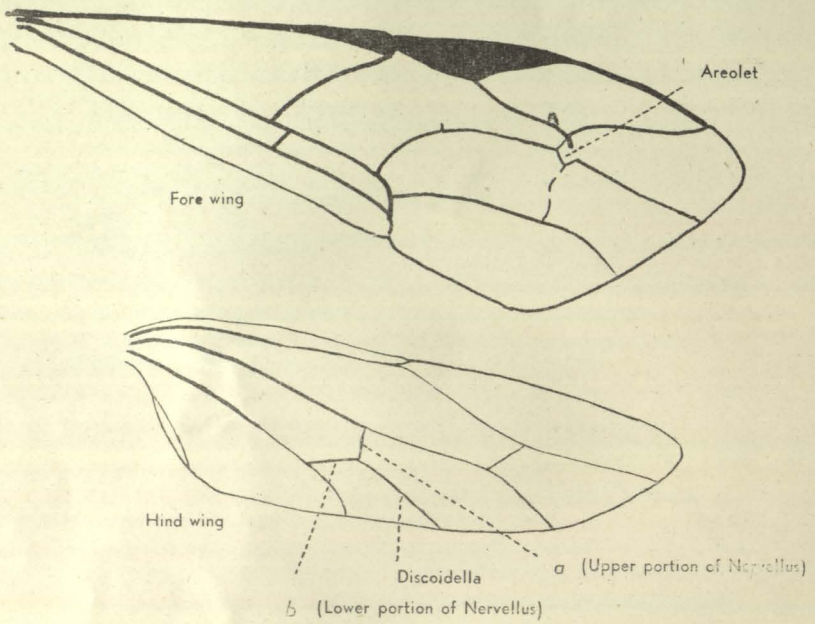

FIG. 4—*Netelia productus*. Fore and hind-wings.

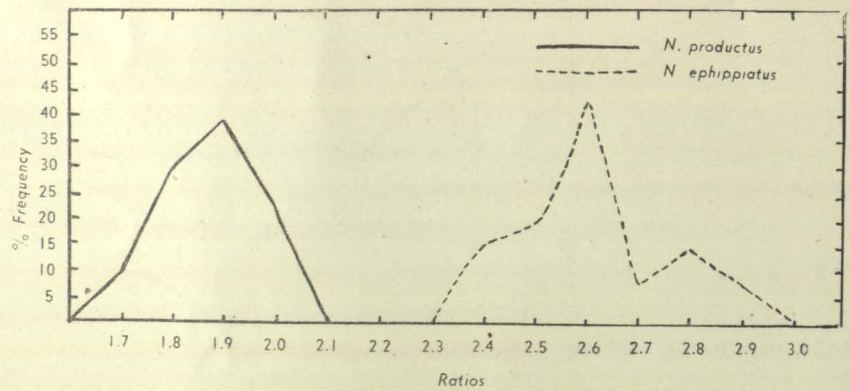

FIG. 5—Graphical representation of Nervellus ratios for *N. productus* and *N. ephippiatus*.

Ratio b/a as is illustrated in Fig. 4.

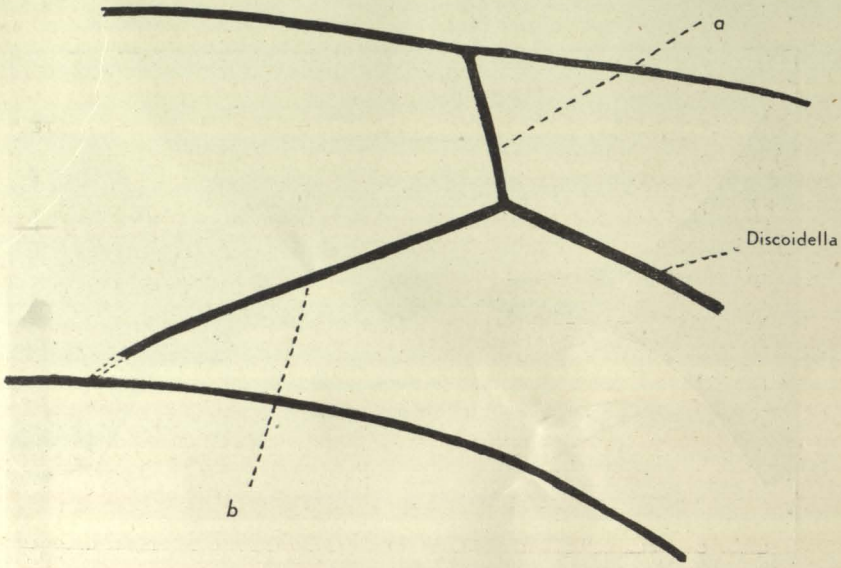

FIG. 6—Nervellus of hind-wing of *N. ephippiatus*.

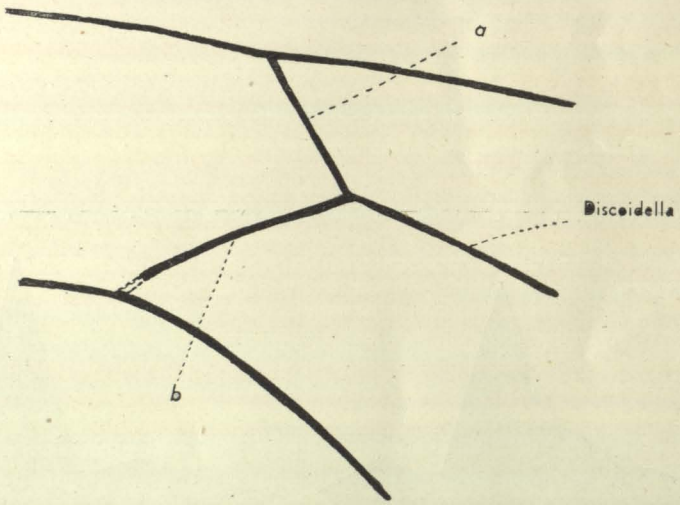

FIG. 7—Nervellus of hind-wing of *N. productus*.

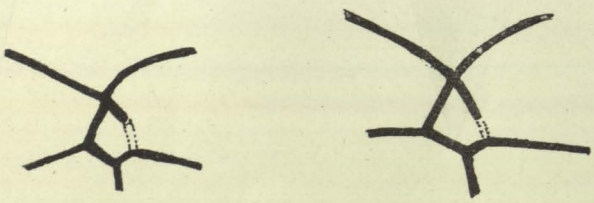

Fig. 8 Fig. 9

FIG. 8—Areolet of fore-wing in *N. productus*.
FIG. 9—Areolet of fore-wing in *N. ephippiatus*.

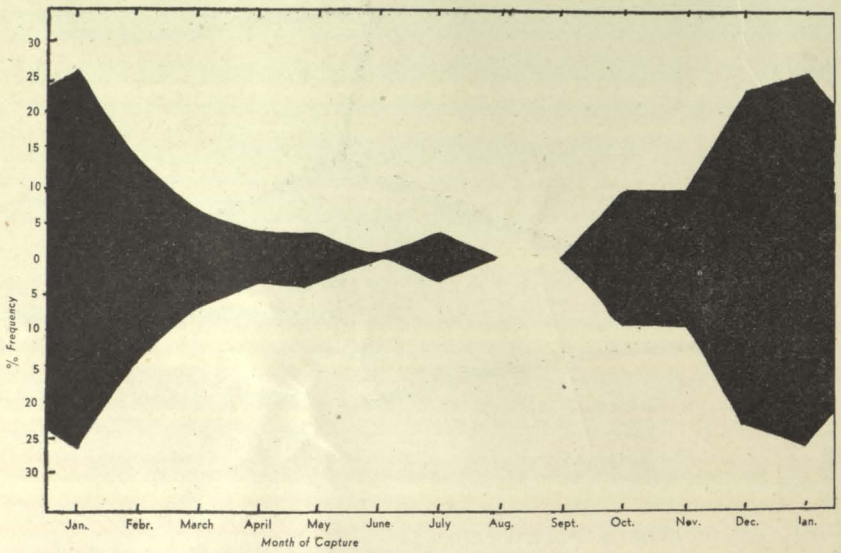

FIG. 10—Seasonal distribution of *N. ephippiatus*.

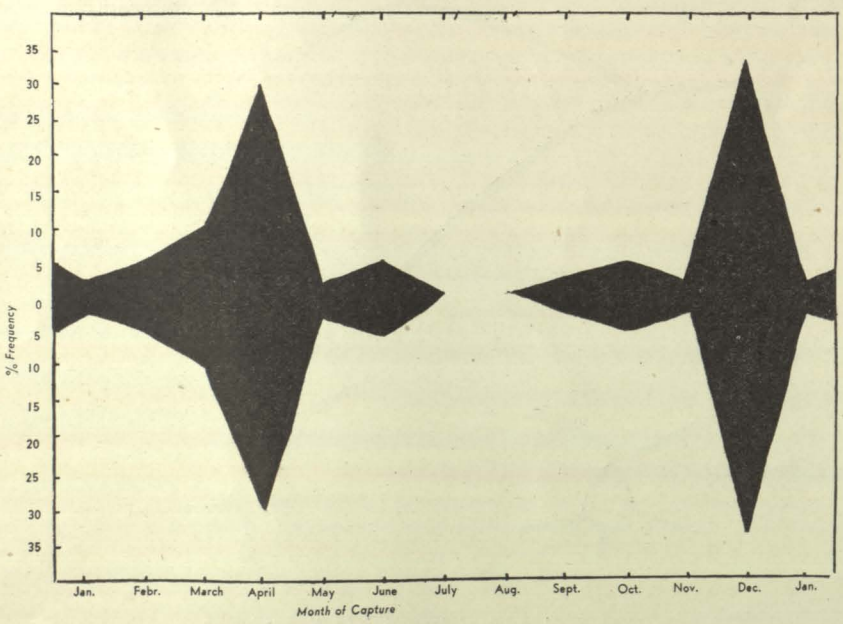

FIG. 11—Seasonal distribution of *N. productus*.

Townes (1938) groups the Nearctic species of *Netelia* into several sub-genera. The New Zealand species belong to his typical sub-genus *Netelia,* but they do not appear to conform to any of his species groups included in this sub-genus, although they show affinities with the *Leo* group.

DEFINITION OF TERMS

The terms used in this paper are illustrated in the various figures and are self-explanatory. Measurements were taken under a microscope with an ocular micrometer; they are only approximate. The nervellus ratio is the relative lengths of *a* and *b* in Figs. 6 and 7.

MATERIAL STUDIED

Specimens from the Cawthron Institute, Entomological Research Station, Dominion Museum, Auckland Museum, and the Canterbury Museum collections were studied.

ACKNOWLEDGMENTS

This work was done at the Entomological Research Station, Nelson, under the direction of Dr. D. Miller, to whom I owe many thanks for much advice and for aid in securing the loan of material. To Dr. Henry K. Townes, of Cornell University, Ithaca, U.S.A., for valuable assistance, without which, my work would have been much less complete. I also wish to acknowledge the great assistance rendered in collecting or in the loan of material, by the Directors of the Canterbury, Dominion, and Auckland Museums, Mr. E. S. Gourlay, of Nelson, Dr. R. A. Cumber, of Foxton, Dr. T. E. Woodward, of Auckland, and Professor Elwood Montgomery, of Purdue University. I wish also to acknowledge the great assistance rendered to me by Miss Shirley E. Armstrong, Librarian, Entomological Research Station, Nelson, in procuring literature and checking references

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