Reprinted from
The New Zealand Science Congress,
1947.

The Zoogeographical Relationships of the New Zealand Opiliones

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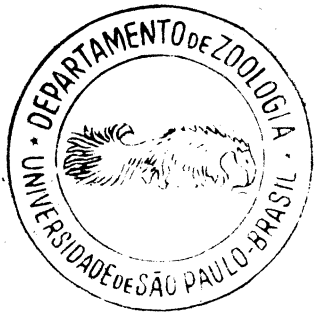

above the centre of the dome, sometimes in strings of five or six. One was opened and found to contain 366 eggs.

A similar web has been described in the United States, spun by a small and apparently rare spider, *Hentzia basilica*. Some authorities place it in the Metinae, others in the Araneinae.

The most specialised web constructed by spiders is the orb web of the Argiopidae. It consists of threads radiating from a central hub and supporting a spiral thread of sticky silk. Sometimes there is a barrier web also in the form of a tangle of thread on one or both sides of the plane of the orb. In spinning the web, after the framework and radii are in place, the spider constructs the hub and notched zone, and attaches a thread, known as the scaffold spiral, outwards towards the edge. Then working inwards, it puts on the sticky spiral and removes the scaffold spiral.

One theory of the evolutionary origin of the orb web is that the ancestral spider acquired the habit of spinning a tangle of threads in which to hang its egg coccoon. From this starting point the sheet web of the Linyphiidae can be imagined to be derived by the addition of a sheet to the tangle, and in some cases the eventual loss of the tangle. The Theridiidae have a tangle web, sometimes containing a little sticky silk. By rearrangement and specialisation of this the orb web of the Argiopidae might have arisen.

The web of the Samoan spider differs from the orb web in being spun from the centre outwards and in having no sticky silk. It does, however, resemble the notched zone and scaffold spiral, and might be regarded as a specialisation of the half-constructed orb web, a sort of paedomorphic form. In this connection the web of the Nephelinae is of interest, as it retains the scaffold spiral when completed as well as the sticky spiral. It also has the branched radii giving the uniform size of mesh all over, but does not otherwise resemble the domed web. On the other hand, the domed web might be regarded as resembling a stage in the evolution of the orb web in which a sheet has been placed in the primitive tangle, more regularly constructed than the sheet of the Linyphiidae, but not yet replaced by one made of sticky silk. It seems most likely that it actually is a modification of an orb web, rather than a primitive type, but it is of considerable interest none the less, as departures from the usual orb pattern are extremely unusual amongst Argiopid spiders.

THE ZOOGEOGRAPHICAL RELATIONSHIPS OF THE NEW ZEALAND OPILIONES

By R. R. Forster, Dominion Museum.

The Opilionid fauna of New Zealand has not as yet been fully described, but the forms recorded to date point to the presence of a comparatively extensive fauna and give a good indication of their affinities with those of other countries.

The majority of the New Zealand species are nocturnal, slow-moving animals, which live under rocks and logs and among the debris and leaf mould of the forest floor. They are predacious, feeding on mites and other small arthropods which are found living in the same habitat.

Taking into consideration their general sluggish habits, inability to cross water except by rafts or logs, and lack of any means of aerial distribution, one might expect to find a rather restricted specific distribution. That this is so is borne out by the fact that not one of the known species can be said to be distributed throughout New Zealand.

It may be further shown that of the twenty-one genera recorded in New Zealand, fifteen are endemic. With one exception, every species is endemic. The exception being the introduced, near-cosmopolitan species, *Phalangium opilio* L., which has recently been found in Christchurch, Nelson, Wellington and Feilding, where it is usually taken in association with gardens.

The order Opiliones is divided into three clearly defined suborders.

The suborder Cyphophthalmi includes small mite-like opilionids with a conical protruberance on each side of the cephalothorax, from which the stink glands open. In the majority (including all New Zealand species) the eyes are

absent and the genital opening is not covered by an operculum. They retain many characters shown (Mello-Leitao 1944) to be of a primitive nature for this order. The legs are usually terminated by a single tarsal segment, the claw of which is single. The pedipalps are slender and antenniform and terminated by a small simple claw. The first five tergites are not fused into a separate scute, and the body lacks cuticular spines. The persistence of these characters show that this suborder may be considered as being closely related to the basic opilionid stock.

The remaining two suborders present two divergent lines of development. In both the genital opening is covered by an operculum. The first five tergites are fused usually into a scute and the two eyes placed one on each side of a median tubercle.

In the suborder Palpatores the antenniform pedipalp is retained as is the single claw on all four pairs of legs. The legs, however, tend to be long and slender and the tarsi are many-jointed.

The suborder Laniatores are typified by the development of powerful pedipalps, which are usually strongly spined, with the terminal claw strongly developed for use as a clasping organ. The legs are comparatively short, and although the tarsal claws of legs 1 and 2 retain the primitive single condition, those of legs 3 and 4 are either trifurcate or double.

All three suborders are represented in New Zealand. While discussing their affinities it will be convenient to treat each suborder separately.

While isolated genera and species of the suborder Cypnophthalmi are recorded from Europe, North and South America, India, Ceylon, North Africa, and the Malayan Peninsula, the greatest development is found in South Africa and New Zealand. From South Africa are recorded two genera, which contain six species, while from New Zealand are described two genera containing sixteen species. Both of the New Zealand genera are endemic. *Rakaia* with thirteen species shows no particular relationship with any other genus, but the genus *Neopurcellia*, with three species, is undoubtedly related to the dominant South African genus *Purcellia*. It is of interest to note that these latter two genera give the only instance in the entire suborder where the primitive state of a single tarsal segment is departed from, the fourth tarsi of the male in both these genera being of two segments.

The Palpatores are represented in New Zealand by two families. The Acropsopilionidae, which is possibly an early offshoot from the main Palpatores group, is of a primitive nature, but is remarkable by reason of the great development of the eye tubercle, which is nearly as high and as wide as the body.

Only three genera are known, *Acropsopilio* from South America, *Caddella* from South Africa, and *Zeopsopilio* from New Zealand. *Zeopsopilio*, while differing widely from the South African species, shows decided affinities with the South American species. The spines on the pedipalp of the New Zealand species are very similar in appearance and disposition to those found in the South American species, whereas in the South African species the pedipalp is armed with large setose papillae, which are limited to the proximal segments. In both the New Zealand and South American species a transverse groove behind the eye mound divides cephalothorax in two. In the South African species this is absent.

The rest of the Palpatores recorded from New Zealand are of the world-wide family Phalangiidae.

Only five genera are at present recorded from New Zealand. *Megalopsalis* is found in both Australia and New Zealand. Ten endemic species are described from New Zealand, while two, one from Victoria and the other from New South Wales, are described from Australia.

The closely related Australasian genus *Pantopsalis* has a similar range of eight endemic New Zealand species and two Australian species, one recorded from Tasmania and the other from Victoria.

Mention may be made here of two newly established genera, *Monoscutum* and *Acihasta*, which have been recorded from Auckland and Great Island of the Three Kings. It was found necessary to erect a new subfamily, Monoscutinae, to contain them. This subfamily appears to have been developed from the dominant New Zealand subfamily Phalangiinae and is limited to the north of New Zealand. However, it shares a number of characters with the subfamily Oligolophinae of the Northern Hemisphere, and the conclusions reached were of parallel development of the two sub-families, which were of separate origin. The occurrence in New Zealand of the widely distributed harvestman of the Northern Hemisphere *Phalangium opilio*, would appear to be due to its recent introduction. The establishment of this species is greatly enhanced by its adaption to a domestic

environment. All records in New Zealand to date have been from gardens and houses, it having never been found in unsettled areas.

The third suborder, Laniatores, includes the majority of the New Zealand opilionids. A remarkable feature found in the New Zealand fauna is the preponderance of one family, the Triaenonychidae, considered the least specialised family of the suborder. The tarsal claws of legs 3 and 4 are single, but in the adult possess two lateral branches. In the South African genera *Roeweria* and *Speleomontia*, and the New Zealand *Sorensenella*, the lateral branches are well developed, but the median prong is greatly reduced. By complete reduction of the median prong the double claw found in the more specialised families Phalangodidae and Assamiidae was possibly developed. Except for one possibly erroneous record, neither of these families has been found in New Zealand.

The general distribution of the triaenonychids is of interest. They are practically limited to the southern areas of the world. Of the 67 genera known, the distribution is as follows: North America 1, South America 2, South Africa 24, Madagascar 6, New Caledonia 2, Australia 19, and New Zealand 12, the only occurrence in the Northern Hemisphere being the one genus from North America. From the present figures the family would appear to have attained its greatest development in South Africa. However, only in New Zealand are representatives of all three sub-orders found and when the fauna is completely worked it seems probable that the greatest development of this family will be seen to be in Australia and New Zealand.

Of the twelve genera at present recorded from New Zealand, nine are endemic. While a number of New Zealand species are placed in the typically South African genus *Adaeum*, the main affinities are undoubtedly with Australia and the Sub-Antarctic Islands. The distribution of the subfamily Triaenobuninae includes only New Zealand and Australia, and while no genera of this subfamily are found common to both areas, the widespread New Zealand genus *Pristobunus* is closely related to *Dipristes* of Victoria and possibly to *Peckhamius* of Tasmania.

In the suborder Triaenonychinae, the dominant New Zealand genus *Nuncia* of which thirteen endemic species are recorded, occurs also on the Auckland and Crozet Islands, on which two islands they represent the entire known opilionid fauna, and a further species is known from New South Wales, Australia. The closely related genus *Nunciella* is also found in both Australia and New Zealand, but its greatest development is in Australia. It is once again evident that the relationship shown is with the eastern portion of Australia.

To summarise: All of the native New Zealand species of opiliones are endemic. Only one species has been introduced by man. The New Zealand opilionid fauna is characterised by the occurrence of a comparatively large number of those forms which are to be considered primitive. Some, for example those of the Cyphopthalmi, show affinities with South Africa, while others, for example *Zeopsopilio*, show close affinity with South America and to a lesser degree with South Africa. The presence of these primitive forms, taken into consideration with the absence of the most highly specialised families, would seem to point to the isolation of New Zealand in the remote past before the development of the more advanced forms. The persistence of these animals would be assisted by the presence of extensive forest areas, the leaf mould of which presents an ideal environment.

The more advanced opiliones found in New Zealand of the families Phalangiidae and Triaenonychidae show a very strong relationship with those found on Tasmania and the East Coast of Australia, a relationship which could be considered as evidence for a comparatively recent interchange of forms between these two areas.

PROBLEMS RELATING TO THE BIRDS OF NEW ZEALAND'S OFFSHORE ISLANDS

By E. G. Turbott, M.Sc., Museum, Auckland.

This short paper is an elaboration of part of my account of the birds of Little Barrier Island, which is to appear in the July, 1947, issue of *New Zealand Bird Notes*. There I have referred to certain ecological conditions affecting the birds of island forests, and emphasised that these birds are not typical of forests on the mainland before European settlement. The problem is essentially ecological,