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First record of a representative of Ballarrinae (Opiliones: Neopilionidae), *Americovibone remota* sp. nov., from New Zealand

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Abstract. *Americovibone remota* sp. nov. is described as the first New Zealand representative of the Ballarrinae, a Gondwanan-distributed group of harvestmen (Arachnida: Opiliones: Palpatores), from a female collected at Dart Hut in Mount Aspiring National Park. Though closely allied by external and ovipositor morphology to *Americovibone lanfrancoae* Hunt & Cokendolpher, 1991 of southern South America, *A. remota* lacks the reflexed pedipalpal tibia previously regarded as characteristic of the Ballarrinae. The genus *Americovibone* is restricted to austral *Nothofagus* forests which have a similar trans-Pacific distribution.

Keywords: Arachnida, Palpatores, taxonomy, biogeography, Gondwana

http://zoobank.org/References/EEE95A2C-9951-4EF3-B7D7-82EA70A09671

The Ballarrinae are a highly distinctive but little-studied group of long-legged harvestmen (Opiliones: Palpatores) found in continents of the Southern Hemisphere. They are immediately recognizable from their distinctive pedipalps, which have an elongate patella, reduced tibia and lack a tarsal claw (Hunt & Cokendolpher 1991). They are also noteworthy for including some of the smallest of all Opiliones, with body lengths less than 1.5 mm in some species (Hunt & Cokendolpher 1991).

When first described by Hunt & Cokendolpher (1991), the Ballarrinae exhibited a near-classic Gondwanan distribution, with species found in southern parts of each of South America, Africa and Australia. However, they have hitherto appeared to be curiously absent from New Zealand. Other Gondwanan-distributed groups of Opiliones, such as Pettalidae (Boyer & Giribet 2009), Triaenonychidae (Forster 1954) and Enantiobuninae (Taylor 2011; Fernández et al. 2014), are diverse in the region and make up the greater part of the local Opiliones fauna. Recently, while sorting through material on loan from the New Zealand Arthropod Collection (NZAC), I discovered a specimen of Ballarrinae in a collection from the Dart Hut in New Zealand's Mount Aspiring National Park. Though only a single female specimen was available, this represents a significant development in our understanding of the New Zealand harvestman fauna.

The New Zealand specimen is very similar to the southern Chilean species *Americovibone lanfrancoae* Hunt & Cokendolpher, 1991 and is here described as a second species of the same genus. This implies a closer relationship of the New Zealand Ballarrinae to South America than to the Australian genera *Plesioballarra* Hunt & Cokendolpher, 1991, *Arrallaba* Hunt & Cokendolpher, 1991 and *Ballarra* Hunt & Cokendolpher, 1991.

The specimen was sourced from the New Zealand Arthropod Collection (NZAC), Landcare Research, Auckland. It was examined using a Nikon SMZ1500 stereo microscope, and photographs and measurements were taken using the NIS-Elements D 4.00.03 program. The ovipositor was removed and partially cleared using 50% lactic acid, and the ovipositor, a separated chelicera, and the original specimen were examined using a Leica DM2500 compound microscope. The ovipositor and separated chelicera were retained in a microvial with the original specimen. Coloration is described as preserved in alcohol. Measurements are reported in millimeters (mm).

Family Neopilionidae Lawrence, 1931
Subfamily Ballarrinae Hunt & Cokendolpher, 1991
Genus *Americovibone* Hunt & Cokendolpher, 1991

Americovibone Hunt & Cokendolpher, 1991: 165.

Type species.—*Americovibone lanfrancoae* Hunt & Cokendolpher, 1991, by original designation.

Remarks.—*Americovibone remota* sp. nov. is consistent with the description of *Americovibone* provided by Hunt & Cokendolpher (1991). Important diagnostic features of this genus include: chelicera with ventral spur at base of segment I; pedipalp with patella longer than tibia and tarsus, femur and patella of female pedipalp pseudosegmented; leg claws with lateral teeth; ovipositor corpus with more than two segments, two spermathecae present. *Americovibone remota* also has a spermathecal morphology very similar to those of *A. lanfrancoae*.

Americovibone remota sp. nov.
(Fig. 1)
http://zoobank.org/NomenclaturalActs/F6D622B7-A474-4553-BE09-683D85C12E2D

Type material.—*Holotype female*. NEW ZEALAND: Dart Hut, Mount Aspiring National Park, 44°32′S 168°33′E, 920 m, 13–14 February 1980, J. S. Dugdale, pan trap in bush (NZAC).

Etymology.—From the Latin *remotus*, remote, in reference to both the remoteness of the type locality in New Zealand, and the species' remoteness from its closest ally in South America.

Diagnosis.—*Americovibone remota* differs from *A. lanfrancoae* in having the pedipalpal tibia not reflexed on the patella,

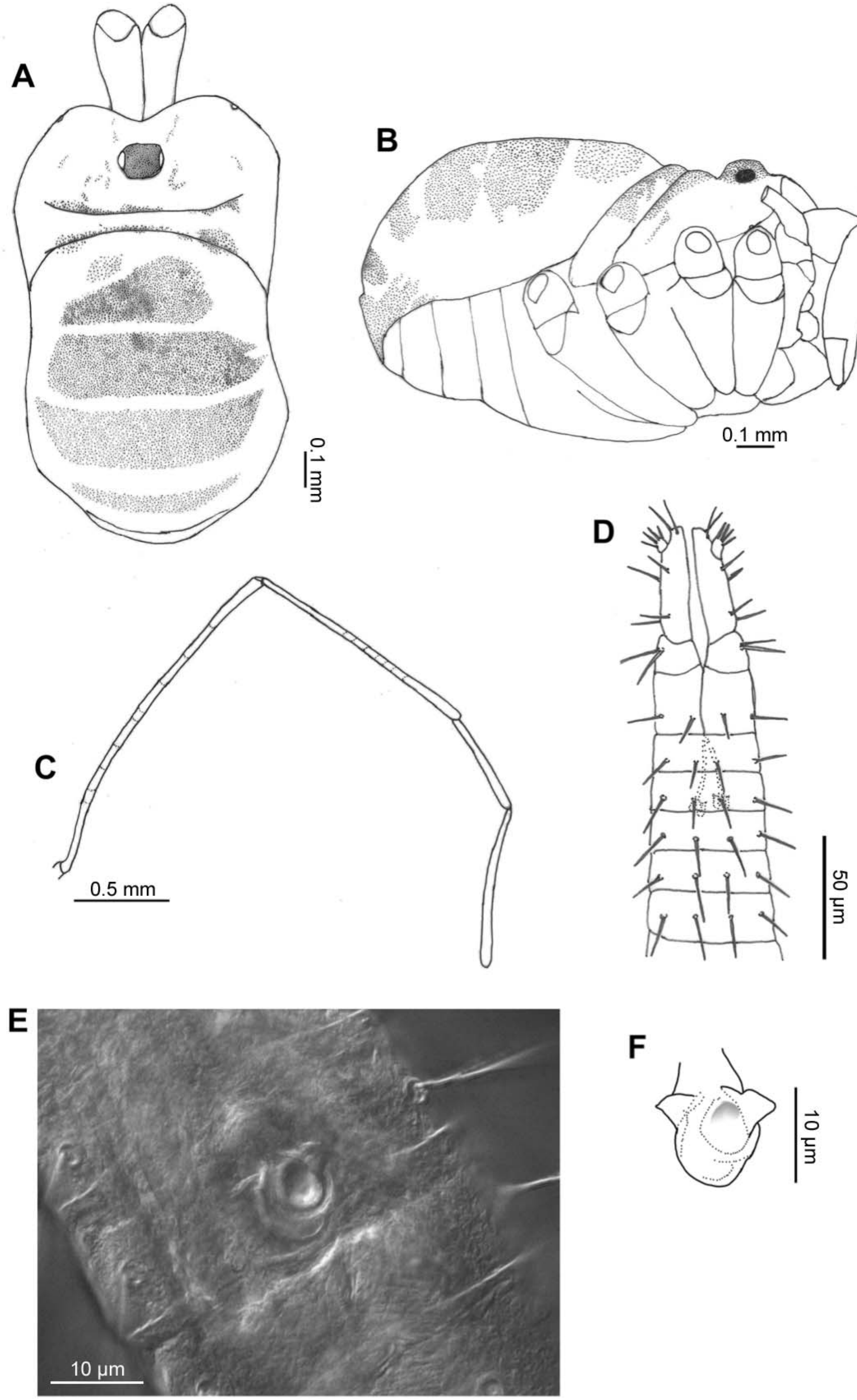

Figure 1.—*Americovibone remota* sp. nov., holotype female. A. Body, dorsal view; B. Body, lateral view; C. Right pedipalp, lateral view, setae omitted; D. Ovipositor, showing position of spermathecae as dotted lines; E. Photograph of spermatheca; F. Line diagram of spermatheca.

with the dorsal angle between the two segments greater than 180°. As in other Phalangioidea, the patella-tibia junction of the pedipalp in Ballarrinae is able to flex laterally but not dorsoventrally (Wolff et al., in press), so the difference in palpal disposition between the two species is not an artefact of preservation. The two species may also differ in color pattern, with *A. lanfrancoae* illustrated by Hunt & Cokendolpher (1991) as having the propodeum medially brown, and the dorsum of its opisthosoma more extensively pale with the brown transverse striping broken medially. However, this should be treated with caution due to the reported poor condition of the *A. lanfrancoae* type specimens. Comparison of body size between *A. remota* and *A. lanfrancoae* is also impeded by the condition of the single known female specimen of the latter, in which the main body is distorted and the legs missing (Hunt & Cokendolpher 1991). However, differences between cheliceral and pedipalpal measurements of the two species are minimal except that the pedipalpal femur and tarsus are relatively longer in *A. lanfrancoae* (1.97 and 0.98 mm, respectively; patella 1.4× length of tarsus in *A. lanfrancoae* vs 1.6× in *A. remota*).

Description (female holotype).—Prosoma length 0.29, prosoma width 0.73, body length 1.18. Dorsum unarmed, without prominent setae. Ozopores small, round, not raised on lobes. Propodeum cream-colored; ocularium black. Mesopeltidium, metapeltidium and dorsum of opisthosoma mostly mottled brown, with cream-colored transverse stripes and cream-colored lateral margins on opisthosoma. Venter cream-colored, without prominent setae; coxapophysis II angled slightly rearwards. *Chelicerae*: Segment I 0.25, segment II 0.46. Unarmed. Base of segment I with ventral spur; spinose scales absent. Fingers relatively slender, bent mesad in frontal view; teeth all small. *Pedipalps* (Fig. 1C): Femur 1.89, patella 1.34, tibia 0.59, tarsus 0.84. Femur more than 1.5 times main body length, with ten pseudosegments. Patella more than two times length of tibia, with eight pseudosegments whose boundaries are concentrated towards midlength; patella with small swelling retrodistally. Tibia not reflexed relative to patella; dorsal angle between patella and tibia slightly more than 180°. Tarsus evenly concave on dorsal margin. Sparse plumose setae along entire length of pedipalp, becoming denser distally on tarsus; plumes restricted to one side of each seta, reaching about halfway down length of each seta on femur to tibia, extending further down each seta on tarsus. Few non-plumose setae present at apex of tarsus. Tarsal claw and microtrichia absent. *Legs*: Leg I femur 1.57, patella 0.33, tibia 1.38; leg II femur 2.96, patella 0.34, tibia 2.92; leg III femur 1.58, patella 0.31, tibia 1.41; leg IV femur 2.40, patella 0.36, tibia 2.32. All segments unarmed. Femora of all legs with, respectively, 6, 12, 4–5 and 7–8 pseudosegments; tibia II with 12 pseudosegments, tibia IV with 3 pseudosegments, tibiae I and III not pseudosegmented. Metatarsi elongate but not pseudosegmented. Tarsal claws of legs I, III and IV with sharp bend near base; dentate lateral carina present on either side; tarsal claw of leg II weaker, without lateral carina. *Ovipositor* (Fig. 1D–F): Furca three-segmented, distal segment of furca elongate (about four times as long as wide). Two spermathecae present in second and third segments; spermathecae consisting of short loop with lateral extension on each side.

Remarks.—As the new species described herein is more similar to *A. lanfrancoae* than any other species of Ballarrinae, it is provisionally assigned to the same genus pending the discovery of male specimens. It might be questioned whether it is appropriate to describe a new species of Opiliones from a single female specimen, considering the pre-eminent position of male genitalic characters in Opiliones taxonomy (see e.g., Macías-Ordóñez et al. 2010; Pérez-González 2011; Pinto-da-Rocha et al. 2012), the presence in many groups of Opiliones of significant sexual dimorphism, and the potential difficulty of distinguishing females of closely related species (see e.g., Taylor 2004). However, this particular example represents the first record in New Zealand of a significant group of Opiliones whose presence there has not hitherto been recognized. Many parts of the south-western South Island of New Zealand are of limited accessibility, and so have not been extensively collected. The type locality of *A. remota*, Dart Hut, is positioned in the eastern part of Mount Aspiring National Park at the junction of Snowy Creek and the Dart River (Fig. 2). Dart Hut is two days' walk from the nearest road, with the entire Rees-Dart track taking four or five days (Department of Conservation 2013).

Significant sexual dimorphism has not yet been recorded from Ballarrinae, though males are generally smaller than females (Hunt & Cokendolpher 1991). The main external differences between *A. lanfrancoae* males and females are that male pedipalps lack the pseudosegments found in females, and the male pedipalpal tarsus is dorsally convex rather than concave. Hunt & Cokendolpher (1991) did not identify any significant differences between the sexes in coloration, ornamentation or cheliceral development.

As noted above, the close similarity of *A. remota* to *A. lanfrancoae* suggests a closer relationship of New Zealand Ballarrinae to South American than to Australian species. Though less common than the converse, other examples of this pattern of biogeographic relationships include the plant genus *Aristotelia* (Elaeocarpaceae) and certain members of the midge subfamily Podonominae (Diptera: Chironomidae) (Crisci et al. 1991). However, it is also noteworthy that Dart Hut is positioned in a beech (*Nothofagus*) forest (map in Sommerville et al. 1982), which is also the known habitat for the South American species (Hunt & Cokendolpher 1991). *Nothofagus* has only a relictual distribution in mainland Australia, being found in Tasmania, southern Victoria and across the New South Wales-Queensland border (Knapp et al. 2005). Where habitat has been recorded, Australian Ballarrinae are mostly known from *Eucalyptus* woodlands, though *Ballarra cantrelli* Hunt & Cokendolpher, 1991 and *Plesioballarra crinis* Hunt & Cokendolpher, 1991 are possibly within the range of *Nothofagus moorei* (Hunt & Cokendolpher 1991). No Ballarrinae have as yet been described from Tasmania.

It is also possible that local extinctions have complicated the biogeography of Ballarrinae. The endemic New Zealand bat genus *Mystacina* is more closely related to South American taxa in the Noctilionoidea than to any living Australian bats (Teeling et al. 2005). Nevertheless, the fossil record supports an Australian origin for *Mystacina*, with its probable sister genus *Icarops* being present in the Miocene of northern Australia (Hand et al. 1998).

Though the Ballarrinae were initially united on the basis of their distinctive pedipalpal morphology (Hunt & Cokendolpher 1991), a recent molecular analysis of Palpatores has questioned the monophyly of ballarrines (Groh & Giribet 2015). In this study, the South African *Vibone vetusta* Kauri, 1961 failed to form a clade with the Australian *Ballarra longipalpus* Hunt & Cokendolpher, 1991. Conversely, *B. longipalpus* and the South American *A. lanfrancoae* did form

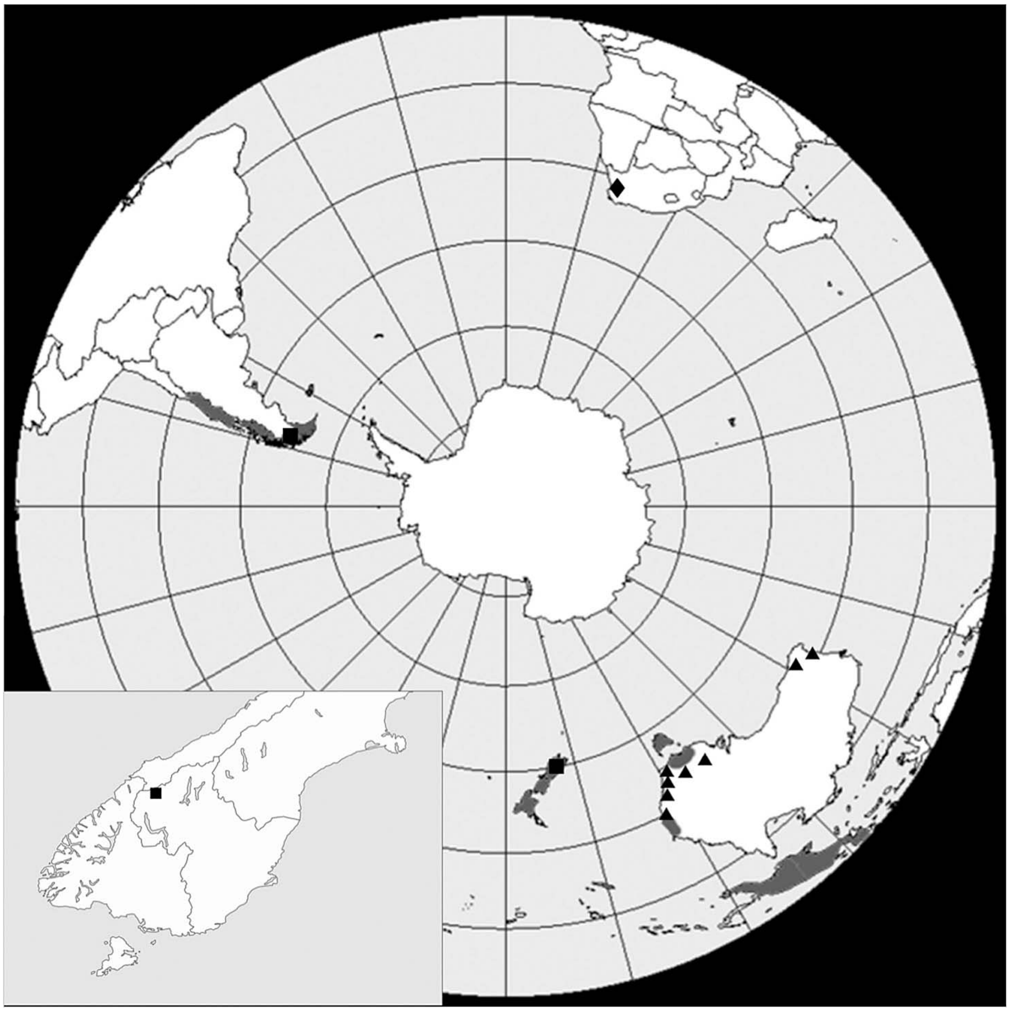

Figure 2.—Map of Southern Hemisphere, showing distribution of Ballarrinae and *Nothofagus*. Symbols indicating known localities of main Ballarrinae subgroups (Hunt & Cokendolpher 1991): square = *Americovibone*; diamond = *Vibone*; triangle = Australian clade (*Ballarra*, *Arrallaba* and *Plesioballarra*). Distribution of *Nothofagus* shown in grey (based on Knapp *et al.* 2005, modified for scale). Inset: southern South Island, New Zealand, with black square indicating type locality of *Americovibone remota*.

a clade when included in a morphological analysis of Neopilionidae by Taylor (2013). However, neither of these analyses included more than two species of Ballarrinae nor had the Ballarrinae as their main focus. The Australian Ballarrinae are united by their distinctive male genital morphology, with a barbed process on the left ventral side of the penis (Hunt & Cokendolpher 1991). This process is absent in *A. lanfrancoae*. The male of *V. vetusta* is unfortunately unknown but it is noteworthy that the ovipositor morphology of this species, as described by Kauri (1961), is unique in the Phalangioidea, with the main body of the ovipositor largely unsegmented.

The absence of a dorsal reflexion between the patella and tibia of the pedipalp in *A. remota*, previously regarded as a defining feature of the Ballarrinae, gives credence to the possibility that the unusual ballarrine palpal morphology may have evolved independently. Glandular setae on harvestmen pedipalps produce sticky secretions that are used in prey capture (Wolff et al. 2014), and it is possible that the 'ballarrine' pedipalp represents a convergent adaption to the active predation of fast-moving prey such as springtails. Further investigation into the monophyly of this group is required.

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