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The *Heterotricha* group in New Zealand

(Diptera: Sciaroidea)

With 30 figures

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Zusammenfassung

Die *Heterotricha*-Gruppe sensu CHANDLER ist in Neuseeland mit fünf Arten vertreten. Neben *Anisotricha novaezealandiae* (TONNOIR) sind dies *Anisotricha similis* sp. n. sowie die einer neuen Gattung, *Insulatricha* gen. n., zugeordneten Arten *I. catrinae* sp. n., *I. chandleri* sp. n. und *I. hippai* sp. n. Neuseeland erweist sich damit als ein rezentes Verbreitungszentrum für die *Heterotricha*-Gruppe. Sowohl *Anisotricha* als auch *Insulatricha* gehören zum Kern der möglicherweise nicht monophyletischen Gruppe, stehen aber in keinem Schwestergruppen-Verhältnis. Die nächste Verwandtschaft von *Insulatricha* ist mit der Gattung *Chiletricha* CHANDLER in der südlichen Neotropis zu finden, während die Schwestergruppe von *Anisotricha* zunächst nicht erkennbar ist.

Summary

The *Heterotricha* group sensu CHANDLER has five species in New Zealand. Apart from *Anisotricha novaezealandiae* (TONNOIR), these are *Anisotricha similis* sp. n. and, classified in a new genus, *Insulatricha* gen. n., the species *I. catrinae* sp. n., *I. chandleri* sp. n. and *I. hippai* sp. n. This makes New Zealand a recent distribution centre of the *Heterotricha* group. Both *Anisotricha* and *Insulatricha* belong to the core of the possibly not monophyletic group, but are not sister taxa. The genus *Insulatricha* appears to be most closely related to the genus *Chiletricha* CHANDLER distributed in the southern Neotropics, while the closer relationship of *Anisotricha* remains unresolved for the time being.

Keywords

Diptera, Sciaroidea, *Heterotricha* group, taxonomy, new genus, new species, New Zealand

Introduction

The *Heterotricha* group has recently been subject of a comprehensive review by CHANDLER (2002). According to this review, 17 living species classified in nine genera occur in all biogeographic regions of the world except the Nearctic, and three species are known from Eocene amber. CHANDLER (2002) excludes from the *Heterotricha* group *Pterogymnus elongata* FREEMAN, 1951 – a view followed here – and further proposes the inclusion of *Mangas exilis* KOVALEV, 1986 – a suggestion rejected here. CHANDLER (2002) states that there is nothing to indicate that *M. exilis* was not allied to *Heterotricha*; on the other hand, indication that *M. exilis*, only fragmentary known from a Cretaceous amber fossil, actually belongs to this group appears very weak.

The presence of the *Heterotricha* group in New Zealand was first noticed in the extensive work on the country's fungus gnats by TONNOIR & EDWARDS (1927). The only species hitherto known, *Heterotricha novaezealandiae* TONNOIR, has recently become type of the monotypic genus *Anisotricha* CHANDLER, 2002. In the course of a study still in progress on various groups of the Sciaroidea in New Zealand (JASCHHOF & DIDHAM, 2002; JASCHHOF & HIPPA, 2002; JASCHHOF & JASCHHOF, 2003), the author became aware of the presence of several more *Heterotricha*-like species; these are described and discussed in the following. Initially, a further intention was to make a computerized parsimony analysis of the phylogenetic and biogeographic relationships of the world species belonging to the *Heterotricha* group. However, soon it became apparent that such a venture would require the microscopic re-examination of almost all the species previously described, in particular the terminalia of their males. Apart from that, the author learned of the appearance of new *Heterotricha* material from other parts of the world, including the first Australian species (COLLESS, in litt.; CHANDLER, in litt.), an African species close to the genus *Rhynchoheterotricha* FREEMAN, 1960 (HIPPA, in litt.) and females of the Japanese *Sciaropota japonica* CHANDLER, 2002 (KALLWEIT, pers. comm.). The study of such an extensive additional material was clearly beyond the manageable scope of an investigation that primarily aims to introduce and consider the affiliations of the New Zealand representatives.

As described in the following, New Zealand's remarkable sciaroid fauna includes a total of five *Heterotricha*-like species, two belonging to the genus *Anisotricha* and three classified in a new genus, *Insulatricha* gen. n. This makes New Zealand – besides southern South America and Africa – one of the recent distribution centres of the *Heterotricha* group and raises the number of named living species to a worldwide 21 for the time being. Clearly the previous idea that the *Heterotricha*-like flies are poor in species and extremely rarely found is outdated. Instead, the group appears to be quite diverse and regularly distributed in the temperate zones, particularly in those of the southern hemisphere. As already suggested by CHANDLER (2002), future research will certainly reveal the *Heterotricha* group, or parts of it, to deserve the status of a distinct family within the Sciaroidea.

Material and methods

Most of the specimens studied here were obtained from unsorted insect samples previously collected by New Zealand entomologists and deposited in various New Zealand institutions over the past almost 30 years (see the 'Material studied' sections of the species chapters). Additional specimens were collected by extensive Malaise trapping and sweepnetting in 2001–2002 in the course of a survey of various Sciaroidea led by the author. It should be noted that this study is based on 199 individuals in total, whereas only a handful of individuals of one species, *Anisotricha novaezealandiae*, was available for study to previous authors. Most of the studied specimens, including all types, are now deposited in the New Zealand Arthropod Collection, Auckland (NZAC).

Several individuals of each species, including all types, were mounted in Canada balsam on microscope slides in order to examine morphological details under a compound microscope. The mounting procedure followed that of JASCHHOF (1998) for lestremiine gall midges; however, before mounting the individuals were macerated in cold 10 % KOH. Other individuals are stored in 70 % ethanol. For light microscopic studies and the preparation of drawings the author used an Olympus BX50 microscope in combination

with the U-DA drawing unit. Morphological terminology, if not otherwise stated, follows that of SÖLI (1997) for Mycetophilidae.

Genus *Insulatricha* gen. n.

Type species: *Insulatricha hippai* sp. n., described below.

Description

Head: Head capsule higher than long; its setation moderately long and undifferentiated. Postfrons slightly two-lobed, non-setose, with simple or slightly two-pointed frontal tubercle. Face large, non-setose. Clypeus smaller (especially narrower) than face, setose, fused with face along its upper margin. Antennae longer than body in males and shorter than body in females, upturned, inserted near midheight of head. Scape somewhat conical, a little larger than pedicel, with ventral setae. Pedicel subglobular, with a few setae along distal margin. Flagellum with 14 flagellomeres, first flagellomere longest, terminal flagellomere longer than penultimate; each flagellomere cylindrical, practically without neck, several times as long as wide (basically longer in males than in females). In males, flagellum without microtrichia except a few on flagellomere 1 basally. Each flagellomere with an even cover of setae arising from membranous rings, these setae about 1.5 times as long as the diameter of the flagellomere or shorter; further with a few sensory spines. Flagellomeres 1(-3) dorsally with a few setae arising from sockets. In females, cover with microtrichia on flagellomere 1 more extensive, and setae arising from sockets longer, more numerous and sometimes present also on flagellomere 4. With 3 ocelli at vertex, arranged in narrow triangle. Eyes reniform, separated at vertex for more than the width of the ocellar triangle; with fine, long interommatidal setulae. Mouthparts well developed, with short proboscis. Labrum beak-like, well sclerotized, non-setose or setose, fringed apically. Lingua with dense fringes apically. Maxillae with stipites separate and cardo absent; lacinia well developed or largely reduced. Maxillary palpus with 5 palpomeres, with the first palpomere ('presegment') smooth and non-setose. Palpomeres 2-5 setose; palpomere 2 with 1-2 wart-like sensillae distally; palpomeres (2-)3-4 with long hyaline sensory hairs, most numerous on palpomere 3; palpomere 3 thickest and 5 clearly longest. Labium with prementum present as pair of setose lobes; premental apodeme sclerotized and with paired processes of apparently species-specific outline. Labial palpus 2-segmented, labellum 1 smaller than 2; labellum 1 non-setose; labellum 2 with numerous, partly spine-like setae.

Thorax: Postpronotum present as collar-like structure above neck. Antepronotum subtriangular, with a few setae. Episternum 1 with a few setae. Epimeron 1 small, subtriangular. Scutum in profile evenly arched to slight degree, with anterior parapsidal suture deep and median transverse suture not traceable. Vestiture of scutum consisting of irregular rows of long acrostichal, dorsocentral and lateral setae. Scutellum with short setae and pairs of long setae. Prescutoscutal suture deep. Prescutum distinct, strongly sclerotized. Mediotergite high, in profile almost straight to slightly arched. Postphragma well developed, i.e. extending into abdominal cavity. Mediotergite and laterotergites with distinct suture in between. Laterotergite large, not pronounced. Anepisternum subrectangular; separated from preepisternum 2 by distinct suture. Anepisternal cleft deep. Preepisternum 2 much larger than anepisternum, subtriangular ventrally. Anterior and posterior basalare distinct. Mid-pleural pit distinct. Epimeron 2 with deep cleft dorsally indicating a subdivision into upper anepimeron and lower katepimeron, the latter strongly narrowed

ventrally. Metanotum very short, barely traceable. Episternum 3 subdivided by a cleft into small, indistinct upper portion (situated behind posterior spiracle) and large, subrectangular lower portion. Epimeron 3 very narrow. Openings of spiracles without striking features. **Legs:** Coxae longer than half the height of thorax. Coxae and femora with setae of moderate length. Tibial spurs 1:2:2, well developed. Fore tibia with well developed anteroapical depression bearing distal comb of setae; in males usually better developed than in females. Tibiae and tarsi covered with large trichia and short, somewhat scale-like setae, most densely on tarsomeres 2-4 and distal portion of tarsomeres 5, particularly underneath. Tarsomeres 1-5 gradually decreasing in length. Pretarsal claws small, curved, without teeth. Pulvilli well developed, about as long as claws. Empodia as long as claws or shorter. **Wing:** Long, i.e. more than two times as long as wide, but shorter than body. Calyptral area somewhat convex; anal area moderately developed. Membrane covered with setae, with setation less dense towards wing base. Venation: C extending to apex of wing, ending at a point half way between apices of R5 and M1; Sc short, ending abruptly clearly before level of Rs; Rs oblique, slightly curved, much longer than ta; ta oblique; R5 with short faint portion proximally; M1+2 stem and fork subequal in length, fork clearly diverging; tb+mcu almost parallel to anterior wing margin, tb shorter or longer than mcu (varying even infraspecifically); CuP reaching to or going beyond half length of CuA2; A1 sometimes going beyond CuP but usually shorter (varying even infraspecifically); A2 barely traceable. M absent, sometimes pretended to be present by a membrane fold. With setae present along wing margin and on Sc, R, R1 (dorsally and ventrally), sometimes Rs, R5 (dorsally and ventrally), M1+2 stem and fork (dorsally and ventrally), sometimes tb, sometimes mcu, CuA1 (dorsally and ventrally), CuA2, and A1. Pattern of sensory pores: R, 0-2; R1, 3-6; Rs, 1-2; R5, 1-2 proximally, 2-3 distally.

Abdomen: Tergites evenly covered with long setae. Tergite 1 and sternite 1 each subdivided into long anterior and short posterior plates with membranous portion in between. Tergite 1 shorter than 2, and 7 longer than 8. Sternite 1 usually non-setose. Sternite 2 with two membranous windows anteriorly separated by sclerotized bar bearing numerous sensory setulae. Membranous portions on sclerites 1 and 2 obviously creating a flexible zone enabling the abdomen to be bent behind segment 1. Sternites 2-8 with long setae arranged in three irregular longitudinal rows. With six pairs of spiracles, one each on segments 2-7. Tergal plaques small, situated in a antero-lateral position on each of the tergites, with their pattern 0/1/1/1/1/1/1/0.

Terminalia. Male. Sternite 9 present as distinct sclerite or intimately fused with gonocoxites. Gonocoxites almost separated ventrobasally or broadly joined, with setose lobe in gonocoxal section 3; gonocoxal apodemes connected by membranous or sclerotized transverse bridge. Gonostyli one- or two-lobed. Aedeagus with long sclerotized apodeme and usually complicated three-dimensional structure terminally. Parameres intimately fused to form a tegmen; tegmen with ventrolateral and distal lobes. Dorsal parameral apodemes well developed. Tergite 9 of varied shape but always bearing many short megasetae inside each distolaterally. Tergite 10 absent. Cerci rather short and broad. Hypoproct two-lobed, weak. **Female.** Mainly corresponding to basic pattern in Sciaroidea. With gonocoxites 8 extending caudally to or beyond tergite 10; gonapophyses 9 present as well sclerotized internal ribs that merge anteriorly to form a notum; tergite 10 rather short and indistinct; sternite 10 present as setose internal ribs that merge posteriorly; and both cerci well developed and subequal in size. With 2 sclerotized spermathecae.

Diagnosis and discussion. Within the *Heterotricha* group, the genus *Insulatricha* is characterized by the combination of the following characters: the antennae are upturned and have a long flagellum (plesiomorphous conditions); the clypeus is unproduced (plesiomorphous); the meso- and metathoracic pleura are bare (plesiomorphous); the wing membrane and veins (including Sc) bear setae (plesiomorphous); Rs is oblique and longer than ta which is also oblique (plesiomorphous); the stem of M1+2 is long, i.e. subequal in length to the fork (apomorphous); the parameres are fused to form a tegmen (apomorphous); the male tergite 9 bears many short megasetae each distolaterally (apomorphous); the ovipositor is unmodified (plesiomorphous); and two sclerotized spermathecae are present (plesiomorphous). This definition of the genus is necessarily polythetic as no autapomorphous characters are recognizable of *Insulatricha*. A long stem of M1+2 is found throughout the *Heterotricha* group except in *Heterotricha*, *Anisotricha* and *Sciarosoma*; a tegmen is present in *Chiletricha*, *Anisotricha*, *Sciaropota* and possibly others; and a tergite 9 modified in a similar way like that in *Insulatricha* is found in *Chiletricha*, *Rhynchoheterotricha*, and *Kenyatricha*.

Etymology. The name is composed of the Latin *insula*, for island, and a part of the genus name *Heterotricha*. Gender is feminine.

Insulatricha hippai sp. n.

(Figs 1-7)

Description

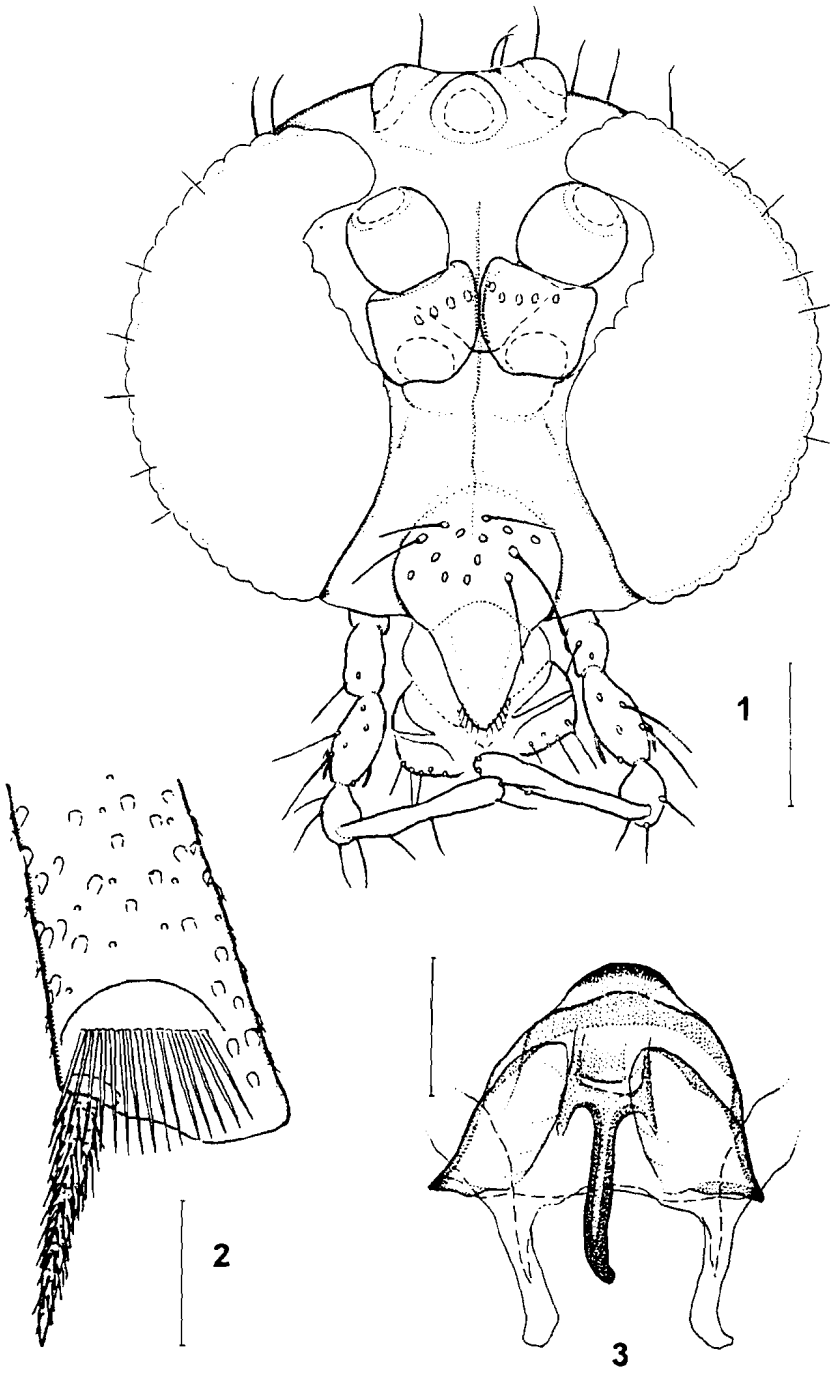
Male. Body size: 3.5-4.0 mm.

Head (Fig. 1): Antenna with 4th flagellomere 7 times as long as wide. Labrum non-setose. Maxillae with lacinia smooth and very short, sometimes not visible. Maxillary palpus segments (2-)3-4 with sensory hairs.

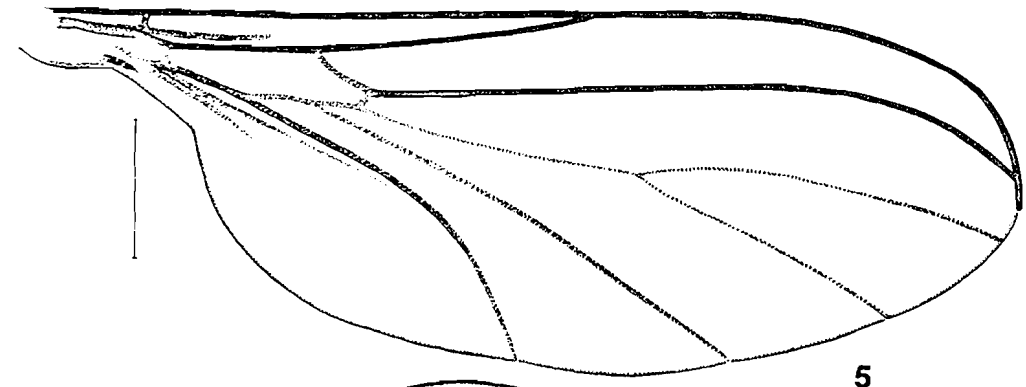
Thorax (Fig. 4): See generic description. **Legs:** Fore tibia with anteroapical depression (Fig. 2) bearing straight comb of 12-16 spine-like setae subequal in length, with distinct rounded upper rim in some distance from the comb, usually without setae between comb and rim. **Wing** (Fig. 5): Venation: tb shorter or longer than mcu, and A1 shorter than CuP.

Abdomen: Segment 8 more than half as long as segment 7.

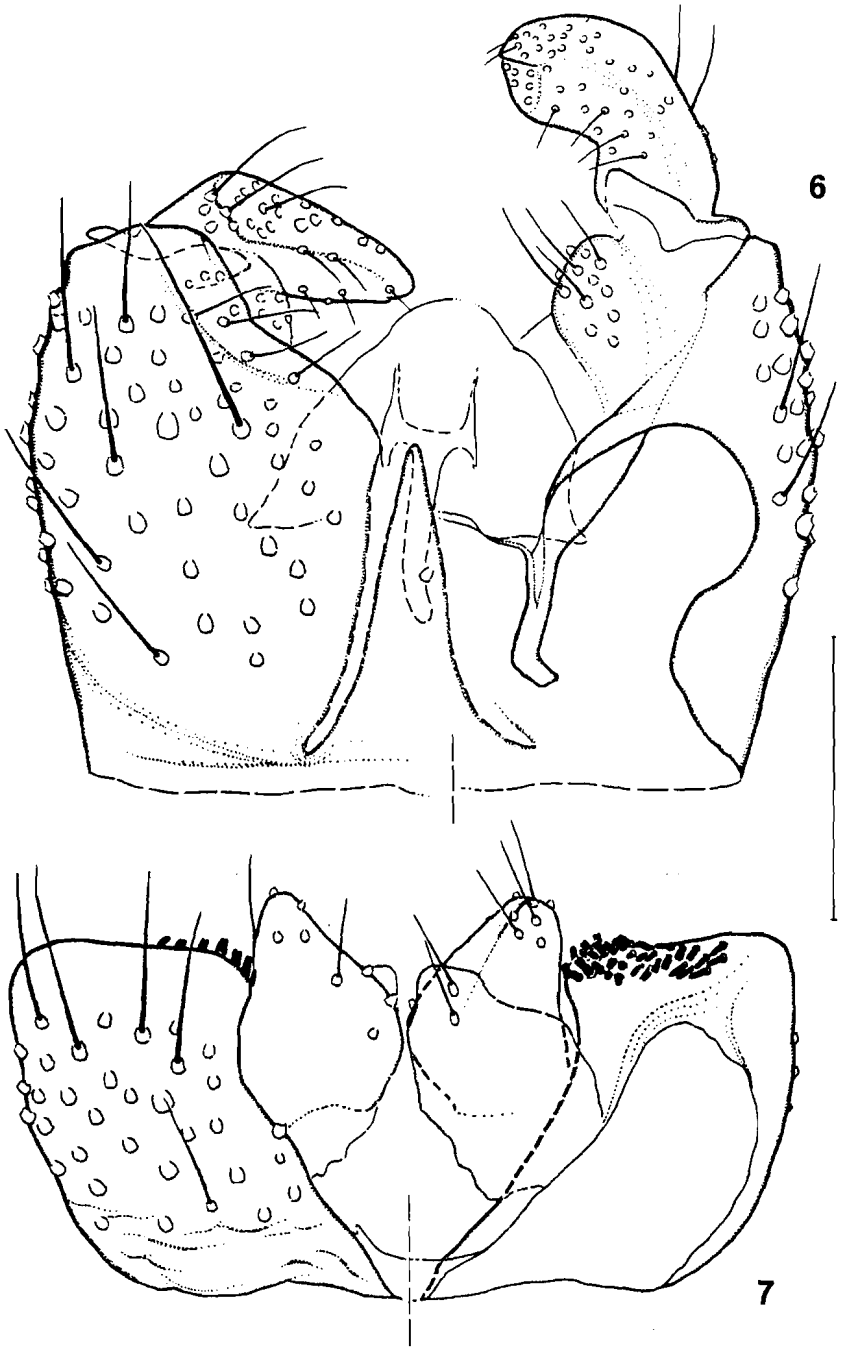
Terminalia: Gonocoxites (Fig. 6) ventrally almost separated from each other with sternite 9 in between, with setae of various lengths on its ventral and dorsal surfaces; with setose, rounded lobes in section 3 and bare, rounded lobes dorso-proximolaterally. Sternite 9 elongate, weakly sclerotized, non-setose or bearing 1-4 setae. Gonostyli (Fig. 6) usually turned inwards, broad proximally and wedge-shaped in distal half, with apex incised; with long setae on outer surfaces and very short, fine setae inside and terminally; basolateral apophysis large. Aedeagus (Fig. 3) with long sclerotized apodeme widened apically into weakly sclerotized head. Tegmen (Fig. 3) broad, with clear contours, distally with broadly rounded lip directed ventrally; ventral parameral apodemes short and sclerotized; dorsal parameral apodemes very long, well sclerotized and connected by weak transverse bridge. Tergite 9 (Fig. 7) almost completely subdivided medially, with long setae on its outer surface and many short, thorn-like, bi-pointed megasetae inside distally. Cerci (Fig. 7) narrowly



Figs 1-3: *Insulatricha hippai* sp. n., male. - **1:** head, frontal view (0.1 mm); - **2:** fore tibial anteroapical depression (0.05 mm); - **3:** aedeagus and tegmen (0.05 mm). 1 and 3: specimen from Lake Daniells Track; 2: paratype. (In parentheses: length of scale bar.).



Figs 4, 5: *Insulatricha hippai* sp. n., male. - **4:** thorax, lateral view (0.5 mm); - **5:** wing, setae omitted (0.5 mm). 4: specimen from St Arnaud; 5: paratype. (In parentheses: length of scale bar.)



Figs 6, 7: *Insulatricha hippai* sp. n., male. - **6:** terminalia; left side: ventral view, right side: dorsal view; - **7:** tergite 9, cerci and hypoproct; left side: dorsal view, right side: ventral view. Specimen from Lake Daniells Track. (Length of scale bar: 0.1 mm.). -

rounded apically, densely setose. Hypoproct (Fig. 7) very weak, two-lobed, bearing 2 setae each distally.

Female. Unknown.

Types. Holotype: male, New Zealand, North Island, Taupo, Tongariro National Park, Mangawhero River valley 3 km NE Ohakune, 690 m, in mixed podocarp/broadleaf forest, 26 Nov.-28 Dec. 2002, by Malaise trap, M. & C. JASCHHOF & U. KALLWEIT. **Paratypes:** 3 males, same data as holotype.

Discussion. As regards most characters, *Insulatricha hippai* is very much like *I. chandleri* (see next species), but clear differences between these two species lie in the male terminalia.

Distribution and phenology. *Insulatricha hippai* occurs on both main islands, but its distribution area appears to be confined to the central parts of the North Island (Ohakune, Mt Egmont) and the northern parts of the South Island (Buller area). Adults were collected by Malaise trapping and sweepnetting in prime, mature native forests of both the podocarp/broadleaf and southern beech type. Middle elevations (400-950 m) are possibly preferred. Apparently the flight period is short and restricted to the early summer (November to mid-December). Numerous males but no females were collected. *Insulatricha hippai* was found to occur in the same sites like *I. chandleri* and *Anisotricha novaezealandiae*.

Etymology. This species is devoted to Prof. Dr HEIKKI HIPPA, Swedish Museum of Natural History, Stockholm, whose sustained interest in and original ideas on the phylogeny of the Sciaroidea has stimulated much of the work in this field over many years.

Other material studied. New Zealand / North Island / Taupo: 10 males, same data as types (in ethanol); Taranaki: 2 males (on slide), Mt Egmont, North Egmont, Holly Hut, 26-30 Nov. 1975, from NZAC. South Island / Buller: 3 males (on slide), Nelson Lakes National Park, St Arnaud, 14-21 Nov. 1990, Landcare Nelson; 1 male (on slide), Nelson Lakes National Park, Lake Rotoiti, 20 Dec. 2000, DoC St Arnaud; 4 males (on slide), Lake Daniells Track 7 km E Springs Junction, 9 and 24 Nov. 2001, M. JASCHHOF; 1 male (on slide), 5 km W Maruia Springs, 26 Nov.-25 Dec. 2001, M. & C. JASCHHOF.

Insulatricha chandleri sp. n.

(Figs 8-17)

Description

Male. Body size: 3.2-4.3 mm.

Head: Antennal flagellum with longest setae 1.5 times as long as the diameter of the flagellomere; with 4th flagellomere (Fig. 8) 6.5 times as long as wide. Labrum non-setose. Maxillae with lacinia reduced in length, i.e. as long as palpomeres 1 and 2 together. Maxillary palpus segments 3 and 4 with sensory hairs.