THE TAXONOMY AND ECOLOGY OF A NEW MONOCELID FLATWORM FROM MACQUARIE ISLAND (PLATYHELMINTHES, TURBELLARIA)

by

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ABSTRACT

Macquarie Island (54°37'S 158°54'E) has been investigated for the occurrence of freshwater macroturbellarians. Twenty sites were examined but only one species, here ascribed to the genus *Minona* sensu lato of the Monocelididae, was found and it is described as *Minona amnica* sp. nov. Its closest taxonomic relationships seem to be with *M. istanbulensis* Ax from the Black Sea, and *M. mica* Marcus from Brasil. The new species is unusual in that it occurs throughout the fresh waters of the island even though it is a member of a predominantly marine group. *Minona amnica* occurs from windswept plateau lakes down to brackish water near the sea and data concerning the distribution and relative abundance of the species in various habitats are presented and discussed.

INTRODUCTION

Our knowledge of the turbellarian fauna of subantarctic islands is very limited, if for no other reason than that these small fragile organisms may easily be overlooked in the general biological surveys that are usually carried out. What is known has been summarized in papers by Westblad (1952), Marcus (1954a), Hyman (1958) and Nurse (1964). Thus far the coast of Macquarie Island has been studied in moderate detail, there being a general review by Bennett (1971), and several marine turbellarians are now known from rock pools and among seaweed. But hitherto the usual baiting and netting techniques used by aquatic biologists have not yielded turbellarians from the fresh waters of this island.

In November 1975 one of us (David Hay) had the opportunity to visit the island during an Australian National Antarctic Research Expedition (ANARE) change-over visit. This opportunity was taken up because of our current interest in the taxonomy and distribution of planarians in Australia (Hay & Ball, in preparation) and because of the considerable interest in the effects of temperature on their ecology as exemplified by work in Britain (Reynoldson et al., 1965; Sefton & Reynoldson, 1972) and Japan (Kawakatsu, 1974). The current work of Hay in Australia is demonstrating the importance of the role temperature plays in the life-cycle of many species. Thus, the opportunity to compare these findings with the harsh conditions prevailing on Macquarie Island was welcome.

However, despite intensive searching among the many streams and lakes on the island (fig. 1), no freshwater planarians were found. Their niche was occupied by a monocelid flatworm, representing a group that is normally confined to the marine, or at most brackish, environment. It is well known that on oceanic islands from which freshwater planarians are historically absent, marine planarians take their place (Ball, 1977) but the wide occurrence and abundance in fresh water of the new monocelid from Macquarie Island, in the total absence of aquatic planarians, seems most unusual. Because of its occurrence and abundance we were able to make many studies on its biology and to obtain sufficient material for an adequate description, for all the specimens collected belonged to a single species of *Minona* that is new to science. In the present paper we describe this new species and discuss its systematic position, and we give the results of the preliminary

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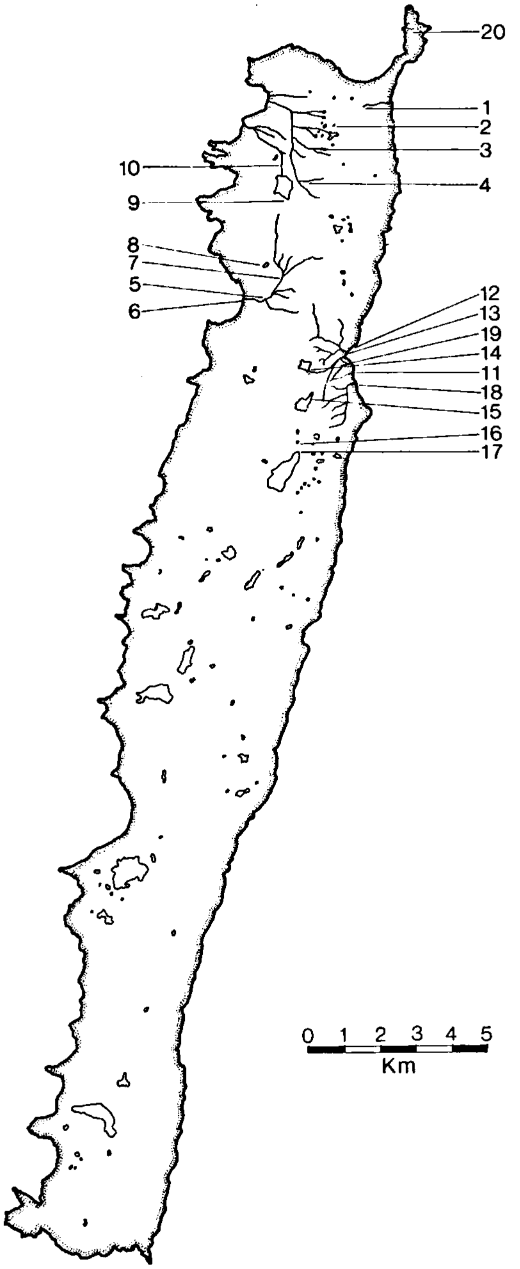


Fig. 1. Map of Macquarie Island. All the lakes of the island are shown, but only those streams investigated during the present survey are indicated. Numbers refer to the collecting sites listed in table I.

work on its ecology. Concerning the latter, little is known generally of the entire Monocelididae.

METHODS AND MATERIALS

Collecting was done by examining the underside of stones and sluicing any turbellarians found into a collecting dish, from which they could be picked out individually. Selected specimens were killed and fixed in Steinmann's fluid to which 2% ammonium nitrate had been added to prevent precipitation of the mercuric chloride. They were then transferred to 70% alcohol plus 5% glycerine. Attempts were made to take live specimens back to Australia but these were unable to withstand the conditions during the return sea-voyage and were therefore killed and fixed.

At each collecting site the water temperature was measured at the time of collecting and a sample taken for measurement of the pH. To express the abundance of the monocelids at any particular site, the numbers caught in a given time period are expressed in numbers collected per hour. This is a method used with success in studies of planarian ecology (Reynoldson, 1958). Its main drawback lies in the assumption that the rate of collection could remain constant for the full hour, which undoubtedly is not the case for smaller sites, and abundance is certain to be underestimated if the population density is very high because there is a limit to how fast they can be collected under ideal conditions. Therefore, quantitative sampling under the conditions prevailing on Macquarie Island, and in small sites, is almost impossible, and by the method outlined some idea of the relative abundance at the various locations may be obtained.

For the descriptive study, selected specimens were serially sectioned sagittally or transversely, some at 8 μm and others at 5 μm, in the usual way. The sections were stained in Mallory-Heidenhain.

SYSTEMATICS

Family MONOCELIDIDAE Hofsten, 1907

Proseriate turbellarians of slender and filiform body form, an almost uniformly ciliated body, and with a rostral end devoid of sensory pits but with feebly differentiated sensory hairs. With a tubular, plicate pharynx, a statocyst in front of the brain, and with a common oviduct opening independently behind the male pore. Type genus: *Monocelis* Ehrenberg, 1831.

A recent critical discussion of the family, with a key to the genera, is that by Karling (1966).

Genus **Minona** Marcus, 1946

Minona Marcus, 1946: 120, and including
Preminona Karling, 1966: 503 and
Duplominona Karling, 1966: 503.

Monocelididae with an accessory prostatic organ (musculo-gland organ), provided with a cuticular stylet, situated behind, or before, the male copulatory organ. Ovaries immediately in front of the root of the pharynx; testes follicular, ventral, and preovarial. With a prepenial bursa and usually with an external vagina. Epidermis infranucleate, adhesive papillae caudally accumulated, pharynx in the middle or posterior region, with or without eyes. Type species: *Minona evelinae* Marcus, 1946.

Minona amnica sp. nov. Figs. 2-6

Diagnosis. — Large species, up to 4 mm, lacking eyes and pigment. Vagina muscular, anterior to the penis. Penis armed with cuticular spines, bulb of the duplex type. Testes numerous and ventral. Male accessory organ with strong radial muscles and smoothly curved stylet. Female pore clearly separate from the accessory male pore. Inhabitants of fresh and brackish waters.

Material examined. — The description is based on seven sets of serial sections. One slide has been designated as the holotype (W. 12189) and the bulk of the material is now in the Australian Museum, Sydney. Paratypes have been retained in the Zoölogisch Museum, Amsterdam.

Description. — Without eyes or pigment, up to 4 mm long and about 0.6 mm wide. Head broad and rounded, not clearly set off from the rest of the body; posterior tapering to a blunt point. The epidermal and pharyngeal structures are typical of the genus.

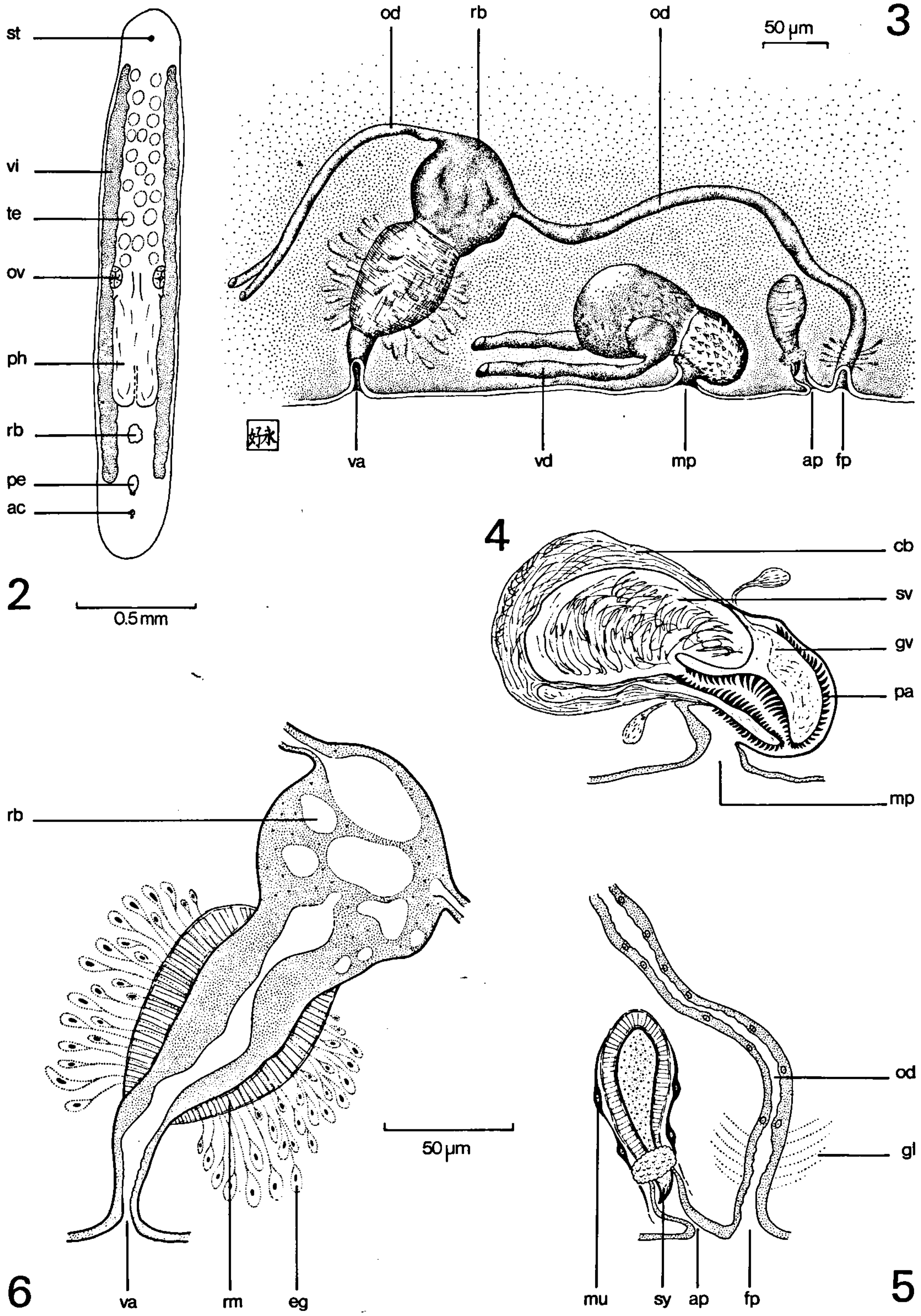
The testes are represented by numerous (20+) small follicles ventrally situated in the prepharyngeal region (fig. 2). The first testes begin a little behind the brain and the last occur immediately anterior to the ovaries. The paired ovaries lie ventrally at the root of the pharynx and the vitellaria are laterally, or latero-ventrally situated and extend from just behind the brain to about the level of the male copulatory organ.

The general configuration of the copulatory organs is shown in fig. 3. There are four quite distinct genital pores. The vaginal pore, leading to a vaginal duct and resorptive bursa occupies a relatively isolated position immediately behind the mouth. About halfway between it and the posterior tip is the male pore, then the accessory male pore, and finally the female pore, the opening of the oviduct to the exterior.

The male copulatory organ (fig. 4) comprises an elongate, up to 80 μm, and very muscular vesicle and a shorter and robust papilla that projects into the thin-walled male atrium; in all the available specimens the copulatory apparatus is everted. The main cavity of the bulb consists of the seminal vesicle but in most specimens there is also a separate prostatic part, containing a granular secretion that extends into the everted papillal region. The papilla itself is stout, with a wide duct, and the duct and outer epithelium are covered with short stout spines that are wide at the base and pointed at the tip.

Behind the male copulatory apparatus there is a small cavity, with its own exterior pore, into which the accessory muscular-gland organ projects (fig. 5). The bulb of the latter is elongate, up to 60 μm long, and it is sheathed with a thick layer of circular muscle fibres. The proximal end of the bulb is slightly curved and here there is a small pore through which numerous unicellular glands empty into the cavity of the accessory organ. At the distal end of the bulb there is a short and curved stylet at the base of which there appears always to be an accumulation of erythrophilic gland secretion (fig. 5).

The oviducts unite behind the pharynx to form a wide common duct that extends over the copulatory apparatus and then curves sharply downwards to open via the female pore immediately behind, but quite separate from, the opening of the male accessory organ (fig. 5). Just above the female gonopore, numerous erythrophilic glands open into the common oviduct. There is a second female pore, the vagina, in front of the penis and close behind the pharyngeal pore. The vaginal duct curves dorsad and posteriad as an ever-widening duct that is surrounded by thick radial muscles and then a layer of longitudinal fibres. Numerous glands pierce this muscular duct. Beneath the common oviduct, from which it opens, there is a resorptive bursa that links the vaginal duct with the common oviduct (figs. 3 and 6).



Figs. 2-6. *Minona amnica* sp. nov. 2, general habitus; 3, reconstruction of the copulatory organs viewed from the left side; 4, sagittal section of the male copulatory organ; 5, sagittal section of the male accessory organ and the female pore; 6, sagittal section of the vagina and bursa. ac = accessory organ; ap = accessory pore; cb = copulatory bulb; eg = eosinophilic glands of the vagina; fp = female pore; gl = eosinophilic glands of the oviduct; gv = granular vesicle of the penis; mp = male pore; mu = muscle; od = oviduct; ov = ovary; pa = penial armature; pe = penis; ph = pharynx; rb = resorptive bursa; rm = radial muscle; st = statocyst; sv = seminal vesicle; sy = stylet of the male accessory organ; te = testis; va = vaginal pore; vd = vas deferens; vi = vitellaria.

Distribution. — *Minona amnica* is widespread and abundant under stones and among vegetation in the fresh and brackish waters of Macquarie Island (54°37'S 158°54'E). Aspects of its distribution are discussed below.

Etymology. — The specific epithet is from the Latin *amnicus*, a river dweller, and refers to the unusual freshwater habit of this species, other Monocelididae being confined to marine or brackish waters.

Taxonomic discussion. — Of the some 17 genera of monocelid turbellarians currently recognized (Karling, 1966) only five possess a male accessory glandular organ provided with a cuticular stylet. These are:

Ectocotyla Hyman, 1944;
Peraclistus Steinböck, 1932 sensu Marcus, 1950;
Minona Marcus, 1946;
Preminona Karling, 1966;
Duplominona Karling, 1966;
the latter three forming the genus *Minona* s.l.

All five may be referred to collectively as the *Minona* group within the family Monocelididae. The status, limits, and relationships of the various very similar genera comprising this group are very difficult to elucidate and the attempt by Karling (1966), although brave, ought not to be considered definitive. The situation is complicated by the loose and varied nomenclature that has been used for the various parts of the reproductive apparatus.

The genus *Ectocotyla* comprises two ectoparasitic species, *E. paguri* Hyman and *E. hirudo* (Levinsen). It also subsumes *Coleophora* Steinböck (cf. Hyman, 1964) but not *Monocelis alba* Levinsen which Steinböck (1932) ascribed to *Coleophora* without giving adequate reasons (Marcus, 1950; Hyman, 1964). The inclusion of *Ectocotyla* within the *Minona* group (Karling, 1966: 502) presupposes some errors in Hyman's original description (see also Hyman, 1964) for she states clearly that it is the penis, situated posteriorly, that is armed with a curved stylet. She detected no ducts associated with this structure and it seems likely that she mistook a musculo-glandular accessory organ to be the penis, much as did Friedmann (1924) when he described *Peraclistus oofagus* (Marcus, 1950: 111), another ectoparasitic species. It is equally difficult to assess the organ described by Hyman as the seminal bursa, for again she did not elucidate its relationship to the rest of the copulatory apparatus. A re-investigation of the type material of *E. paguri* is needed but the genus as a whole can be separated from *Minona* s.l. by its ectoparasitic habit, caudal disc, and anterior position of the pharynx.

The genus *Peraclistus* is problematical, as has been discussed in detail by Karling (1966). Those species that have been ascribed to this genus are to be recognized by the fact that the vagina lies posteriorly to the penis, whereas in species of *Minona* sensu Marcus the vagina is anterior to the penis. Karling (1966: 500) considers this feature to be of little taxonomic importance at the generic level because of the variability that exists within the Monocelididae as a whole. But within the *Minona* group as here recognized there is no difficulty in determining the position of the vagina, and whether it is anterior or posterior to the penis seems to us a constant and major architectonic feature. Similarly, while it is true that a vagina may develop late, or be lacking in male mature individuals when sequential hermaphroditism occurs, this in no way invalidates its use in higher classification. To the species of *Peraclistus* recognized by Marcus (1950) viz., *P. oofagus* (Friedmann) and *P. itaipus* Marcus, there must now be added the species described under the latter name by Westblad (1952), but which has since been redescribed as new, under the binomen *Duplominona westbladi*, by Karling (1966), despite the fact that it has a vagina posterior to the penis. At the same time Karling removed *P. itaipus* from the genus and assigned it to *Minona* sensu Karling. The dangers of allowing the name *Minona* to fall as a junior synonym of *Peraclistus*, with its poorly known type species, have wisely been pointed out by Karling (1966), but the difficulties cannot be obviated simply by restricting the genus to the type species on purely arbitrary grounds. Consequently we retain *P. itaipus* and *D. westbladi* in *Peraclistus* and accept the genus in Marcus' (1950) sense as a genus quite distinct from *Minona* s.l. Moreover, it seems that the authorship of the genus *Peraclistus* should be given to Marcus because the mere citations of the name by Steinböck (1932: 329) and Bresslau (1933: 279) do not fulfill the requirements of the International Code of Zoological Nomenclature (1964: article 13).

We regard, therefore, the genus *Minona* s.l. as comprising those species of the *Minona* group in which the vagina opens anteriorly to the penis. As thus constituted, and including the new species herein described, there are contained 18 valid species:

Minona (*Minona*) *evelinae* Marcus, 1946 — Brasil
M. (*M.*) *divae* Marcus, 1951 — Brasil
M. (*M.*) *baltica* Karling & Kinnander, 1953 — Baltic Sea, Dutch coast
M. (*M.*) *tridens* Marcus, 1954b — Brasil
M. (*M.*) *trigonopora* Ax, 1956 — Mediterranean France
M. (*M.*) *cornupenis* Karling, 1966 — California, U.S.A.
M. (*M.*) *obscura* Karling, 1966 — California, U.S.A.
M. (*M.*) *bistylifera* Karling, Mack-fira & Dörjes, 1972 — Hawaii
M. (*M.*) *fernandinensis* Ax & Ax, 1977 — Galapagos
M. (*Preminona*) *insularis* (Meixner, 1928) — Adriatic Sea
M. (*Duplominona*) *mica* Marcus, 1951 — Brasil
M. (*D.*) *istanbulensis* Ax, 1959 — Sea of Marmara, Black Sea
M. (*D.*) *kaneohei* Karling, Mack-Fira & Dörjes, 1972 — Hawaii
M. (*D.*) *galapagoensis* Ax & Ax, 1977 — Galapagos
M. (*D.*) *karlingi* Ax & Ax, 1977 — Galapagos
M. (*D.*) *krameri* Ax & Ax, 1977 — Galapagos
M. (*D.*) *sieversi* Ax & Ax, 1977 — Galapagos
M. (*D.*) *amnica* sp. nov. — Macquarie Island

It has been suggested (Karling, 1966: 505) that *Monocelis alba* Levinsen also belongs in *Minona* but the same author has indicated that the species is too poorly known to be certain of this.

Karling (1966) has divided the genus according to whether the musculo-glandular accessory organ is in front of (*M. insularis*) or behind the penis, and for the species with the former condition he erected the monotypic genus *Preminona*. Furthermore, he made a distinction between two types of penis bulb. In the simplex type there is a simple cavity that is not differentiated into separate prostatic (glandular) and seminal vesicles. In the duplex type there is a bulbar cavity showing such a clear separation. As mentioned previously, Karling rejects the position of the vagina as a taxonomic character and consequently he includes *Peraclistus itaipus* Marcus in *Minona* s.s. and *P. itaipus* sensu Westblad in *Duplominona* as *D. westbladi* Karling. But the problem of the validity of the various characters remains because duplex bulbs are found within other genera of Monocelididae, notably in species of *Archiloa* and *Promonotus*. Furthermore, Karling admits that there is a gradation of one type into another. Certainly it is not always obvious that the bulb of *M. amnica* is of the duplex type and the character needs re-assessment on all the previously described species. An adequate division of *Minona* s.l. can be made only when we have a better idea of the evolutionary relationships of the species, or good criteria for delimiting strictly monophyletic (holophyletic) groups. We are a long way from this ideal and consequently, until the phylogenetic value of Karling's revision has been thoroughly tested, we restrict his changes to the subgeneric level so that future workers are encouraged to make broad comparisons of new material with the genus *Minona* in its wider sense. It may be noted, however, that Ax (1977) has recently attempted a provisional phylogenetic analysis of the *Duplominona* species, although with little consideration of the difficult, but surely phylogenetically significant, *Peraclistus* group.

Minona amnica sp. nov. is a large species within the genus, being exceeded only by *M. baltica*. Like most of the species it is devoid of pigment (only *M. insularis* has mesenchymal pigment) and without eyes (*M. evelinae* and *M. obscura* possess eyes). The prominent cuticular armature of the penis is shared with all the *Duplominona* species except *M. krameri* and *M. sieversi* in which the armature has been reduced (Ax, 1977). Weak cuticular spines may also occur in *M.* (*Minona*) *cornupenis*, although this is not absolutely sure (Karling, 1966: 513).

Of those species comprising the subgenus *Duplominona* the four described from the Galapagos Islands by Ax & Ax (1977) form a uniform group within the genus in their possession of a distinct and elongate stylet within the male copulatory organ. They are also unusual in the unification of the vaginal and male pores, and of the accessory and female pores, combined features that are shared with *M. kaneohei*. One member of this group, *M. galapagoensis* shares the unusually strong vaginal musculature of the new species, as does *M. stimula* Ax & Ax, here ascribed to *Peraclistus*.

Of the remaining species of this subgenus, *M. mica* is distinguished by the alate expansions at the base of the stylet of the accessory male organ (Marcus, 1951: fig. 115r) and *M. istanbulensis* by the unification of the accessory and female pores while the vagina has a relatively isolated position well anterior to the rest of the copulatory apparatus. Both these latter species also show strong musculature of the female genital canal, comparable to that of *M. amnica* sp. nov., but in these species it seems to be a part of the bursa that is muscularized for the common oviduct enters the vagina below the musculature, whereas in the new species it is truly the vagina, and not the bursa, that is richly supplied with both muscles and glands (cf. fig. 6 with Ax, 1959: 87, fig. 51). *M. amnica* may be further distinguished from these two closely related species (Ax, 1959: 88) by its large size, and by its large and elongate accessory male organ.

A unique feature of *M. amnica* is its freshwater habit, for the Monocelididae have hitherto been regarded as a marine group. This is a phenomenon that will be further discussed below.

ECOLOGY

The locality and collecting sites. — A succinct description of Macquarie Island, its climate and its history, has been provided by Berry & Peters (1975) and so only a few pertinent details are given here. At 54°37′S 158°54′E, Macquarie Island lies close to the Antarctic Convergence and some 1500 km southeast of Tasmania. The Antarctic mainland lies 1700 km to the south. It has a very stable climate with an annual minimum temperature of 3.1°C in July and a maximum in January of 6.7°C. There is considerable cloud cover, 83% on average, and rain or snow on about 320 days of the year. There are no permanent inhabitants but an ANARE station is located on an isthmus at the north of the island, with several temporary outstations around the coast.

The island is probably a horst block which is subject to extreme erosion, both from the sea and from the burrowing of the rabbit population which has grown unchecked in the absence of significant predators. It is about 33 km long with a maximum width of 5 km and consists of a barren plateau 200-300 m above sea level. On this plateau there are many lakes some of which are isolated and others feeding streams which flow down steep slopes to a boggy terrace that is narrow, particularly on the eastern side. The island, and the position of the collecting sites, is shown in fig. 1.

A total of 20 sites in the northern half of the island were investigated; there was insufficient time to visit the southern region. The pH ranged from 7.0 to 7.8 with no indication of any systematic trend from low to high ground or between lakes and streams. For the lake localities our data indicate that the monocelids were not uniformly distributed over the lake bottom, but rather they were confined to the littoral zone on the eastern side where there was a gently shelving stony bottom. With the prevailing wind coming from the east, wave action has generally scoured away the opposite bank resulting in heavy silting that eliminates suitable refuges for the turbellarians. This situation is similar to that found for lake-dwelling triclads in northern Britain (Reynoldson, 1958). At one site (Square Lake), where the shallow bottom permitted, the search for turbellarians was continued some 10 m out from the bank, but nearly all the individuals collected were found within 2 m of the shore-line.

Distribution and abundance. — Rather than considering all the sites separately they will be grouped into three general divisions: (i) the lakes on the plateau, (ii) the streams on the plateau and leading down from the plateau, and (iii) the streams on the coastal terrace and close to the sea. Table I gives details of all the sites with the relative numbers of *Minona amnica*. The locality descriptions are provided mainly for the benefit of future collectors, but it is worth pointing out some qualitative differences that may explain further the variations in numbers between the sites within the three general categories.

(i) The lakes. — Although all the lakes lie on the plateau above the 200 m contour they differ considerably in the amount of total dissolved and suspended matter (TDM) and in the presence of filamentous algae. The many small lakes in the general vicinity of Scoble Lake differed greatly in these two respects, even over very short distances.

TABLE I

Locality data and relative abundances of *Minona amnica* on Macquarie Island.

Site	Location	Temp. (°C)	Relative number of monocelids (number/hour)
(i) Plateau Lakes			
2	Small lake near Scoble Lake	18	480
8	Small lake above Boiler Rocks	13	50
9	Island Lake	10	54
14	Square Lake	(see table II)	
15	Tulloch Lake	15	150
16	Small lake near Prion Lake	16	60
17	Prion Lake	14	72
(ii) Plateau Streams			
1	On Perseverance Bluff	14	180
3	Between Scoble and Island Lakes	14	960
4	Another fork of site 3	14	800
7	Above Bauer Bay	9	20
10	Between site 3 and Eagle Bay	9	40
20	Summit of Wireless Hill	—	single individual
(iii) Coastal Streams			
5	200 m from Bauer Bay	7	1000
6	100 m from Bauer Bay	7	300
11	Shore near Sandy Bay	8	90
12	Tributary of site 13, 12 m from sea	7	480
13	Finch Creek, 20 m from sea	8	48
18	20 m from shore at Sandy Bay	7.5	240
19	Tributary of site 13, 30 m from sea	7	112

Of four small lakes sampled in this group three had a very low TDM level, and only one monocelid was found. The other lake (site 2) had a high TDM level and monocelids were abundant (table I). This lake also contained far more tubificid worms than the other three and field observations indicate clearly that these are a food resource for the monocelids. Most of the turbellarians were collected, with difficulty, from among the filamentous algae.

The other lakes are somewhat larger, with less TDM, but the places in which monocelids could be found were strictly limited to the stones on the eastern side, and only to those areas of the lake where there was an extensive covering of black moss. Only the smaller of these lakes (sites 8 and 16) had any algae and it was here that the monocelids were located.

TABLE II

Distribution and relative abundance of *Minona amnica* in Square Lake (site 14), Macquarie Island.

Distance from bank (m)	2	4	6	8	10
Depth of water (cm)	3	8	12	18	24
Temperature (°C)	18	12	11	9	8
Relative number of monocelids (number/hour)	225	16	12	0	0

As mentioned previously, the very gradual shelving of Square Lake (site 14) made it possible to study the occurrence of *Minona amnica* at different depths. These data are given in table II and show how the distribution was confined to the littoral zone, even though apparently suitable refuges existed further out. The shore temperature here of 18°C was similar to that recorded at the other lakes, but the fact that this decreased rapidly with increasing depth, and when the air temperature was 6°C, suggests that the higher temperatures of most of the lakes listed in table I, compared with the streams, was simply due to the fact that there had been several days of sunshine, an unusual occurrence, at the time of collecting which had elevated surface temperatures. Under the normal cloudy conditions there would be far less temperature differences between the sites.

(ii) The plateau streams. — As in the lakes, *Minona amnica* was concentrated in areas where there was a considerable growth of filamentous algae. Thus, at sites 7 and 10 where the streams were fast-flowing on the steep slopes from the plateau, few algae were present and few worms were found. Site 20, on Wireless Hill, is isolated from all the other collecting areas since it is on North Head, a 100 m high hill separated by a sea-level isthmus from the main plateau (fig. 1). Few streams exist on North Head and the one monocelid found was in a very small trickle of water.

(iii) The coastal streams. — One major factor affecting the monocelids in the coastal streams appears to be the penguins. Low relative numbers of *Minona amnica* were found at sites 11, 13 and 19 and these are all on or immediately beside streams that the Gentoo penguins habitually travel along to their inland colonies. The resulting organic enrichment of the water, together with the physical disturbance of the sites, may be expected to render them unsuitable for fragile turbellarians. Site 12 is a tributary of site 13, one of the disturbed sites, and the relative abundance of monocelids at the former site is confirmatory of the above supposition.

It is interesting that in the coastal streams the monocelids did not appear to extend below the high water mark and they were never found among the plentiful seaweed on the eastern shore which harbours other marine turbellarians (Nurse, 1964). This is susprising because the Monocelididae are predominantly a marine group (Meixner, 1938) although *Peraclistus westbladi* is known from running water in Tierra del Fuego, which implies a freshwater influence (Westblad, 1952). But an analogous situation occurs on Gough Island where Holdgate (1960) found that the coastal streams were occupied by *Procerodes ohlini*, a marine planarian, which did not extend into the marine littoral, where *Procerodes variabilis* dominated.

It is clear that on Macquarie Island *Minona amnica* is occupying a wide range of habitats from freshwater lakes on the windswept plateau to brackish habitats beside the sea. This species seems to have invaded a vacant niche, much as have some marine planarians on St. Helena (Ball, 1977), and it must have developed an osmoregulatory capacity comparable to that so well studied in *Procerodes littoralis*, the common marine planarian in northern Europe (Pantin, 1931 a & b; Weil & Pantin, 1931). Little is known of the ecology of the *Minona* group in general, but Den Hartog (1964) has provided evidence to indicate that on the Dutch coast *Minona baltica* withstands wider salinity fluctuations than in the Baltic (see also Bilio, 1964, 1967). Furthermore, since little is known of the food resources of the new species it is not known to what extent food may be an important factor in determining distribution. In a general study of the proseriate turbellarians of the Island of Sylt in the North Sea, Sopott (1973) found that, in addition to the effects of temperature, salinity, sulphide content, and pore water content of the sand beach, the food available could be an important density regulating factor. It is interesting to note that for some of the species studied by Sopott, oligochaetes were an important food resource, for we have observed *Minona amnica* to feed on tubificid worms. Very frequently the monocelid and the tubificids were found together at the same site, but the ecology of the latter on Macquarie Island is as poorly known, or more so, than that of the monocelids.

These preliminary observations show that *Minona amnica* is sufficiently dominant in the fresh waters of Macquarie Island as to permit a more detailed life-cycle and ecological study in a unique and harsh environment than is presented here. The biology of the Monocelididae is poorly known, and we know equally little, both systematically and ecologically, of the freshwater fauna of subantarctic islands in general. Further studies would be of importance not only for their intrinsic value, but also as standards for comparison with faunistically richer and better studied regions of the world where community complexity is much greater.

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