Freshwater Biotas of the Solomon Islands

Analysis of Richness, Endemism and Threats

Prepared by

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David Boseto and John T. Polhemus

Honolulu, Hawai'i
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Cover picture: Dr. Dan A. Polhemus and local villagers conducting aquatic insect surveys at Kwarea Falls, Malaita Island (R. Englund photo).

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We dedicate this report to the people of the Solomon Islands, in the hope that it will aid them in the wise management of their unique and precious natural resources.

This report was funded by the grant "Freshwater Biotas of the Melanesian Region" from Conservation International, Washington, DC to the Bishop Museum and the Smithsonian Institution, with matching support from the Smithsonian Institution, Washington, DC.

Figure 1. Gerry Allen and local colleagues at Tenaru Falls, Guadalcanal (Station 14).

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EXECUTIVE SUMMARY

Effective conservation of regional biotas requires accurate information on the distribution, taxonomic composition, endemicity, and local richness of species assemblages across multiple geographic scales. This is especially true in the Melanesian region, which contains ten percent of the world's biota on its numerous islands which lie scattered across thousands of kilometers between Fiji and the Moluccas. Although certain important biotic components within this region, such as birds, have been reasonably surveyed, many others, particularly freshwater organisms, have remained poorly understood.

As one step in rectifying knowledge gaps regarding Melanesian freshwater organisms, a systematic survey program for freshwater fishes and invertebrates in the Solomon Islands was undertaken during 2004 and 2005, involving staff from five research organizations with long-standing interests in Melanesia: the Bishop Museum, the Smithsonian Institution, the Western Australian Museum, the University of the South Pacific (USP), and Conservation International. These surveys revealed previously unsuspected levels of species richness and endemism among certain groups of Solomon Islands freshwater organisms, particularly aquatic insects, and provided a much clearer understanding of the distribution and taxonomic composition of the Solomon Islands' freshwater biota as a whole.

Sampling for fishes was conducted at 31 sites ranging in elevation from sea level to 200 meters. A total of 43 species belonging to 26 genera and 14 families were recorded. Although additional species can certainly be expected, the fauna is relatively impoverished compared to freshwater systems of New Guinea, and no definitively endemic species were collected, although one or two of the sicydiine gobies may prove to be local endemics when the samples are completely analyzed taxonomically.

Sampling for aquatic insects was conducted at 69 sites ranging in elevation from sea level to 460 meters. Sampling for insects concentrated on three major groups that had been employed in previous aquatic biodiversity surveys in New Guinea: Heteroptera (aquatic true bugs), Zygoptera (damselflies), and Gyrinidae (whirlygig beetles), with other aquatic insect taxa also collected on an opportunistic basis. The aquatic insect biota of the Solomon Islands was diverse, and, in contrast to the freshwater fishes, contained many endemic species, with these endemics often confined to single islands. Based on these surveys, plus examination of museum collections and scientific literature, the aquatic insect biota of the Solomon Islands displays the following levels of richness and endemism for the groups surveyed:

1.) In the Heteroptera, 93 species are now known, representing 28 genera in 12 families. Within this assemblage, 56 species are endemic, representing a 60% rate of endemism at the species level, and at least 31 of the species collected are new to science. There are no endemic genera in this group.

2.) In the Odonata, 63 described species are now known, representing 37 genera in 9 families. Of these, 4 genera and 28 species are endemic, representing a 11% rate of endemism at the generic level and a 44% rate of endemism at the species level. At least one undescribed species of endmic Zygoptera was collected during the present surveya.

3.) In the Gyrinidae (Coleoptera), 9 described species are now known, representing 2 genera in this family. Of these, 8 species are endemic, representing an 89% rate of endemism at the species level.

4.) In the Simuliidae (Diptera), 10 described species are now known, representing 2 genera in this family. Of these, 9 species are endemic, representing an 90% rate of endemism at the species level.

Overall, the current surveys resulted in the collection of at least 32 aquatic insect species new to science, many of them single island endemics. These new species include 31 Heteroptera, and 1 Odonata.

An analysis of species distributions within these freshwater groups revealed seven distinct areas of freshwater endemism within the Solomon Islands, with some of these areas containing distinctive subareas of endemism within them. These areas are as follows: 1.) Bougainville and the Shortland Islands; 2.) Choiseul and Santa Isabel, containing Choiseul and Santa Isabel as individual island subareas of endemism; 3.) The New Georgia Group, containing the four endemic subareas of Ranongga-Vella Lavella-Gizo, Kolombangara, New Georgia, and Rendova; 4.) Guadalcanal; 5.) Malaita; 6.) the Florida Group; 7.) Makira. All of these areas contain locally endemic freshwater species with circumscribed distributions.

Although the overall condition of freshwater ecosystems in the Solomon Islands region is excellent, there are still obvious threats to the biota, which tend to manifest themselves on local rather than regional scales. These threats may be grouped into three general categories: 1.) Physical alteration of habitat, particularly from logging and mining operations; 2.) Utilization of biotic resources, primarily by harvesting of fishes; and 3.) Invasive species, particularly the Little Fire Ant, *Wassmania aureopunctata*. Of these, logging and the spread of invasive ants in riparian zones represent by far the most pressing current threats to the integrity of Solomon Islands freshwater biotas.

INTRODUCTION

Effective conservation of regional biotas requires accurate information on the distribution, taxonomic composition, endemicity, and local richness of species assemblages across multiple geographic scales. This is especially true in the Melanesian region, which contains ten percent of the world's biota on its numerous islands which lie scattered across thousands of kilometers between Fiji and the Moluccas. Although certain important biotic components within this region, such as birds, have been reasonably surveyed, many others, particularly freshwater organisms, have remained poorly understood.

As one step in rectifying knowledge gaps regarding Melanesian freshwater organisms, a systematic survey program for freshwater fishes and invertebrates in the Solomon Islands was undertaken during 2004 and 2005, involving staff from five research organizations with long-standing interests in Melanesia: the Bishop Museum, the Smithsonian Institution, the Western Australian Museum, the University of the South Pacific (USP), and Conservation International. These surveys revealed previously unsuspected levels of species richness and endemism among certain groups of Solomon Islands freshwater organisms, particularly aquatic insects, and provided a much clearer understanding of the distribution and taxonomic composition of the Solomon Islands' freshwater biota as a whole.

The Solomons Islands consist of a set of large, mountainous, generally elongate islands lying in the southwest Pacific between the Bismarck Archipelago and eastern New Guinea on the west, and Vanuatu (formerly known as the New Hebrides) to the southeast. Politically, the Solomons chain is divided between Papua New Guinea (Buka and Bougainville) and the independent nation of the Solomon Islands (consisting of the remaining islands from the Shortland Islands to Makira, as well as the Santa Cruz Islands, the latter geologically part of the New Hebrides group). As tectonically (versus politically) defined, and for the purposes of this report, the Solomon Islands proper extend from Buka to Makira, a distance of approximately 1,450 km, spanning latitudes between 154°30'E and 162°30'E, and longitudes between 5°00'S and 10°55'S (Fig. 3, Table 1). The islands of the Solomons group form two parallel chains running from the northwest to the southeast, with the outermost, or northeastern, line of islands, consisting of Buka, Bougainville, Choiseul, Santa Isabel and Malaita, and the inner, or southwestern, line of islands consisting of the New Georgia group, Guadalcanal, and Makira. Scattered amid these two major chains are additional smaller high islands and low atolls, including the Shortland Islands, the Russell Islands, the Florida Group and Rennell Island.

TABLE 1. Geographic aspects of the larger Solomon Islands

Island Name	Lat/Long	Area (km^2)	Maximum Elevation (m)
Shortland Island	7.00°S 155.75°E	202	237
Vella Lavella	7.75°S 156.65°E	629	808
Ranongga	8.05°S 156.55°E	147	869
Kolumbangara	7.95°S 157.05°E	687	1,768
New Georgia	8.25°S 157.60°E	2,036	860
Rendova	8.55°S 157.30°E	411	1,060
Tetepare	8.75°S 157.55°E	118	420
Vangunu	8.60°S 158.00°E	509	1,082
Choiseul	7.10°S 159.95°E	2,970	1,067
Santa Isabel	8.00°S 159.10°E	3,664	1,219
Malaita	9.00°S 161.00°E	548	1,433
Maramasike	9.60°S 161.45°E	480	518
Guadalcanal	9.60°S 160.20°E	5,352	2,447
Rennell	11.65°S 160.20°E	660	154
Makira (San Cristobal)	10.60°S 161.85°E	3,190	1,250
Nendo (Ndeni)	10.75°S 166.00°E	505	549
Vanikolo	11.60°S 166.85°E	173	924

Figure 2. Coral coastline of northern Malaita near Lake Osi, 1 km. north of Auki (Station 59). Note the steep ridgelines dropping sharply to the sea, a geomorphology typical of the Solomon Islands.

The majority of the Solomon Islands have mountainous coasts that drop steeply to the sea (Fig. 2), with only a limited amount of fringing reef development. The major exception to this rule occurs in the New Georgia Group, where extensive shallow water platforms support complex patterns of fringing and patch reefs, particularly in the Roviana and Vonavona lagoons (Fig. 59). On the northern sides of New Georgia and Kolombangara, there is also an unusual pattern of fringing reef development, often involving several parallel reef ridges, some of which may be emergent and vegetated, lying offshore of and parallel to the coastline. All of the above features have allowed the development of complex and intricately juxtaposed shallow water and estuarine ecosystems in the New Georgia Group, which support many unique and endemic marine Heteroptera species.

Lying between 5° and 10° south of the equator, the Solomons have a warm, wet and humid tropical climate all year. Annual mean temperatures range from 26.5 °C. in Honiara to 26.2 °C. at Kirakira, and 27.2 °C at both Choiseul Bay and Munda. Mean annual precipitation is high, being 2154 mm at Honiara, 3552 mm at Munda, 3558 mm at Chioseul Bay, and 3601 mm at Kirakira. As a result of these high rainfall totals, coupled with the generally mountainous terrain of the archipelago, the Solomons contain thousands of perennial freshwater streams, as well as wide array of lacustrine and palustrine ecosystems.

Geologically, the Solomon Island archipelago is a double island arc system formed as the result of collision between the Pacific and Australian tectonic plates. In a broad tectonic sense, the Solomons represent part of an island arc system that was initiated in the Oligocene, which extends from New Guinea through the Solomons and Vanuatu to Fiji. The exact geological history of the Solomon sector is complicated, however, given that the chain formed in at least two stages (Coulson 1985; Petterson *et al*., 1999; Dickinson 2001; Hall, 2002). Subduction reversals occurred several times in the Solomon sector; in each case, subduction was terminated due to the intersection of the arc with either submarine flood basalts of the the Ontong Java Plateau (OJP) in the northeast, or the northern coastal terranes of New Guinea in the southwest, both of which were too massive and buoyant to be subducted. This led to alternating episodes of subduction in the northeast and southwest that from the Miocene onward which gradually consumed most of the backarc basin that had been formed behind the earliest, eastward migrating, Oligocene arc system.

In the Mid-Oligocene (ca. 40 Mya), the Pacific Plate was subducting beneath the Australian Plate, along what is termed the Vitiaz Trench, producing an eastward-migrating volcanic island arc over westward dipping subduction. Remnants of this older arc include Choiseul and Guadalcanal. This “Stage 1” volcanism ceased by the Mid-Miocene (ca. 20 Mya), as the OJP arrived at the subduction zone and jammed the trench, so that by 18 Mya the original subduction had largely ended. There was then reversal of subduction about the early Late Miocene (ca. 12 Mya), with the Australian Plate now beginning to plunge under the Pacific Plate. This event produced “Stage 2” volcanism, creating a second island arc, including the New Georgia and Russell groups, and resulting in the parallel chains of islands seen today. For more general details, see Polhemus (1996, 2007), and Hall (2002); the latter work contains a CD of animated reconstructions that are useful in comprehending the alternating subduction episodes.

The events outlined above were complex, and as a result the Solomon Islands have been previously divided into three geological provinces based on distinct paleogeology (e.g., Coulson 1985). In more recent years, using new data from the Deep Sea Drilling Program and other sources, these original three provinces have been reinterpreted to represent five distinct terranes, including some with islands that involve terranes derived from the OJP. Again, each of the five terrains has a complex history. Three of them contain Cretaceous rock units that probably represent the oldest arc rocks in the Solomons. The other two units are more recent, dating from only the last few million years. Of particular interest to geologists are the portions of the islands (Malaita, Santa Isabel) that apparently represent exposures of the OJP that have obducted (uplifted/overridden) onto the eastern portion of the Solomons chain and are now subaerially exposed, producing the potential for economically important mineralization. It is important to note that islands containing some of the oldest rocks may not have been the longest emergent: although both Santa Isabel and Malaita have basement rocks up to 120 My in age, they have apparently been emergent as subaerial islands for only 2–4 My, having appeared in the Pliocene. By contrast, the basement rocks of Choiseul and Guadalcanal are less than 100 My, but these islands have been emergent since at least the Miocene.

The five terranes now recognized in the Solomons are as follows:

1. *South Solomon Terrain* (Guadalcanal, Choiseul): These islands have Cretaceous (ca. 92 Mya) underpinnings, but also show Stage 1 volcanism (24 Mya). There is then evidence of subsidence and considerable sedimentation. Renewal of volcanic activity commenced at the Late Miocene/Pliocene (6.4 and 3-1 Mya) with the Stage 2 arc volcanism. Again, there is evidence for sedimentation. For Guadalcanal, Quaternary and Recent alluvial sediments were probably derived from material eroded off the volcanic northern part of the island associated with a marked uplift (> 2 km) of the south, commencing in the Pliocene (1.8 Mya). By the end of the Pleistocene (0.0115 Mya), Guadalcanal was essentially in its modern form. In general, there has probably been subaerial land in this position since the Miocene (ca. 6 Mya). Choiseul has thousands of meters of sediment over its basement rocks, but was probably emergent in early Mid-Miocene or later Mid-Miocene (ca. 20–12 Mya), as evidenced by fossil coral/algal reefs that fringed higher adjacent land; this would imply that the island is probably of similar age or a bit older than Guadalcanal with regard to its subaerial existence.

2. O*ntong Java Plateau Terrane* (Malaita, North Santa Isabel, Ulawa) – This terrane is of much interest to geologists and planetary scientists. The underpinning of this terrain is the OJP itself, formed far to the east in the Pacific. This Alaska-sized plateau is the largest such oceanic structure known on earth. Formed mainly during the Cretaceous, it has anomalously thick pelagic sediments, plus flood basalts, acquired during the Paleocene/Miocene. With approach of the OJP to the Solomon Islands from the Late Miocene to Recent, southern portions of the plateau have been obducted onto the archipelago. Malaita has Cretaceous base rock of 125–120 Mya overlain by deep sedimentary sequences that can clearly be equated to sequences in drill cores taken from the OJP proper. Unlike islands elsewhere in the Solomon Islands, Malaita has undergone little geochemical evolution. Uplifted and subaerial for some 4–2 Mya, it is heavily eroded. The majority of Santa Isabel is also of OJP origin and similar to

Malaita. Neither of these islands shows any indication of Solomon Island Arc volcanic activity. The island of Ulawa also belongs to this assemblage.

3. *Makira Terrain* (Makira) – This terrane consists solely of the island of Makira. This is a special case within the Solomon block, for while it shows OJP material dating back to 90 Mya, there is little or no pelagic sedimentation, as would be expected, suggesting deep erosion of a subaerial edifice. There is abundant evidence for what appears to be Stage 2 arc activity, but there are no volcanic structures preserved. The island has probably been subaerial since the late Pliocene (ca. 3 Mya).

4. *Central Solomon Terrain* (Florida Islands, south Santa Isabel, Shortland Islands) – This terrane is more recent and the underpinnings of the constituent islands date in large part from the Stage 1 arc magmatism. There are no dates for the Shortland Islands, but ages of 44 and 35 Mya are known for the Florida Islands. In general, the genesis stage was Eocene-Early Miocene (ca. 40–20 Mya), but the southern part of Santa Isabel has Paleocene-age (60–55 Mya) material. It has been suggested (Coulson 1985) that the Florida Islands were emergent in the Late Oligocene and Early Miocene (ca. 23–20 Mya), but then there was widespread sedimentation indicative of subsidence. Therefore, although the basement rocks of this terrane are relatively old, the Florida Islands probably only became subaerial again with the general uplift of the Solomon Islands from the Late Pliocene to Recent.

5. *New Georgia Terrain* (New Georgia Group, Russell Islands, Kavachi and Savo) – All of the islands comprising this terrane are volcanic, formed by Stage 2 arc activity. Exact dates are few, ranging from 4.5–1.4 Mya. These islands define when Stage 2 volcanism of the Solomon Arc commenced with the reversal of subduction involving the two tectonic plates. While it has been suggested that such reversal took place at 12 Mya, there is no evidence that volcanism commenced in the New Georgia Group earlier than the Late Miocene (ca. 8 Mya). The volume of the New Georgia volcanics is enormous, suggesting the presence of subaerial land in this group from the very Late Miocene (ca. 7 Mya) to Recent.

While the ages of some Solomon Islands are considerable, probably of more importance biogeographically is the major uplift that accompanied the Stage 2 arc activity and continued since the Late Pliocene. For example, in the New Georgia Islands, foraminifera indicate that there has been 2–3 km of post-Pliocene (>1.8 Mya) uplift. Similarly, for Guadalcanal there are Pleistocene (>1.6 Mya) coral limestones some 200 m above sea level and similar aged marine deposits at 800 m altitude. Also of possible biogeographic importance were ice ages over the last 500,000 yrs, when sea level depression reached up to 150 m below present (Rohling *et al.,* 1998). The 200-m bathymetric contour suggests that that Bougainville, Choiseul, Santa Isabel, and the Florida Islands were probably connected during the Pleistocene maxima, with only a narrow channel separating them from Guadalcanal. As a result, these islands share certain common freshwater faunal elements. The islands of the New Georgia Group, although of younger age, were similarly connected among themselves, and their freshwater faunas also share certain locally endemic elements.

The volcanically recent Santa Cruz Islands to the southeast, while politically of the Solomon Islands, are not strictly part of the Solomon terrains; rather, they are the northernmost extent of the New Hebrides Arc and are geologically related to the islands of Vanuatu.

The currently emergent islands in the Solomons chain mostly are elongate in shape (Fig. 3), with maximum elevations rising to near 1300 m (Table 1). The interior ridgelines are often remarkably uniform along their crests, and lack significant peaks or massifs. The exceptions to this rule are Guadalcanal and Bougainville, which rise to elevations in excess of 2000 m., and the islands of the New Georgia Group, which represent eroded volcanic craters and calderas. In terms of geomorphology, most of the islands in the Solomons consist of an outer band of limestone, representing uplifted fringing reef deposits, surrounding a core of volcanic or metamorphic rocks. In this regard they are similar to the islands of Vanuatu lying to the southeast, and to Woodlark Island in the Marshall Bennett group and Misima Island in the Louisiades, both of which lie well to the south. The similarity of all these islands in terms of their petrology indicates that similar large–scale processes in terms of both sea level fluctuation and regional tectonic evolution influenced their development during the Late Tertiary.

Due to their long geological history and diverse terrain, the Solomon Islands contain a wide array of freshwater and mixohaline ecosystems. These include rivers 30–40 km. in length on Bougainville, Choiseul, and Guadalcanal, and countless rocky upland streams on all the islands (Figs. 15–17, 19–25). Many of the larger streams and rivers terminate in elongate, horizontally stratified estuaries that form excellent nursery habitats for intinerant marine fishes and crustaceans, and also support unusual assemblages of neuston-dwelling aquatic Heteroptera. Certain parts of the Solomon Islands also contain extensive coastal lowlands that support a complex array of both limnetic and saline palustrine habitats, ranging from tall, closed-canopy freshwater swamp forests to florally diverse, mixohaline mangrove swamps. Lacustrine habitats are also present, including high elevation crater lakes on Bougainville and Rendova, lowland freshwater lakes on Bougainville and Malaita, and mixohaline lakes on Santa Ana Island. Although not part of the Solomon Islands geologically, the politically included Santa Cruz group possesses estuarine limnocrenes in coastal limestone exposures, similar to those seen in adjacent Vanuatu.

Previous collections of freshwater organisms in the Solomon Islands have been very limited. Prior to 1940, a few collections of aquatic insects were made by British entomologists associated with the colonial admnistration, notably R. A. Lever. The islands were a major theatre of conflict during World War II, with intense fighting occurring on Guadalcanal from August 1942 to February 1943, on New Georgia from June to August 1943, and on Bougainville from November 1943 to March 1944 (Bergerud, 1996). Even after the end of active conflict in the archipelago in mid-1944, the islands remained a significant staging area, and a certain number of biological collections were made by servicemen with interests in natural history, including A. B. Gurney. Following the war, the islands reverted to British control, with aquatic entomological collections being made by E. S. Brown, D. E. Kimmins, J. D. Bradley,

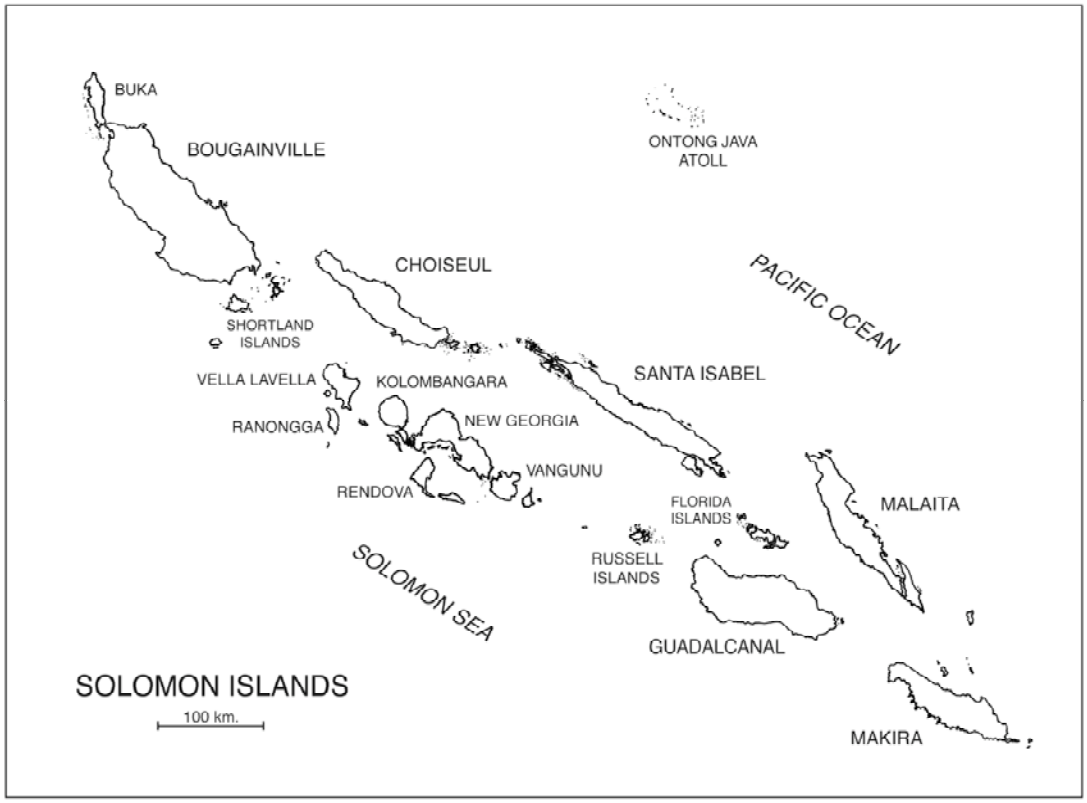

Figure 3. Map of the Solomon Islands, with major islands or island groups named.

M. Laird, and P. Greenslade, and by collectors from the Bishop Museum, including J. L. Gressitt, E. J. Ford, W. Brandt, and J. and M. Sedlacek. Portions of these entomological collections eventually went to the British Museum in London, or the Bishop Museum in Honolulu. Some limited work on the aquatic insects of Bougainville Island was also undertaken in the late 1980's as part of the environmental monitoring program for the copper mining operation on that island (Yule, 1996a; Yule, 1996b).

By contrast, the only previous publication on freshwater fishes of which we are aware is that of Gray (1974), a relatively superficial account treating 36 mainly brackish water species. Although this author provided a section on the methods that were used to catch the fishes, there was no mention of where the specimens were deposited. or even if they were actually preserved. The fisheries department in Honiara did maintain a collection of marine fishes through the 1990s, but this was largely neglected and destroyed during the social unrest of the early 2000s. As a result, until the recent research program, the Solomon Islands remained largely undersampled for freshwater organisms, and had never been subject to a comprehensive limnological survey.

METHODS

The major groups of organisms were used to prepare the current report were freshwater fishes (Figs. 27–36) and selected groups of aquatic insects, specifically Heteroptera (Figs. 53, 54), Odonata (Figs. 37–52), and certain aquatic Diptera (Simuliidae) and Coleoptera (Gyrinidae). All have diverse and regionally distinctive species radiations within Solomon Islands, and are typical components of aquatic community assemblages across a wide range of elevations. Since these groups have all had individual biogeographic histories in the region and have received differing degrees of attention by collectors, the distributions of their constituent species and the areas of endemism they occupy are not strictly congruent. Few of the groups utilized in this analysis contain species representatives in all of the areas of endemism defined below, while in other cases a single regionally endemic species may occur across several more localized areas of endemism within the archipelago. Even so, the observed patterns of distribution display remarkable similarity across the various groups studied, and indicate that the endemic areas they define are likely to pertain for the remaining elements of the island's aquatic biota.

Checklists of Solomon Islands taxa within these groups may be found in the Appendices 1–5. Specific collecting and analysis protocols for fishes and aquatic insects may be found in the sections dealing with those respective groups.

Fishes

Data for freshwater fishes has been derived primarily from the surveys associated with the present project. Interestingly, although freshwater fishes show notable local endemism on both New Guinea and Fiji, which bracket the Solomon Islands region to the west and southeast respectively, there were no locally endemic genera or species of freshwater fishes previously recorded from the Solomon archipelago, nor were any unequivocally discovered during the present surveys, although there is a possibility that a few of the sicydiine gobies collected may prove to be regionally endemic.

Aquatic insects

Although much additional work remains to be done, reliable distributional data is now emerging for certain groups of aquatic insects in the Solomon Islands. In part, this new understanding is built upon the historical collections of colonial period entomologists such as E. S. Brown, but largely it has been the result of recent surveys associated with the current project. Reasonable aquatic entomological survey data is now available for the islands of Guadalcanal, Malaita, Makira, Choiseul, Rendova, Ranongga, New Georgia, Gizo, Vella Lavella and Kolombangara, and preliminary surveys have also been conducted on Santa Isabel. This has been augmented by literature data for aquatic Heteroptera (Andersen, 1975, 1989a, 1989b; Baehr, 1990; Kormilev, 1971; Lansbury 1962, 1963,1968, 1993; Polhemus & Polhemus, 1993; Polhemus & Polhemus, 1996; Todd, 1959), Odonata

(Kimmins, 1957; Lieftinck 1963) certain aquatic Coleoptera (Brinck 1976; 1981) and certain aquatic Diptera (Craig, Englund, & Takaoka, 2006). Based on this analysis, groups that appear to show clear utility in establishing patterns of aquatic species endemism in the Solomon Islands include genera in the Heteroptera (*Metrobatopsis, Rhagovelia*), Odonata (*Teinobasis, Lieftinckia, Rhinocypha, Pseudagrion*), Coleoptera (*Callistodineutus*), and Diptera (*Morops, Simuliium*).

Figure 4. The research vessel Marlin 1, shown here at anchor at Mole harbor, on Choiseul. This vessel provided a floating base of operations for freshwater surveys in the western Solomon Islands in 2005 (see Fig. 7 for cruise track).

AQUATIC SAMPLING STATIONS IN THE SOLOMON ISLANDS

The localities listed are those visited during the course of this study between 11 November 2004 and 4 August 2005. Stations are numbered sequentially from November 2004 onward. Both freshwater fishes and aquatic insects were sampled at each station unless otherwise noted.

Locations of these sampling stations are shown in Figs. 5, 6, and 8–14. The numbers given on Fig. 6 correspond to the station numbering given below. The cruise track for the research vessel *Marlin 1*, which served as a floating base of operations during March 2005 (Fig. 4), is provided in Fig. 7. Photographs o
\f exemplar habitats are provided in Figs. 15–26.

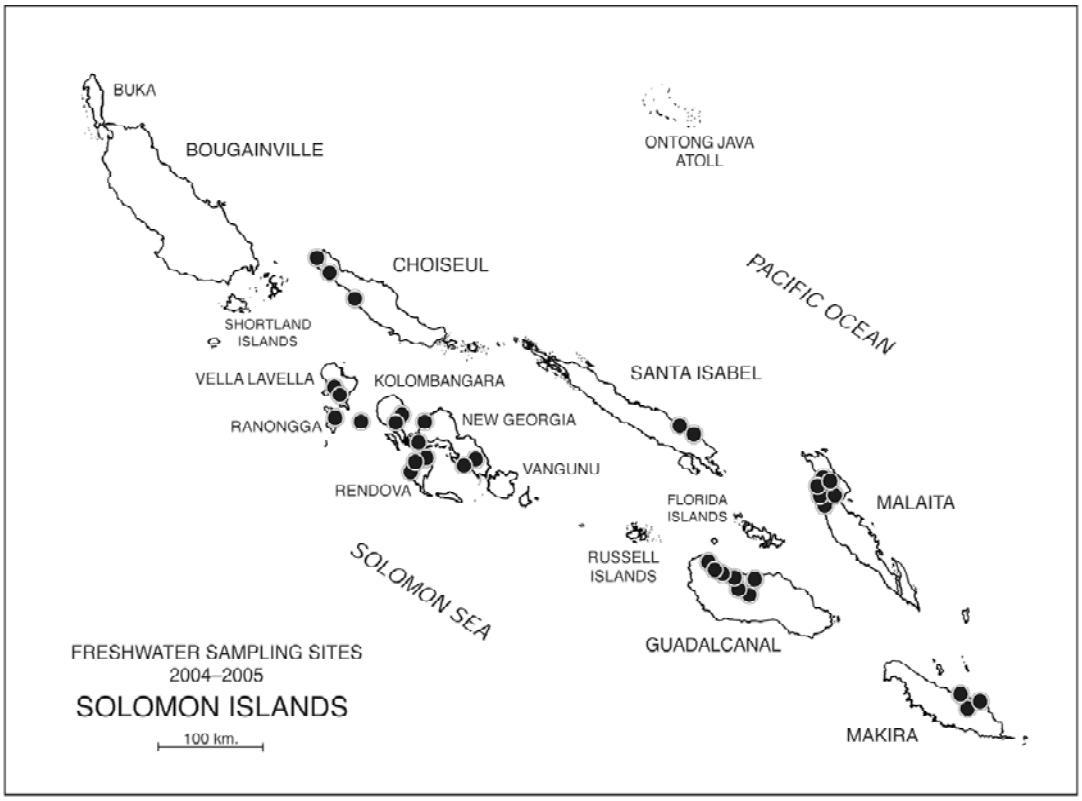

Figure 5. Freshwater sampling sites in the Solomon Islands from which collections were made during the course of this project.

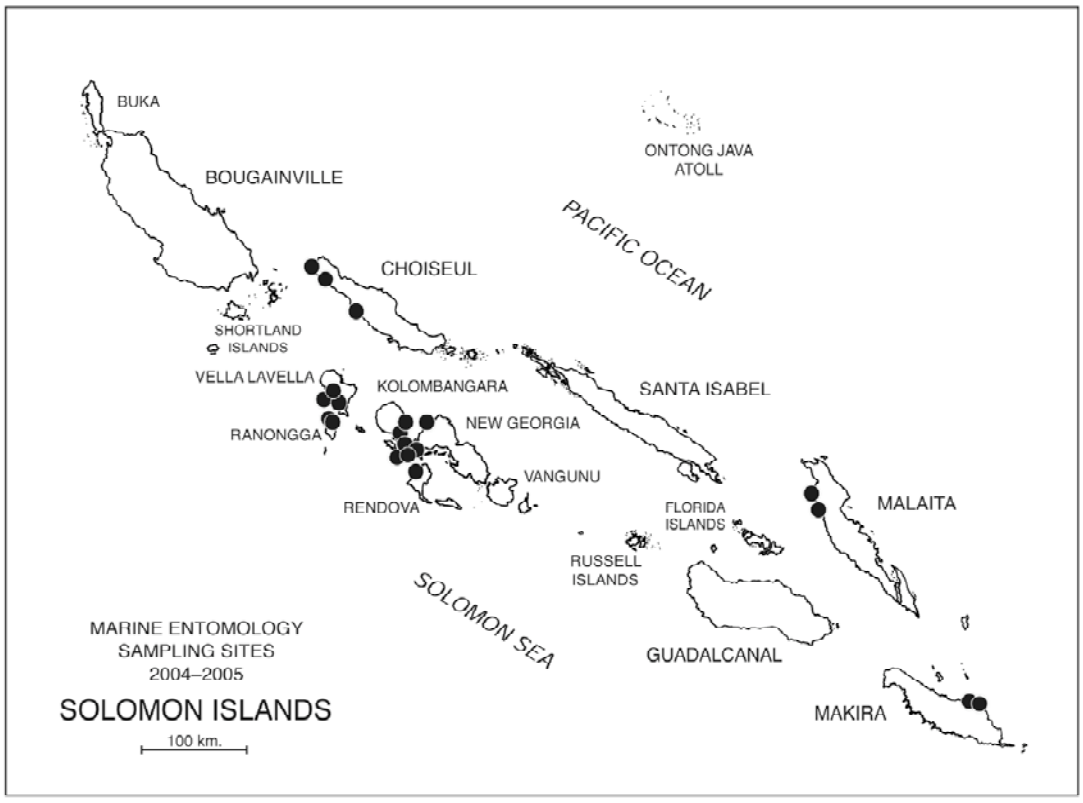

Figure 6. Estuarine sampling sites in the Solomon Islands from which collections were made during the course of this project.

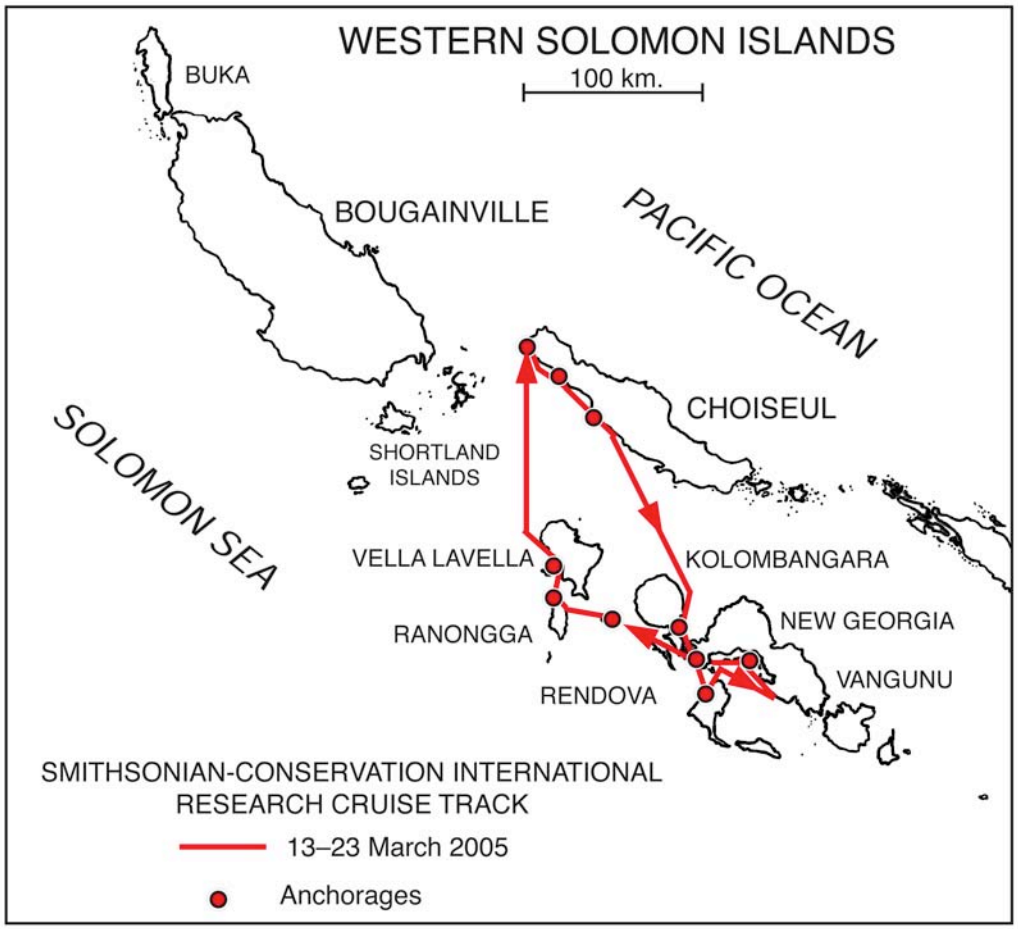

Fig. 7. Cruise track of the research vessel *Marlin 1* during the March 2005 surveys associated with this project.

Fig. 8 Location of sampling sites on the island of Ranongga.

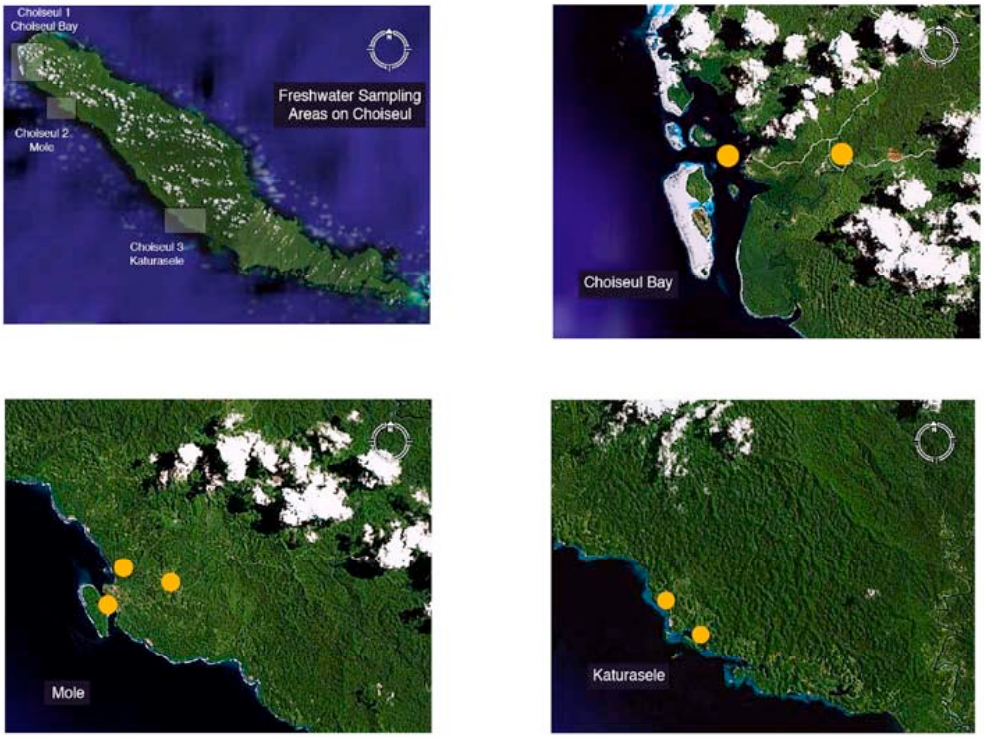

Fig. 9. Location of sampling sites on the island of Choiseul, showing general areas surveyed (upper left) and locations of individual sites within these areas.

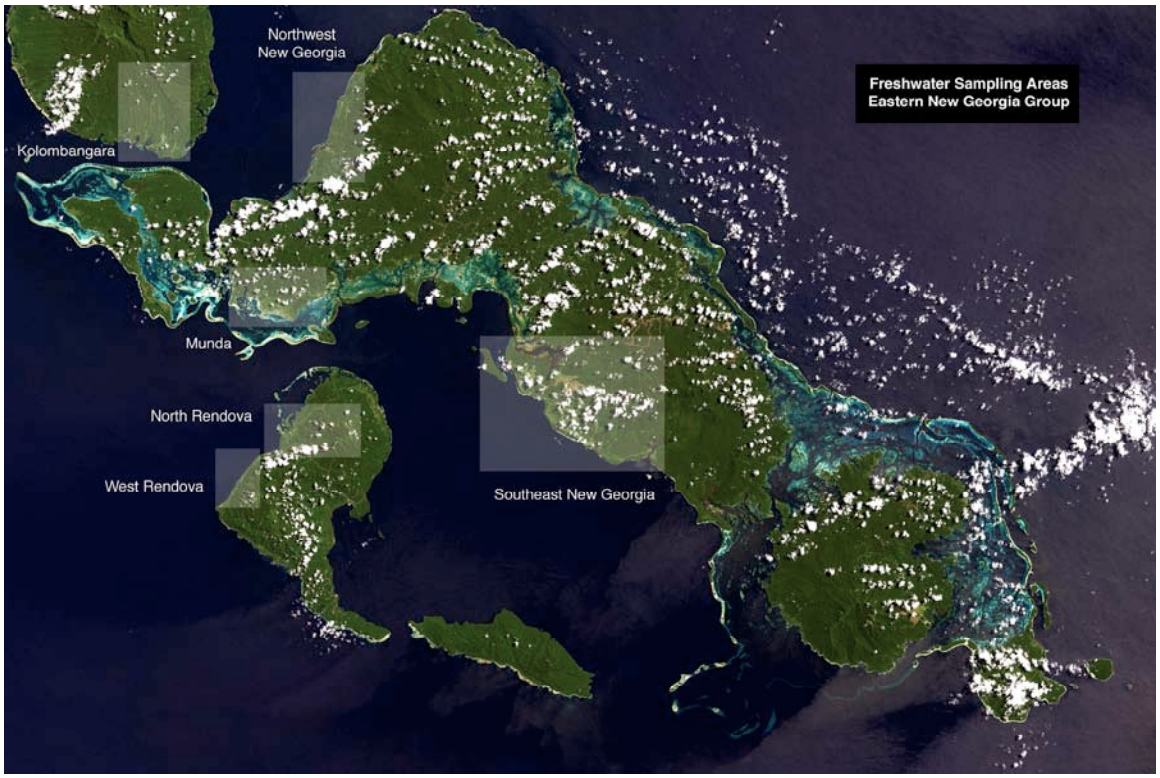

Fig. 10. Location of general areas surveyed on the islands of Kolombangara, Rendova and New Georgia.

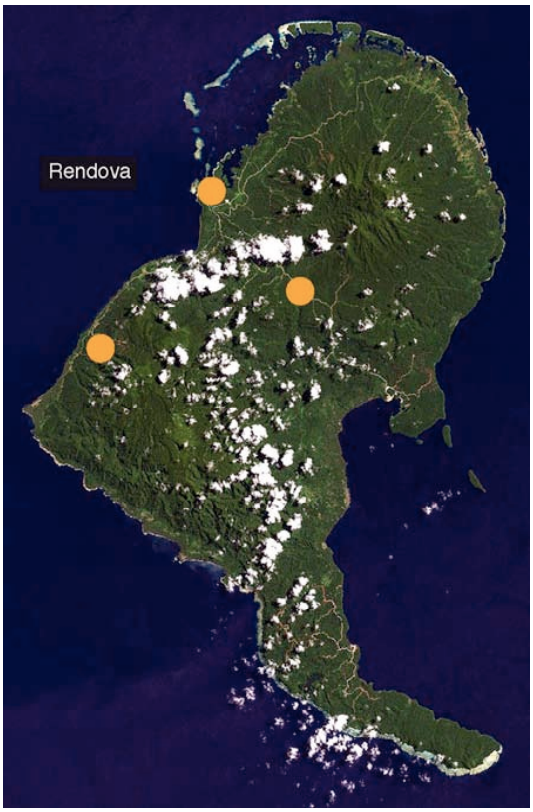

Fig. 11. Location of sampling sites on the island of Rendova.

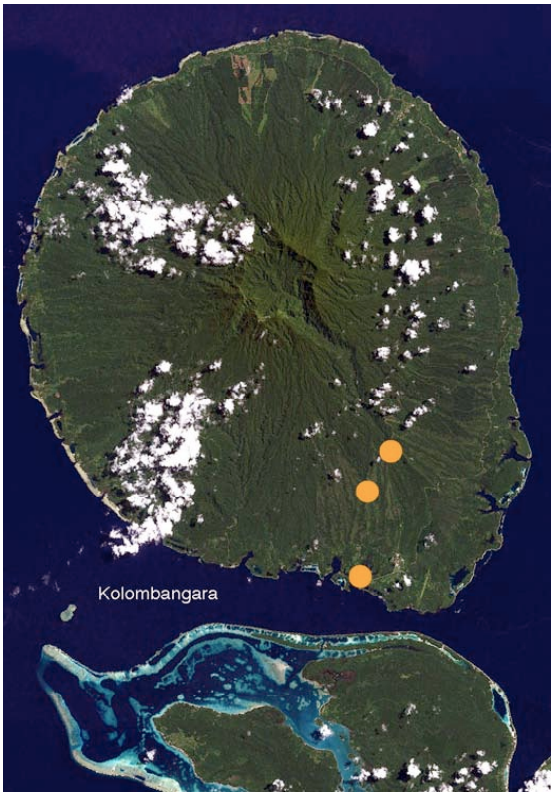

Fig. 12. Location of sampling sites on the island of Kolambangara.

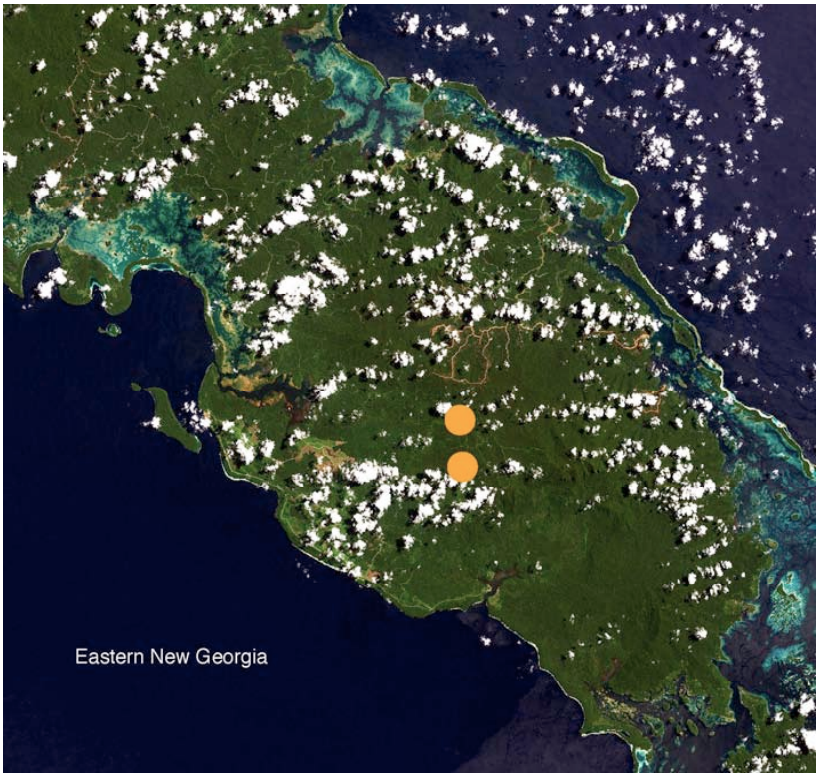

Fig. 13. Location of sampling sites on southeast New Georgia.

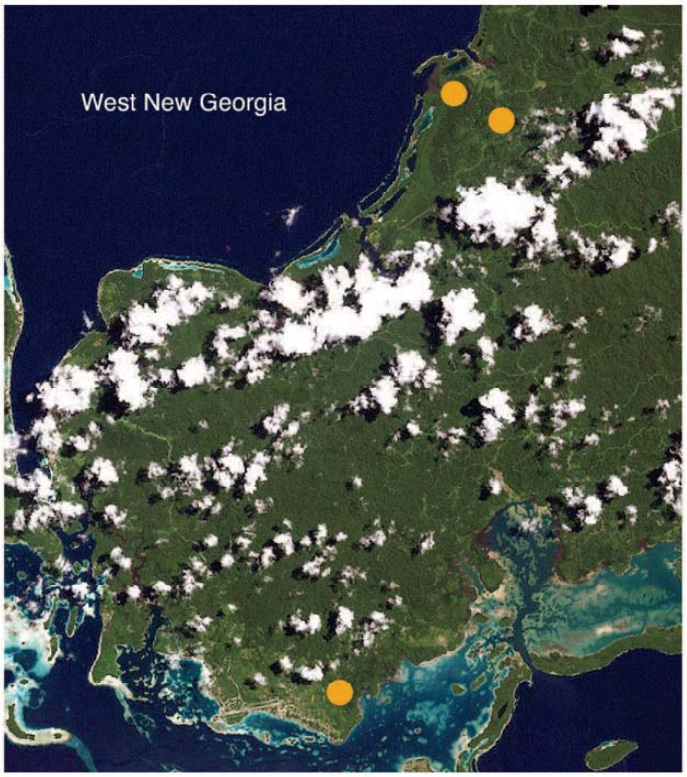

Fig. 14. Location of sampling sites on western New Georgia.

Sampling Station Locations

The following contains site locality information for all the stations sampled during this study from 2004–2005.

Locality information includes latitude and longitude (WGS 84 datum), elevation (m), and water temperature (°C.).

November 2004 Sampling Stations

Station 1: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Honiara, King Solomon Hotel swimming pool, 30 m., water temp. not taken, 11 November 2004, D. A. Polhemus and G. R. Allen, CL 7324.
9°25'58.1"S, 159°57'07.5"E

Station 2: SOLOMON ISLANDS, *Western Prov*., Vella Lavella, west coast, Oula River estuary, sea level, water temp. 26 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7325.
7°47'05.0"S, 156°37'06.2"E'

Station 2a: Lower estuary, water temp. 27.5 °C, salinity 5 ppt.
7°47'27.1"S, 156°36'25.9"E'

Station 2b: Middle estuary, water temp. 26 °C, salinity 3 ppt.
7°47'05.0"S, 156°37'06.2"E'

Station 2c: Upper estuary, water temp. 26 °C, salinity 1 ppt.
7°46'57.2"S, 156°37'21.7"E'

Station 3: SOLOMON ISLANDS, *Western Prov*., Vella Lavella, Oula River midreach and tribs., 0–20 m., water temp. 26 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7326.
7°47'32.6"S, 156°37'33.6"E

Station 3a: Head of tidal influence and south bank trib., water temp. 26 °C.
7°47'18.8"S, 156°37'32.9"E'

Station 3b: South bank trib. with ponded mouth, water temp. 26 °C.
7°47'32.6"S, 156°37'33.6"E'

Station 4: SOLOMON ISLANDS, *Western Prov*., Vella Lavella, SW coast, S. of Oula, sea level, sea temp. 30 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7327.
7°49'09.1"S, 156°36'07.1"E

Station 5: SOLOMON ISLANDS, *Western Prov*., Gizo Is., NE coast, 7 km. NW of Gizo, sea level, sea temp. 31 °C, salinity 35 ppt., 14–15 November 2004, D. A. Polhemus and G. R. Allen, CL 7328.
8°03'08.6"S, 156°48'30.1"E

Station 6: SOLOMON ISLANDS, *Western Prov*., Gizo Is., rocky streamlet in forest 1.5 km. W. of Gizo, 15 m., water temp. 26 °C, 15 November 2004, D. A. Polhemus and G. R. Allen, CL 7329.
8°06'09.7"S, 156°49'48.0"E

Station 7: SOLOMON ISLANDS, *Western Prov*., Gizo Is., abandoned water supply reservoirs 2 km. W. of Gizo, 25 m., water temp. 28 °C, 15 November 2004, D. A. Polhemus and G. R. Allen, CL 7330.
8°06'04.2"S, 156°49'35.0"E

Station 8: SOLOMON ISLANDS, *Western Prov*., Lola Is., Vonavona Lagoon, SW of Munda, north coast, sea level, sea temp. 31 °C, salinity 35 ppt., 16 November 2004, D. A. Polhemus and G. R. Allen, CL 7331.
8°18'30.0"S, 157°09'53.9"E

Station 9: SOLOMON ISLANDS, *Western Prov*., New Georgia, Pundokona River estuary, S. of Jericho, sea level, water temp. 26 °C, salinity 1–5 ppt., 17 November 2004, D. A. Polhemus and G. R. Allen, CL 7332.
8°08'58.4"S, 157°21'22.0"E'

Station 9a: Lower estuary, water temp. 26 °C, salinity 5 ppt.
8°07'58.5"S, 157°19'22.8"E'

Station 9b: Upper estuary, water temp. 26 °C, salinity 2 ppt.
8°08'58.4"S, 157°21'22.0"E'

Station 10: SOLOMON ISLANDS, *Western Prov*., New Georgia, Pundokona River and tribs., SE of Jericho, from head of estuary to first major confluence, 0–10 m., water temp. 26 °C, 17 November 2004, D. A. Polhemus and G. R. Allen, CL 7333.
8°09'04.7"S, 157°21'43.2"E (Fig. 20)

Station 10a: Head of tidal influence and shaded hill trib., water temp. 26 °C.
8°08'58.4"S, 157°21'22.0"E'

Station 10b: Long, pooled reach, water temp. 26 °C.
8°08'23.3"S, 157°21'20.1"E'

Station 10c: Swift rocky north bank trib., water temp. 26 °C.
8°09'04.7"S, 157°21'43.2"E'

Station 11: SOLOMON ISLANDS, *Western Prov*., New Georgia, Dadaloana River, NE of Munda, from road bridge upstream to first cave, 20 m., water temp. 26 °C, 18 November 2004, D. A. Polhemus and G. R. Allen, CL 7334.
8°18'17.1"S, 157°17'35.8"E

Station 12: SOLOMON ISLANDS, *Western Prov*., Rendova, Tovavo River, E. of Hopango, 0–25 m., water temp. 26 °C, 19 November 2004, D. A. Polhemus and G. R. Allen, CL 7335.
8°34'04.8"S, 157°12'39.8"E (Fig. 17)

Station 13: SOLOMON ISLANDS, *Western Prov*., Marakumbo Is., Vonavona Lagoon, SW of Munda, south coast and interior sinkhole, sea level, water temp. 30 °C (interior sinkhole), sea temp. 33 °C, 20 November 2004, D. A. Polhemus and G. R. Allen, CL 7336.
8°17'24.9"S, 157°09'31.1"E

Station 14: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Tenaru River at Tenaru Falls, 12 km. SE of Honiara, 40 m., water temp. 25 °C, 21 November 2004, D. A. Polhemus and G. R. Allen, CL 7337.
9°31'01.0"S, 160°00'59.5"E (Fig. 1)

Station 15: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Tinahulu River above Gold Ridge road bridge at Bemuta village, 24 km. ESE of Honiara, 35 m., water temp. 27 °C, 27 November 2004, D. A. Polhemus and G. R. Allen, CL 7338.
9°30'26.8"S, 160°09'20.3"E

March 2005 Sampling Stations

Station 16: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., Puepue River and cascading trib. (Tarihau Creek), 3 km. S. of Kirakira, 15–50 m., water temp. 26 °C, 10 March 2005, 09:30–14:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7373.
10°28'40.3"S, 161°55'33.3"E (Fig. 16)

Station 17: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., Tawaitara Creek, SE of Tawaitara, 3 km. S. of Kirakira, 30 m., water temp. 26 °C, 10 March 2005, J. T. Polhemus, CL 7374.
10°27'34.8"S, 161°56'37.0"E

Station 18: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., Tagataga Creek, upper Puepue River basin, 4 km. S. of Kirakira, 160–190 m., water temp. 26 °C, 11 March 2005, 11:30–14:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7375.
10°29'33.6"S, 161°55'58.5"E

Station 19: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., small swamp on ridge crest E. of Puepue River valley, SE of Kirakira, 250 m., water temp. 26 °C, 11 March 2005, 09:30–09:45 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7376.
10°28'30.8"S, 161°56'20.7"E

Station 20: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., rocky coast E. of Kirakira, sea level, sea temp. 85° F., tide pools 83° F., 11 March 2005, J. T. Polhemus, CL 7377.

Station 20a: Tawari Beach
10°27'29.9"S, 161°57'15.6"E

Station 20b: Wairake Beach
10°27'49.2"S, 161°57'25.4"E

Station 21: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., Naororo Beach, E. of Kirakira, sea level, sea temp. 83° F., 11 March 2005, 13:00–14:00 hrs., J. T. Polhemus, CL 7378.
10°27'55.3"S, 161°57'23.6"E

Station 22: SOLOMON ISLANDS, *Makira & Ulawa Prov*., Makira (San Christobal) Is., Waiana Kaurau Creek at Kaororo village, 10 m., water temp. 80° F., 11 March 2005, 14:00–15:00 hrs., J. T. Polhemus, CL 7379.
10°27'59.0"S, 161°57'20.2"E

Station 23: SOLOMON ISLANDS, *Western Prov*., Gizo Is., mangrove-lined bay on north coast, W. of Gizo, sea level, sea temp. 31 °C, salinity 36 ppt., 13 March 2005, 20:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7380.
8°02'41.1"S, 156°48'31.9"E

Station 24: SOLOMON ISLANDS, *Western Prov*., Ranongga Is., Paoroe Creek, above Boroi village, 50–70 m., water temp. 26 °C, 14 March 2005, 09:30–11:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7381.
8°04'59.7"S, 156°35'51.1"E

Station 25: SOLOMON ISLANDS, *Western Prov*., Ranongga Is., Kolomomola River, terminal reach from head of estuary to first major confluence, S. of Boroi village, 5–10 m., water temp. 27 °C, 14 March 2005, 12:00–14:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7382.
8°05'20.5"S, 156°35'55.8"E (Fig. 22)

Station 26: SOLOMON ISLANDS, *Western Prov*., Ranongga Is., Tutusú River, N. of Boroi village, 40 m., water temp. 28 °C, 14 March 2005, 14:30–15:30 hrs., D. A. Polhemus and R. Englund, CL 7383.
8°04'34.1"S, 156°35'52.4"E

Station 27: SOLOMON ISLANDS, *Western Prov*., Ranongga Is., Koriovuku harbor, nr. Buri village, sea level, sea temp. 31 °C, salinity 36 ppt., 14 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7384.
7°56'36.8"S, 156°32'44.1"E

Station 28: SOLOMON ISLANDS, *Western Prov*., Vella Lavella Is., Bainapo Kasi Creek, trib. to Sireri River, 5–15 m., water temp. 26 °C, 15 March 2005, 10:00–14:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 3855.
7°45'53.6"S, 156°36'17.0"E

Station 29: SOLOMON ISLANDS, *Western Prov*., Bagi Is. (W. of Vella Lavella), Singgataravana, sea level, sea temp. 31 °C, salinity 36 ppt., 15 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7386.
7°47'50.7"S, 156°32'138.9"E

Station 30: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., Sui River at Parasi Falls, 30–45 m., water temp. 26 °C, 16 March 2005, 13:30–16:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7387.
6°41'46.0"S, 156°26'28.3"E (Fig. 25)

Station 31: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., Choiseul Bay near Parama Island, sea level, sea temp. 31 °C, salinity 34 ppt., 16 March 2005, 19:30–23:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7388.
6°41'18.3"S, 156°24'20.0"E

Station 32: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., Vangamole River, 3 km. N. of Mole, 25 m., water temp. 28.5 °C, 17 March 2005, 11:30–14:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7389.
6°48'39.7"S, 156°32'42.9"E WP = SOL 11

Station 33: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., terminal reach of Muma River, NW of Mole, 3 m., water temp. 82° F., 17 March 2005, 12:00–15:00 hrs., G. R. Allen and J. T. Polhemus, CL 7390.
6°49'11.9"S, 156°31'48.0"E

Station 34: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., south coast, Mole harbor, sea level, sea temp. 31 °C, salinity 34 ppt., 17 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7391.
6°49'34.4"S, 156°31'12.9"E

Station 35: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., coastal springs and waterfalls at Katurasele, 0–30 m., water temp. 25 °C, 18 March 2005, 12:00–15:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7392.
7°10'51.7"S, 156°53'58.2"E (Fig. 24)

Station 36: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul Is., south coast, inlet 1 km. S. of Katurasele, sea level, sea temp. 28 °C, salinity 11 ppt., 18 March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7393.
7°12'02.9"S, 156°54'39.9"E

Station 37: SOLOMON ISLANDS, *Western Prov*., Kolombangara Is., rocky forest stream 5.5 km. N. of Ringgi harbor, 120 m., water temp. 26 °C, 19 March 2005, 13:00–16:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and J. T. Polhemus, CL 7394.
7°12'02.9"S, 156°54'39.9"E

Station 38: SOLOMON ISLANDS, *Western Prov*., Kolombangara Is., Ringgi harbor, sea level, sea temp. 29 °C, salinity 14 ppt., 19 March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7395.
8°07'14.2"S, 157°06'43.2"E

Station 39: SOLOMON ISLANDS, *Western Prov*., Kolombangara Is., mangrove shore on Tura Is., mouth of Ringgi harbor, sea level, sea temp. 29 °C, salinity 29 ppt., 20 March 2005, J. T. Polhemus, CL 7396.
8°07'34.0"S, 157°06'19.0"E

Station 40: SOLOMON ISLANDS, *Western Prov*., Kolombangara Is., Vila River, 8.5 km. N. of Ringgi harbor, 140–150 m., water temp. 24 °C, 20 March 2005, 10:00–13:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7397.
8°02'38.7"S, 157°07'16.1"E

Station 41: SOLOMON ISLANDS, *Western Prov*., Mbanga Is., western shore near Goldie College, sea level, sea temp. 31 °C, salinity 36 ppt., 20 March 2005, D. A. Polhemus, and J. T. Polhemus, CL 7398.
8°16'27.4"S, 157°12'36.1"E

Station 42: SOLOMON ISLANDS, *Western Prov*., Rendova Is., upper trib. to Toropi River at road crossing 5.5 km. SE of Kenole, 230–250 m., water temp. 26 °C, 21March 2005, 11:30–15:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D. Boseto, CL 7399.
8°30'30.0"S, 157°18'45.4"E

Station 43: SOLOMON ISLANDS, *Western Prov*., Rendova Is., west coast, Kenole harbor, sea level, sea temp. 30 °C, salinity 28 ppt., 21March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7400.
8°28'04.4"S, 157°16'45.6"E

Station 44: SOLOMON ISLANDS, *Western Prov*., New Georgia Is., upper Sakumbare River near former Sakumbare logging camp, 15.5 km. E. of Putagita harbor, 190 m., water temp. 26 °C, 22 March 2005, 11:00–15:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7401.
8°24'27.9"S, 157°41'34.2"E (Fig. 21)

Station 45: SOLOMON ISLANDS, *Western Prov*., New Georgia Is., forest streamlet crossing logging road, 12.5 km. E. of Putagita harbor, 180 m., water temp. 27 °C, 22 March 2005, 15:45–16:00 hrs., D. A. Polhemus, R. Englund, and J. T. Polhemus, CL 7402.
8°24'58.5"S, 157°39'52.9"E

July–August 2005 Sampling Stations

Station 46: SOLOMON ISLANDS, *Santa Isabel Prov*., above Buala town, Blahitada Stream and large waterfalls, above hydropower plant, 268-280 m, 22 July 2005, R.A. Englund and D. Boseto, CL 1RE.
08.15681°S, 159.59264°E WP = 202

Station 47: SOLOMON ISLANDS, *Santa Isabel Prov*., above Jejovo village, Boboro Stream, 107 m, 22 July 2005, R.A. Englund and D. Boseto. CL 2RE.
08.15248°S, 159.59975°E (Fig. 26)

Station 48: SOLOMON ISLANDS, *Santa Isabel Prov*., above Buala Town, Laticie River, 2-118 m, 23 July 2005, R.A. Englund and porters. CL 3RE.
08.14212°S, 159.58585°E

Station 48a: small tributary to Laticie River, 56-91 m
08.14350°S, 159.58498°E WP = 205

Station 49: SOLOMON ISLANDS, *Santa Isabel Prov*., Garana River, one hour boatride from Buala, 0-23 m, water temp. not taken, 24 July 2005, R.A. Englund and D. Boseto, CL 4RE. River mouth, O m.
08.06301°S, 159.47723°E (Fig. 23)

Station 49a: 24 m elevation, 1.97 km upstream from Garana River mouth
08.07131°S, 159.46126°E WP = 207

Station 50: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Lungga River at mouth of gorge, near proposed dam site , SW of Mt. Austen, 25 m. [80 ft.], water temp. 25.5 °C, 28 July 2005, 11:30–13:30 hrs., D. A. Polhemus, R. Englund, and D. Boseto, CL 7407.
9°23'44.3"S, 159°50'47.6"E

Station 51: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kwarea River at high bridge on road from Auki to Atori, 85 m., water temp. 25.5 °C, 29 July 2005, 13:30–16:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7408.
8°39'10.3"S, 160°45'33.5"E (Fig. 19)

Station 52: SOLOMON ISLANDS, *Malaita Prov*., Malaita, trib. to Kwarea River, E. of high bridge on road from Auki to Atori, 180 m., water temp. 25 °C, 29 July 2005, 16:15–16:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7409.
8°39'14.4"S, 160°45'50.1"E

Station 53: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kwaisale River at Kwaisale Falls, nr. Anomasu village on road from Auki to Atori, 48 road km. NE of Auki, 120–200 m., water temp. 25.5 °C, 30 July 2005, 11:30–14:00 hrs., D. A. Polhemus and R. Englund, CL 7410.
8°41'53.3"S, 160°49'39.7"E (see front cover)

Station 54: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Aluta River at bridge on road from Auki to Atori, 50 road km. NE of Auki, 75 m., water temp. 25.5 °C, 30 July 2005, 14:30–16:00 hrs., D. A. Polhemus and R. Englund, CL 7411.
8°41'46.5"S, 160°50'02.6"E

Station 55: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kapolo Creek (trib. to Koa River), 7.5 km. N. of Auki on road to Dala, 5 m., water temp. 25.5 °C, 31 July 2005, 09:00–10:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7412.
8°42'09.3"S, 160°41'58.7"E

Station 56: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Koa River, 9 km. N. of Auki on road to Dala, 10 m., water temp. 26 °C, 31 July 2005, 10:45–12:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7413.
8°41'25.1"S, 160°41'51.1"E

Station 57: SOLOMON ISLANDS, *Malaita Prov*., Malaita, pond in cattle pasture, 11 km. N. of Auki on road to Dala, 10 m., water temp. 31 °C, 31 July 2005, 13:00–14:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7414.
8°40'22.7"S, 160°40'56.9"E

Station 58: SOLOMON ISLANDS, *Malaita Prov*., Malaita, rocky limestone coast at end of airstrip at Gwaunaruu, 7 km. N. of Auki, sea level, sea temp. 31 °C, 31 July 2005, 15:00–15:30 hrs., D. A. Polhemus and R. Englund, CL 7415.
8°42'26.4"S, 160°40'47.8"E

Station 59: SOLOMON ISLANDS, *Malaita Prov*., Malaita, coast 1 km. NW of Auki, nr. Lake Osi, sea level, sea temp. 29.5 °C, 1 August 2005, 10:00–11:00 hrs., D. A. Polhemus, CL 7416.
8°46'23.6"S, 160°41'15.1"E (Fig. 2)

Station 60: SOLOMON ISLANDS, *Malaita Prov*., Malaita, mouth of Kelokwai Stream and adjacent coast, 2 km. NW of Auki, sea level, water temp. (stream) 28 °C, sea temp. 29 °C, 1 August 2005, 11:00–11:45 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7417.
8°44'35.9"S, 160°40'13.6"E (Fig. 18)

Station 61: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Sasaa River at road bridge, 6 km. SW of Cape Esperance, 31 km. NW of Honiara on coastal road, 5 m., water temp. 28 °C, 2 August 2005, 13:00–13:45 hrs., D. A. Polhemus, CL 7418.
9°17'23.2"S, 159°45'27.3"E

Station 62: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Ndoma River at road bridge, 25 km. NW of Honiara on coastal road, 5 m., water temp. 27.5 °C, 2 August 2005, 14:00–15:00 hrs., D. A. Polhemus, CL 7419.
9°19'16.7"S, 159°48'03.4"E

Station 63: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, roadside pond in forest, 21 km. NW of Honiara on coastal road, 5 m., water temp. 26.5 °C, 2 August 2005, 15:00–15:20 hrs., D. A. Polhemus, CL 7420.
9°20'20.9"S, 159°49'17.3"E

Station 64: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Charebuma River, above Gold Ridge mine, 390–460 m., water temp. 23.5 °C, 3 August 2005, 11:00–15:00 hrs., D. A. Polhemus, CL 7421.
9°35'39.8"S, 160°07'28.4"E (Fig. 15)

Station 60a: lower limit of reach sampled
9°35'39.8"S, 160°07'28.4"E

Station 60b: upper limit of reach sampled
9°36'00.1"S, 160°07'23.5"E

Station 65: SOLOMON ISLANDS, *Western Prov*., Piraka River, near Munda, large estuary, 0 m (from mouth to 750 m upstream), 4 August 2005, R. Englund.
8°16'43.2"S, 157°21'46.6"E

Station 5a: Tributary 2.4 km upstream of Piraka River mouth
8°15'41.7"S, 157°21'55.0"E

Station 66: SOLOMON ISLANDS, *Western Prov*., Rendova, Ugehele Village, Maradeva Stream (Ugehele water supply stream), 1.5 km from village (GPS reading taken on trail to stream due to thick vegetation at stream), 235-296 m, 6 August 2005, R. Englund
8°27'28.8"S, 157°23'16.3"E

Station 67: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul, river at Sene village, 3 m, 16 August 2005, D. Boseto
7°18'04.6"S, 157°05'57.3"E

Station 68: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul, Lumoto River, 23 m, 17 August 2005, D. Boseto
7°14'49.9"S, 157°07'12.6"E

Station 69: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul, Kolobangara River, 6 m, 25 August 2005, D. Boseto
6°59'05.6"S, 156°45'57.8"E

Station 70: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul, Bisilata Creek, 54 m, 25 August 2005, D. Boseto
6°59'23.6"S, 156°46'34.8"E

Figures 15–26: Photos of various collection sites sampled during this study.

Fig. 15. Charebuma River near the Gold Ridge mine, in the interior mountains of Guadalcanal (Station 64).

Fig. 16. Puepue River cutting through limestone exposures, 3 km. south of Kirakira, on Makira (Station 16).

Fig. 17. Tovavo River, east of Hopango village, on Rendova (Station12).

Fig. 18. Kelokwai Stream, near Lake Osi, 2 km. north of Auki on Malaita (Station 60)

Fig. 19. Midreach of the Kwarea River, at the high bridge on the road from Auki to Atori, in the interior mountains of Malaita (Station 51).

Fig. 20. Tributary to the Pundokona River, near Jericho on western New Georgia (Station 10).

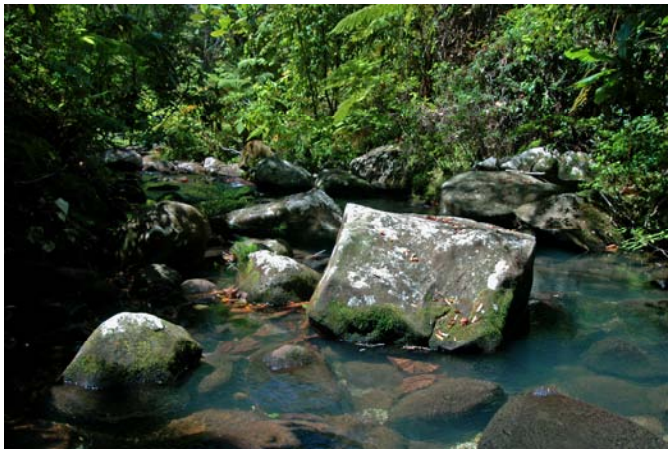

Fig. 21. Upper Sakumbare River, in the interior mountains of eastern New Georgia (Station 44).

Fig. 22. Kolomomola River above the head of its estuary, Ranongga (Station 25). Note the strong scouring of the channel from recent flooding.

Fig. 23. Terminal reach of the Garana River, Santa Isabel (Station 49). Note the low gradient and open, unshaded channel, in contrast to the high gradient, shaded channels of the rocky upland streams typical of mid- and headwater reaches in the Solomon Islands.

Fig. 24. Coastal springs and waterfalls emerging from limestone bluffs at Katurasele, western Choiseul (Station 35).

Fig. 25. Parasi Falls on the Sui River, western Choiseul (Station 30). The pool below the falls represents the upstream limit of migration for intinerant fishes such as *Kuhlia*.

Fig. 26. Fish survey crew at Boboro Stream above Jejovo village, 107 m, Santa Isabel (Station 47).

RESULTS

Freshwater Fishes of the Solomon Islands

Gerald R. Allen and David Boseto

Introduction

Freshwater fishes of the Solomon Islands were surveyed on two separate visits during 2004 and 2005. A total of 43 species belonging to 26 genera and 14 families were recorded. The fish fauna consists primarily of wide-ranging elements that are typical for insular areas of western Papua Province (Indonesia) and northern Papua New Guinea. The fauna is dominated by gobioid fishes (Rhyacichthidae, Eleotridae, and Gobiidae) that constitute approximately 60 percent of the overall total. No introduced fishes were observed or collected during the survey, but it is possible that tilapia, carp, and mosquitofishes are present at some locations.

The freshwater fish fauna of the New Guinea region was summarized by Allen (1991) who reported 330 species. Additional discoveries during the past decade have increased the total to approximately 385 species. The fauna consists mainly of marine-derived groups such as ariid and plotosid catfishes, atherinoids, terapontid grunters, and gobioids. It is further characterized by a high level of endemism (about 60 percent). About 35 species are shared with northern Australia, reflecting the historical land connection between these areas.

Much of the Melanesian region remains unsurveyed and basic faunal information is urgently required for conservation planning and management. In particular, there is very little information available on the faunal composition of fresh water aquatic systems in the archipelagoes lying east of New Guinea, including the Bismarcks, the Solomons, and Vanuatu. Consequently, the first author of this section, in cooperation with Dr. Dan Polhemus, embarked on a survey program approximately seven years ago. The main thrust of our field work until recently was focused at the extreme western and eastern ends of New Guinea, in the Raja Ampat Islands in Papua Province of Indonesia, and the major island groups of Milne Bay Province, Papua New Guinea. The present report presents the results of two short-term field surveys in the Solomon Islands including Makira, Guadalcanal, New Georgia, Rendova, Vella Lavella, Ranongga, Kolombangra, and Choiseul.

The only previous compilation of the freshwater fish fauna was that of Gray (1974), who listed 36 species from Guadalcanal. However, most of these were marine or estuarine forms that seldom penetrate far into fresh water. Therefore, the present study offered the first real opportunity to document fishes in the interior.

Methods

Fishes were observed and/or collected at six sites on Vella Lavella, New Georgia, Rendova, and Guadalcanal between 14–27 November 2004 (Table 2). A second visit between 10–22 March 2005 included Makira, Ranongga, Vella Lavella, Choiseul, Kolombangra, Rendova, and New Georgia (Table 3). Survey techniques consisted of underwater observations with mask and snorkel at each site, as well as the selective capture of specimens with small hand nets. Digital photographs of most species were obtained, utilizing a small field aquarium. In addition, photographs of fishes in their natural habitat were taken during the second visit with a Nikon D-100 SLR digital camera in an underwater housing. Finally, a third round of survey work was undertaken by one of us (DB) on Guadalcanal, Santa Isabel and Malaita in July and August of 2005 (Table 4).

The specimens collected will eventually be deposited at the Bishop Museum, Honolulu, Hawaii, USA and Western Australian Museum, Perth, Australia.

Results

A total of 43 species belonging to 26 genera and 14 families were recorded during the present surveys (Table 5). Although additional species can certainly be expected, the fauna is relatively impoverished compared to freshwater systems of mainland New Guinea. For example 100, 88, 55, and 49 species have been recorded from the Fly, Kikori, Sepik, and Ramu systems of Papua New Guinea respectively.

Unlike continental drainages, which typically contain species that spend their entire life cycle in fresh water, those inhabiting the Solomons and other Melanesian islands are forms that possess a pelagic larval stage, hence are widely dispersed. For example, many species have distributions that encompass most of Melanesia or range beyond this region to Australia and Indonesia.

The dominant element of the fauna consists of gobioid fishes, mainly members of Gobiidae and Eleotridae, plus a single representative of the Rhyacichthidae. Indeed, this assemblage accounts for about 60 percent of the overall fauna. Members of the gobiid subfamily Sicydiinae (containing *Lentipes*, *Sicyopterus*, *Sicyopus*, and *Stiphodon*) are especially prominent in clear, rocky streams, which constitute the dominant aquatic habitat in the interior of the islands. These fishes, commonly known as cling gobies, possess a peculiar “sucking disk”, a modification formed by the fused pelvic fins. This structure is used for clinging to rocks in fast-flowing streams. Apparently pelagic sicydiine larvae enter Solomon Island streams at periodic intervals in prodigious numbers and no doubt play an

integral role in the food web and overall stream ecology. Unfortunately, there is almost no reliable information about the details of such larval migrations in this archipelago.

Sicydiines are typically brightly colored, exhibiting neon shades of blue, gold, and red (Figs. 28, 31–36). This group includes many recent discoveries and the taxonomy is relatively unstable, particularly for the genus *Sicyopterus*. Although many sicydiines range widely throughout Melanesia (for example most member of the genera *Sicyopus* and *Stiphodon*), at least some members of the latter genus, plus *Sicyopterus* and *Lentipes,* have more restricted distributions. For example, the recently described *Lentipes venusta* Allen (2004) is thus far known only from the D'Entrecasteaux Islands in Milne Bay Province of Papua New Guinea. Indeed, the only potential new species that were collected during the present survey belong to *Lentipes* and *Sicyopterus*, and these are possibly the only endemic Solomon Islands freshwater fishes.

Most of the non-gobioid fishes are basically itinerant marine forms restricted to the lower reaches of freshwater streams, usually within about one kilometer of the sea. The first significant waterfall usually forms a barrier to their upstream dispersal, although we have found *Kuhlia* well into the interior of New Georgia, above substantial, boulder-strewn cascades (Fig. 21). Some of these fishes are of sufficient size to be of interest for the local subsistence fishery. For example, the Papuan Spot-tail Bass (*Lutjanus fuscescens*) attains a maximum total length of at least 100 cm, and is considered good eating (Fig. 63). Other reasonable sized fishes in this category include mullets (*Liza* spp.), trevallies (*Caranx* spp.), archerfish (*Toxotes jaculatrix*), and Mangrove Jack (*Lutjanus argentimaculatus).*

Table 2. Summary of fish-survey sites during 2004 visit

#	Date	Location	Island	Lat. (S)	Long. (E)	Alt.(m)
1	14/11/05	Oula River	Vella Lavella	7°47'32.6"S	156°37'33.6"E	0–20 m
2	14/11/05	Pundokona River	New Georgia	8°09'04.7"S	157°21'43.2"E	0-10 m
3	14/11/05	Dadaloana River	New Georgia	8°18'17.1"S	157°17'35.8"E	20-30
4	14/11/05	Tovavo River	Rendova	8°34'04.8"S	157°12'39.8"E	0-25
5	14/11/05	Tenaru River	Guadalcanal	9°31'01.0"S	160°00'59.5"E	40
6	14/11/05	Tinahulu River	Guadalcanal	9°30'26.8"S	160°09'20.3"E	35

Table 3. Summary of fish-survey sites during March 2005 visit

#	Date	Location	Island	Lat. (S)	Long. (E)	Alt.(m)
1	10/03/05	Tarithau Creek	Makira	10° 28'40.3"	161° 55'33.3"	18-70
2	11/03/05	Puepue River tributary	Makira	10° 29'33.6"	161° 55'58.5"	150
3	14/03/05	Paoroe Creek	Ranongga	8° 04'59.7"	156° 36'51.1"	30
4	14/03/05	Kolomomola River	Ranongga	8° 05'20.5"	156° 35'55.8"	2-10
5	15/03/05	Bainapo Kasi Creek	Vella Lavella	7° 45'53.6"	156° 36'17.0"	15
6	16/03/05	Parasi Falls, Sui River	Choiseul	6° 41'46.0"	156° 26'28.3"	5-20
7	17/03/05	Muma River	Choiseul	6° 49'11.9"	156° 31'48.0"	2-15
8	18/03/05	Voa Creek	Choiseul	7° 10'51.7"	156° 53'58.2"	5-20
9	19/03/05	Small forest creek	Kolombangra	8° 04'20.6"	157° 07'11.9"	150
10	20/03/05	Vila River	Kolombangra	8° 02'38.7"	157° 07'16.1"	140
11	21/03/05	Upper Toropi River	Rendova	8° 30'30.0"	157° 18'45.4"	230
12	22/03/05	Sakumbare River	New Georgia	8° 24'27.9"	157° 41'34.2"	190

Table 4. Summary of fish-survey sites during July–August 2005 visit

#	Date	Location	Island	Lat. (S)	Long. (E)
1	22 July 2005	Blahitada Creek	Santa Isabel	08. 15681	159.59264
2	23/07/05	Laticie River	Santa Isabel	08. 14350	159.58498
3	24/07/05	Garana River	Santa Isabel	08.06301	159.47723
4	27/07/05	Charovuga River	Guadalcanal	09.59441	160.12483
5	28/07/05	Upper Lunga River	Guadalcanal	09.50158	159.98746
6	29/07/05	Kwarea River	Malaita	08.65320	160.75999
7	30/07/05	Kwaisale falls	Malaita	08.69787	160.82784
8	30/07/05	Aluta River	Malaita	08.41465	160.50026
9	31/07/05	Kapolo Creek	Malaita	08.70313	160.69937
10	31/07/05	Koa River	Malaita	08.69019	160.69768
11	31/07/05	Fiu River	Malaita	08.72430	160.70433
12	1/08/05	Osi Lake	Malaita	08.76927	160.68855
13	1/08/05	Kelokwai River	Malaita	08.74390	160.67143

Table 5. Summary list of species recorded during preliminary survey of Solomon Islands in November 2004 and March 2005 (Gu = Guadalcanal; Ve = Vella Lavella; Re = Rendova; NG = New Georgia; Ra = Ranongga; Ko = Kolombangra; Ch = Choiseul; Ma = Makira). Author names and date of publication are omitted, but are readily available on the California Academy of Sciences website at: http://www.calacademy.org/research/ichthyology/catalog/fishcatsearch.html

Family/Species	**Gu**	**Ve**	**Re**	**NG**	**Ra**	**Ko**	**Ch**	**Ma**
Anguillidae								X
Anguilla marmorata							X	
Muraenidae								
Gymnothorax polyuranodon							X	
Mugilidae								
Liza vaigiensis							X	
Hemiramphidae								
Zenarchopterus dispar							X	
Syngnathidae								
Microphis brachyurus		X					X	
Microphis leiaspis	X	X	X	X				
Microphis retzi							X	
Ambassidae								
Ambassis interrupta		X						
Ambassis miops		X		X	X		X	
Kuhliidae								
Kuhlia marginata		X	X	X	X	X	X	X
Kuhlia rupestris		X	X	X	X	X	X	X
Terapontidae								
Mesopristes argenteus		X	X	X	X			
Mesopristes cancellatus						X		X
Carangidae								
Caranx papuensis					X		X	
Lutjanidae								
Lutjanus argentimaculatus		X						
Lutjanus fuscescens				X	X			
Toxotidae								
Toxotes jaculatrix				X			X	

Table 5 (continued). Summary list of species recorded during preliminary survey of Solomon Islands in November 2004 and March 2005 (Gu = Guadalcanal; Ve = Vella Lavella; Re = Rendova; NG = New Georgia; Ra = Ranongga; Ko = Kolombangra; Ch = Choiseul; Ma = Makira).

Family/Species	Gu	Ve	Re	NG	Ra	Ko	Ch	Ma
Rhyacichthyidae								
Rhyacichthys aspro	X			X	X		X	
Eleotridae								
Belobranchus belobranchus	X		X	X				
Butis amboinenis		X						
Eleotris fusca		X			X		X	X
Hypseleotris sp.		X		X			X	
Ophieleotris hoedti		X	X	X	X	X	X	X
Gobiidae								
Awaous sp.	X	X	X	X	X	X	X	X
Glossogobius sp. 1		X	X	X	X	X	X	
Glossogobius sp. 2					X			
Lentipes multiradiatus								X
Lentipes sp.			X					
Redigobius bikolanus		X						
Redigobius leptochilus			X					
Schismatogobius marmoratus	X	X		X	X		X	
Sicyopterus lagocephalus			X	X	X	X	X	
Sicyopterus longifilis?	X		X	X			X	
Sicyopterus sp. 1						X		
Sicyopterus sp. 2						X		
Sicyopus discordipinnis			X	X		X		
Sicyopus mystax			X	X		X	X	X
Sicyopus zosterophorum			X	X		X		
Stenogobius hoesei			X	X			X	
Stiphodon atratus		X	X	X		X	X	
Stiphodon birdsong			X			X	X	X
Stiphodon rutilaureus			X		X		X	X
Stiphodon semoni	X		X			X		
TOTAL SPECIES	**7**	**17**	**19**	**21**	**15**	**15**	**25**	**11**

Community composition can be assessed by making reference to the following station tables which provide examples of fish species assemblages at various sites on Santa Isabel, Malaita, and Guadalcanal sampled by David Boseto in July and August 2005. They can be directly compared with similar tables regarding aquatic insect community composition included in the section under Aquatic Insects in order to assess the overall faunal breadth at particular sampling sites.

A quick examination of these tables will reveal that *Kuhlia marginata* and *K. rupestris* are ubiquitous and abundant in lotic habitats throughout the Solomon Islands at elevations below 100 meters. *Ambassis miops* is also uniformly abundant in stream terminal reaches, where the species occurs in schools.

Station 46: SOLOMON ISLANDS, *Santa Isabel Prov*., above Buala town, Blahitada Stream and large waterfalls, above hydropower plant, 268-280 m, 22 July 2005, R.A. Englund and D. Boseto, CL 1RE.
08.15681°S, 159.59264°E

PERCIFORMES

Gobiidae

Sicyopus sp. (1 collected)

Fish were scarce at this site which consisted of rocky limestone stream bed with occasional pools (to 1.5 m depth). One specimen of *Sicyopus* sp. was collected from a base of 30 m high waterfall and a total of seven S*icyopus* sp. were observed from three different pools below the waterfall. The stream flowed rapidly through tropical rainforest with pools, plunge pools, side pools, riffles, cascades and waterfalls. The stream had a gravel, cobble, boulder, and rock bottom, and the water was slightly turbid.

Station 48: SOLOMON ISLANDS, *Santa Isabel Prov*., above Buala Town, Laticie River, 2-118 m, 23 July 2005, R.A. Englund and porters. CL 3RE.
08.14212°S, 159.58585°E

PERCIFORMES

Anguillidae

Anguilla marmorata (1 collected/after ID, Silas Chekana ate it)

Gobiidae

Lentipes multiradiatus (1 collected)

Sicyopterus lagocephalus (1 collected)

This station was located at a 120 m high impassible waterfall. This moderately sized stream flowed through heavily shading tropical rainforest with high gradient riffles, cascades and waterfalls interspersed between pools, side pools, and plunge pools. Substreate was gravel, cobble, boulder, and rocky bottom. Due to heavy rains, the water was slightly turbid.

Station 49: SOLOMON ISLANDS, *Santa Isabel Prov*., Garana River, one hour boatride from Buala, 0–23 m, water temp. not taken, 24 July 2005, R.A. Englund and D. Boseto, CL 4RE. River mouth, 0 m.
08.06301°S, 159.47723°E

PERCIFORMES

Anguillidae

Anguilla marmorata (1 observed)

Apogonidae

Apogon sp (2 observed)

Carangidae

Caranx sexfasciatus (observed)

Chandidae

Ambassis miops (abundant in school at the lower river/3 collected)

Eleotridae

Butis butis (4 collected)

Eleotris fusca (1 collected)

Ophieleotris hoedti (observed)

Gobiidae

Glossogobius sp. (6 collected)

Redigobius sp. (2 collected)

Sicyopterus lagocephalus (observed)

Sicyopterus sp. B (observed)

Stenogobius sp. (5 collected)

Stiphodon rutilaureus (4 collected)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Lutjanidae

Lutjanus fuscescens (observed)

Scatophagidae

Scatophagus argus (1 collected)

Terapontidae

Mesopristes argenteus (1 collected)

Terapon jarbua (10 observed)

A tropical rainforest river flowing rapidly over riffles, with a gravel, cobble, rock and boulder bottom. Water slightly turbid (Fig. 23).

Station 50: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Lungga River at mouth of gorge, near proposed dam site , SW of Mt. Austen, 25 m. [80 ft.], water temp. 25.5 °C, 28 July 2005, 11:30–13:30 hrs., D. A. Polhemus, R. Englund, and D. Boseto, CL 7407.
9°23'44.3"S, 159°50'47.6"E

PERCIFORMES

Gobiidae

Glossogobius sp. (observed)

Sicyopus zosterophorum (observed)

Stiphodon rutilaureus (observed/Common along the stream edge)

Stiphodon semoni (observed male/female)

A tropical rainforest river with flowing pools, plunge pools, side pools, riffles, cascades and waterfalls. Substrate consisted of gravel, cobble, boulder, and rock. Water slightly turbid.

Station 51: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kwarea River at high bridge, road from Auki to Atori, 85 m., water temp. 25.5 °C, 29 July 2005, 13:30–16:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7408.
8°39'10.3"S, 160°45'33.5"E

PERCIFORMES

Gobiidae

Glossogobius sp. (observed)

Sicyopterus lagocephalus (observed)

Sicyopterus sp. A. (observed)

Stiphodon rutilaureus (2 collected)

Stiphodon semoni (observed male/female)

Redigobius sp. (observed)

Rhycichthys aspro (observed)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Syngnathidae

Microphis sp. A (1 collected)

Microphis sp. B (2 collected)

Terapontidae

Mesopristes argenteus (1 collected)

A swift upland river with flowing pools, plunge pools, side pools, riffles, cascades and waterfalls. Substrate consisting of gravel, cobble, boulder, and rock. Water slightly turbid (Fig. 19).

Station 53: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kwaisale River at Kwaisale Falls, nr. Anomasu village on road from Auki to Atori, 48 road km. NE of Auki, 120–200 m., water temp. 25.5 °C, 30 July 2005, 11:30–14:00 hrs., D. A. Polhemus and R. Englund, CL 7410.
8°41'53.3"S, 160°49'39.7"E

PERCIFORMES

Gobiidae

Glossogobius sp. (observed)

Sicyopterus lagocephalus (observed)

Stiphodon rutilaureus (observed)

A swift upland river with flowing pools, plunge pools, side pools, riffles, cascades and waterfalls. Did not catch any fish at the second and third waterfall, but observed *Stiphodon rutilaureus* above the 2nd and 3rd waterfall. Gravel, cobble, boulder, and rock bottom. Water slightly turbid (see cover photo).

Station 54: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Aluta River at bridge on road from Auki to Atori, 50 road km. NE of Auki, 75 m., water temp. 25.5 °C, 30 July 2005, 14:30–16:00 hrs., D. A. Polhemus and R. Englund, CL 7411.
8°41'46.5"S, 160°50'02.6"E

PERCIFORMES

Gobiidae

Sicyopterus lagocephalus (observed)

Stiphodon rutilaureus (observed)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Terapontidae

Mesopristes cancellatus (1 collected)

Rhyacichthidae

Rhyacichthys aspro (1 collected)

A low land tropical rainforest river flowing rapidly through pools, plunge pools, side pools, riffles, cascades and waterfalls. Gravel, cobble, boulder, and rock bottom. Water slightly turbid.

Station 55: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Kapolo Creek (trib. to Koa River), 7.5 km. N. of Auki on road to Dala, 5 m., water temp. 25.5 °C, 31 July 2005, 09:00–10:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7412.
8°42'09.3"S, 160°41'58.7"E

PERCIFORMES

Anguillidae

Anguilla marmorata (1 collected)

Chandidae

Ambassis miops (observed)

Eleotridae

Butis butis (3 collected)

Eleotris fusca (8 collected)

Hypseleotris sp. (3 collected)

Ophieleotris hoedti (2 collected)

Gobiidae

Glossogobius sp. (observed)

Redigobius sp. (2 collected)

Stenogobius sp. (1 collected)

Stiphodon rutilaureus (1 collected)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Syngnathidae

Microphis sp. B (6 collected)

A small creek near the coast, lying at 3 m above sea level, and covered with coastal plants. Gravel and sand in the center with muddy substrate and overhanging shrubs on the sides of the creek. Water very clear.

Station 56: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Koa River, 9 km. N. of Auki on road to Dala, 10 m., water temp. 26 °C, 31 July 2005, 10:45–12:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7413.
8°41'25.1"S, 160°41'51.1"E

PERCIFORMES

Chandidae

Ambassis miops (observed)

Eleotridae

Station 56 (cont.)

Butis butis (1 collected)

Gobiidae

Glossogobius sp. (Observed)

Redigobius sp. (1 collected)

Stenogobius sp. (1 collected)

Stiphodon rutilaureus (2 collected)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Syngnathidae

Microphis sp. A (3 collected)

A coastal river at 5 m. above sea level, flowing through coastal vegetation. Gravel, cobble and lime rocks. Water clear.

Station 57: SOLOMON ISLANDS, *Malaita Prov*., Malaita, Fiu River, 11 km. N. of Auki on road to Dala, 10 m., water 31 July 2005, 13:00–14:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7414.
8°40'22.7"S, 160°40'56.9"E

PERCIFORMES

Gobiidae

Awaous sp. (observed)

Glossogobius sp. (observed)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Syngnathidae

Microphis sp. A (observed)

A station lying at 3m above sea level. Surveyed under and below the bridge. Gravel and sand bottom. Water clear.

Station 59: SOLOMON ISLANDS, *Malaita Prov*., Malaita, south end of Lake Osi and outflow creed, sea level, 1 August 2005, 10:00–11:00 hrs., D. A. Polhemus, CL 7416.
8°46'23.6"S, 160°41'15.1"E

PERCIFORMES

Chandidae

Ambassis miops (observed/abundant in schools on the lake edge)

Gobiidae

Glossogobius sp. (observed)

Redigobius sp. (1 collected)

Kuhlidae

Kuhlia marginata (observed)

Kuhlia rupestris (observed)

Lutjanidae

Lutjanus argentimaculatus (caught by local fishermen in the lake)

A station lying at 2 m above sea level. Surveyed the southern end of the lake. Water lilies covered the surface. On the sides are wetlands with vegetation dominated by pandanas. Gravel and sand bottom. Water clear.

Station 60: SOLOMON ISLANDS, *Malaita Prov*., Malaita, mouth of Kelokwai Stream and adjacent coast, 2 km. NW of Auki, sea level, water temp. (stream) 28 °C, sea temp. 29 °C, 1 August 2005, 11:00–11:45 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7417.
8°44'35.9"S, 160°40'13.6"E

PERCIFORMES

Chandidae

Ambassis miops (observed/abundant in schools along the river)

Eleotridae

Hypseleotris sp. (1 collected)

Gobiidae

Awaous guamensis (observed)

Glossogobius sp. (observed)

Redigobius sp. (2 collected)

Stenogobius sp. (observed)

Stiphodon rutilaureus (1 collected)

Kuhlidae

Kuhlia marginata (observed)

Station 60 (cont.)

Kuhlia rupestris (observed)

Terapontidae

Mesopristes argenteus (observed)

Mesopristes cancellatus (observed)

A station lying at 1 m above sea level. Surveyed near the bridge. Coastal vegetation. Gravel and sand bottom. Water clear (Station 18).

Station 64: SOLOMON ISLANDS, *Guadalcanal Prov*., Guadalcanal, Charebuma River, above Gold Ridge mine, 400–480 m., R.A. Englund and D. Boseto.

PERCIFORMES

Gobiidae

Sicyopus zosterophorum (1 male and 1 female collected/common upstream)

Sicyopus discordipinnis (observed)

Sicyopterus lagocephalus (observed/common upstream)

Stiphodon semoni (1 female collected/common in the stream)

Rhyacichthidae

Rhyacichthys aspro (observed)

A swift upland rainforest stream with flowing pools, plunge pools, side pools, riffles and cascades. Substrate consisted of gravel, cobble, boulder, and bedrock. The stream was covered with sediments as a result of gold digging in the stream by the villagers (Fig. 15).

Discussion

Although more surveys are required, the Solomon Islands appear to possess a relatively impoverished freshwater fish fauna, which is typical of Melanesian islands beyond New Guinea. The Solomons are slightly less speciose compared to other areas in the region that were recently surveyed by the first author. For example, the following insular locations have yielded the these results (number of species indicated in parentheses): Milne Bay islands, Papua New Guinea (56), Yapen Island, Papua Province (48), and Raja Ampat Islands, Papua Province (57). Faunal continuity between the various areas is relatively high due to pelagic larval dispersal as discussed above. For example, only 14.6 percent, or six species, are unique to the Solomons when its fauna is compared with that of the combined Milne Bay and Raja Ampat islands. Only 3 of the 6 species, the potentially new *Lentipes* and 2 *Sicyopterus* mentioned above, appear to be genuinely unique. The other 3 species are widespread forms that have been reported from other areas.

Distance plays an obvious role in the similarities between the fish faunas of different locations in Melanesia. For example, about 75 percent of Solomon Islands fishes are also present at the Milne Bay islands, compared with about 47 percent at the Raja Ampat Group. The latter area is separated by a distance of 2,900 km, compared to only 400 km between the Solomon Islands and Woodlark Island in Milne Bay Province.

Although the fish fauna of the Solomon Islands is composed mainly of species that range widely in the Melanesian Archipelago and beyond, there is a critical need to preserve the unique faunal "mix" of the islands. Aquatic habitats are definitely under threat, particularly from logging of native forests and so-called "environmentally friendly" sustainable tree farms. Both of these activities drastically alter the delicate ecological balance of freshwater systems. During our visits, we witnessed several graphic examples of streams that have been grossly disturbed by logging and tree farming. Stream faunas in these areas are conspicuous by the lack or scarcity of sicydiine gobies, which seem to be a good indicator of healthy environmental conditions. Fortunately, there are still vast areas of more or less pristine forest remaining, but it is critical to preserve these before it is too late.

We did not detect any invasive fishes during our surveys, but apparently tilapia (*Oreochromis mossambica*) is present at some locations, such as the lakes on Rennel Island, and in aquaculture ponds in some of the other Solomon Islands. It is vital that the spread of this fish be controlled as it is notorious for drastically changing stream ecology to the detriment of native species. The same can be said for mosquitofish (*Gambusia* spp.) and carp (*Cyprinus carpio*), which have been widely introduced on the New Guinea mainland. There is absolutely no justification for the introduction of exotic fish species anywhere in the Solomon Islands.

Figures 27–36: Photos of various freshwater fish collected in Solomon Island Streams during these surveys.

Figure 27. *Awaous* sp.

Fig. 28. *Lentipes* sp. (male)

Fig. 29. *Mesopristes argenteus* (juvenile)

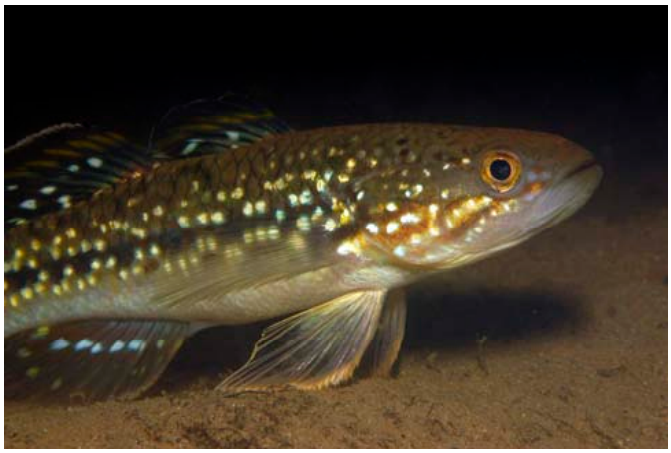

Fig. 30. *Ophioeleotris hoedti* (male)

Fig. 31. *Sicyopus discordipinnis* (male)

Fig. 32. *Sicyopterus* sp. (male)

Fig. 33. *Sicyopterus lagocephalus* (male)

Fig. 34. *Sicyopus mystax* (male)

Fig. 35. *Stiphodon atratus* (male)

Fig. 36. *Stiphodon rutilaureus* (male)

Aquatic Insects of the Solomon Islands

Dan A. Polhemus, Ronald A. Englund and John T. Polhemus

Introduction

The current survey of aquatic insects was intended to provide an initial biodiversity profile of selected groups occurring in the Solomon Islands as a whole. As with previous aquatic insect surveys undertaken in Papua New Guinea and Indonesia over the last decade, the primary groups utilized were aquatic Heteroptera (true bugs), Zygoptera (damselflies), Gyrinidae (whirlygig beetles), and Simuliidae (blackflies). These groups were selected due to their consistency of representation across a wide range of altitudes and habitat types, variation of species assemblages on a local scale between sampling sites, and relatively well investigated taxonomy. The latter factor in particular allowed confidence that identifications could be made to at least the genus level for all specimens collected, and reduced the potential number of undescribed species to be dealt with, a frequently limiting factor in studies utilizing tropical insects.

Methods

Heteroptera, Zygoptera, Gyrinidae and Simuliidae were collected intensively at each of the sampling stations, while other taxa such as Dytiscidae, Ephemeroptera, and Trichoptera were collected on an opportunistic basis. Collections were made by visual searching, hand netting, and localized pyrethrin fogging of riparian logs and hygropetric habitats. Specimens were preserved in 75% ethanol, and subsequently transported to the Bishop Museum and the Smithsonian Institution for detailed analysis and identification. Specimens from these collections will eventually be divided between the Smithsonian and the Bishop Museum

The currently known aquatic insect biota of the Solomon Islands contains 94 species of aquatic Heteroptera, 60 species of Zygoptera (Odonata), 9 species of Gyrinidae (Coloeptera), and 10 species of Simuliidae (Diptera). A preliminary listing of these taxa is provided in the tables for Stations 1–70 below, and in the checklists in Appendices 2–5. Of these species, 31 represent taxa new to science. Where an exact species determination could not yet be made, the following notations were employed:

n.sp.: indicates that the species is clearly new to science. In cases where multiple new species were present belonging to the same genus, as in *Microvelia* and *Rhagovelia*, a numbering system was used (ie., “n. sp. #1”). Such numbering is consistent for a given taxon throughout all the distribution tables in this report, providing a type of interim classification for purposes of cross-referencing species occurrences among sites.

sp. undet.: indicates that the species has not yet been definitively identified, and may possibly be undescribed, or simply unidentifiable given the limitations of the current taxonomic literature.

.

Results

Station 1: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Honiara, King Solomon Hotel swimming pool, 30 m., water temp. not taken, 11 November 2004, D. A. Polhemus and G. R. Allen, CL 7324.
9°25'58.1"S, 159°57'07.5"E

HETEROPTERA

Notonectidae

Anisops tahitiensis Lundblad

Station 2: SOLOMON ISLANDS, Western Prov., Vella Lavella, west coast, Oula River estuary, sea level, water temp. 26 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7325.
7°47'05.0"S, 156°37'06.2"E'

Station 2a: Lower estuary, water temp. 27.5 °C, salinity 5 ppt.
7°47'27.1"S, 156°36'25.9"E'

Station 2b: Middle estuary, water temp. 26 °C, salinity 3 ppt.
7°47'05.0"S, 156°37'06.2"E'

Station 2c: Upper estuary, water temp. 26 °C, salinity 1 ppt.
7°46'57.2"S, 156°37'21.7"E'

HETEROPTERA

Gerridae

Halobates peronis Herring

Rhagdotarsus kraepelini Breddin

Station 3: SOLOMON ISLANDS, Western Prov., Vella Lavella, Oula River midreach and tribs., 0–20 m., water temp. 26 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7326.
7°47'32.6"S, 156°37'33.6"E

Station 3a: Head of tidal influence and south bank trib., water temp. 26 °C
7°47'18.8"S, 156°37'32.9"E'

Station 3b: South bank trib. with ponded mouth, water temp. 26 °C
7°47'32.6"S, 156°37'33.6"E'

HETEROPTERA

Gelastocoridae

Nerthra macrostyla Todd

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Rhagdotarsus kraepelini Breddin

Mesoveliidae

Mesovelia subvittata Horvath

Ochteridae

Ochterus sp. nr. *nigrinus* Baehr

Saldidae

Saldula ornatula (Reuter)

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia n. sp. #1 (Vella Lavella #1)

ODONATA

Protoneuridae

Nososticta salomonis (Selys)

Station 4: SOLOMON ISLANDS, Western Prov., Vella Lavella, SW coast, S. of Oula, sea level, sea temp. 30 °C, 14 November 2004, D. A. Polhemus and G. R. Allen, CL 7327.
7°49'09.1"S, 156°36'07.1"E

HETEROPTERA

Gerridae

Halobates maculatus Schadow

Hermatobatidae

Hermatobates weddi China

Veliidae

Haloveloides browni (Lansbury)

Station 5: SOLOMON ISLANDS, Western Prov., Gizo Is., NE coast, 7 km. NW of Gizo, sea level, sea temp. 31 °C, salinity 35 ppt., 14–15 November 2004, D. A. Polhemus and G. R. Allen, CL 7328.
8°03'08.6"S, 156°48'30.1"E

HETEROPTERA

Gerridae

Halobates calyptus Herring

Thetibates matawa (Lansbury)

Veliidae

Halovelia sp. undet.

Ocheovelia solomon (Andersen)

Xenobates seminulum (Esaki)

Station 6: SOLOMON ISLANDS, Western Prov., Gizo Is., rocky streamlet in forest 1.5 km. W. of Gizo, 15 m., water temp. 26 °C, 15 November 2004, D. A. Polhemus and G. R. Allen, CL 7329.
8°06'09.7"S, 156°49'48.0"E

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Station 6 (cont.)

Mesoveliidae

Mesovelia subvittata Horvath

Notonectidae

Anisops tahitiensis Lundblad

Veliidae

Microvelia sp. undet. #2 (subgenus *Picaultia*)

ODONATA

Coenagrionidae

Agriocnemis sp. undet. (sight)

Protoneuridae

Nososticta salomonis (Selys) (sight)

Station 7: SOLOMON ISLANDS, Western Prov., Gizo Is., abandoned water supply reservoirs 2 km. W. of Gizo, 25 m., water temp. 28 °C, 15 November 2004, D. A. Polhemus and G. R. Allen, CL 7330.
8°06'04.2"S, 156°49'35.0"E

HETEROPTERA

Gerridae

Limnogonus fossarum skusei (Torre-Bueno)

Notonectidae

Anisops leucothea Esaki

Anisops nasuta Fieber

Anisops tahitiensis Lundblad

Veliidae

Phoreticovelia n. sp.

ODONATA

Coenagrionidae

Xiphiagrion cyanomelas Selys

Station 8: SOLOMON ISLANDS, Western Prov., Lola Is., Vonavona Lagoon, SW of Munda, north coast, sea level, sea temp. 31 °C, salinity 35 ppt., 16 November 2004, D. A. Polhemus and G. R. Allen, CL 7331.
8°18'30.0"S, 157°09'53.9"E

HETEROPTERA

Gerridae

Halobates calyptus Herring

Halobates maculatus Schadow

Thetibates matawa (Lansbury)

Veliidae

Halovelia annemariae Andersen

Halovelia esakii Andersen

Halovelia n. sp.

Haloveloides browni (Lansbury)

Haloveloides papuensis (Esaki)

Ocheovelia solomon (Andersen)

Station 9: SOLOMON ISLANDS, Western Prov., New Georgia, Pundokona River estuary, S. of Jericho, sea level, water temp. 26 °C, salinity 1–5 ppt., 17 November 2004, D. A. Polhemus and G. R. Allen, CL 7332.
8°08'58.4"S, 157°21'22.0"E

Station 9a: Lower estuary, water temp. 26 °C, salinity 5 ppt.
8°07'58.5"S, 157°19'22.8"E'

Station 9b: Upper estuary, water temp. 26 °C, salinity 2 ppt.
8°08'58.4"S, 157°21'22.0"E'

HETEROPTERA

Gerridae

Halobates peronis Herring

Metrobatopsis lannae J. & D. Polhemus

Rhagdotarsus kraepelini Breddin

Rheumatometroides browni Hungerford & Matsuda

Veliidae

Xenobates sp.undet.

Station 10: SOLOMON ISLANDS, Western Prov., New Georgia, Pundokona River and tribs., SE of Jericho, from head of estuary to first major confluence, 0–10 m., water temp. 26 °C, 17 November 2004, D. A. Polhemus and G. R. Allen, CL 7333.
8°09'04.7"S, 157°21'43.2"E (Fig. 20)

Station 10a: Head of tidal influence and shaded hill trib., water temp. 26 °C
8°08'58.4"S, 157°21'22.0"E'

Station 10b: Long, pooled reach, water temp. 26 °C.
8°08'23.3"S, 157°21'20.1"E'

Station 10c: Swift rocky north bank trib., water temp. 26 °C,
8°09'04.7"S, 157°21'43.2"E'

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis lannae J. & D. Polhemus

Rhagdotarsus kraepelini Breddin

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia n. sp. #3 (New Georgia #1)

Rhagovelia n. sp. #4 (New Georgia #2)

Station 11: SOLOMON ISLANDS, Western Prov., New Georgia, Dadaloana River, NE of Munda, from road bridge upstream to first cave, 20 m., water temp. 26 °C, 18 November 2004, D. A. Polhemus and G. R. Allen, CL 7334.
8°18'17.1"S, 157°17'35.8"E

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Station 11 (cont.)

Metrobatopsis lannae J. & D. Polhemus

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia n. sp. #4 (New Georgia #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Protoneuridae

Nososticta salomonis (Selys)

Station 12: SOLOMON ISLANDS, Western Prov., Rendova, Tovavo River, E. of Hopango, 0–25 m., water temp. 26 °C, 19 November 2004, D. A. Polhemus and G. R. Allen, CL 7335.
8°34'04.8"S, 157°12'39.8"E (Fig. 17)

DIPTERA

Dolichopodidae

Genus and species undet.

HETEROPTERA

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia n. sp. #6 (Rendova #1)

Rhagovelia n. sp. #8 (Rendova #3)

Saldidae

Saldula parens Cobben

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Protoneuridae

Nososticta salomonis (Selys) Sight record

Station 13: SOLOMON ISLANDS, Western Prov., Marakumbo Is., Vonavona Lagoon, SW of Munda, south coast and interior sinkhole, sea level, water temp. 30 °C (interior sinkhole), sea temp. 33 °C, 20 November 2004, D. A. Polhemus and G. R. Allen, CL 7336.
8°17'24.9"S, 157°09'31.1"E

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Thetibates matawa (Lansbury)

Station 14: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Tenaru River at Tenaru Falls, 12 km. SE of Honiara, 40 m., water temp. 25 °C, 21 November 2004, D. A. Polhemus and G. R. Allen, CL 7337.
9°31'01.0"S, 160°00'59.5"E

HETEROPTERA

Gerridae

Limnogonus sp. undet.

Limnometra hysterema Nieser & Chen

Metrobatopsis browni J. Polhemus & D. Polhemus

Mesoveliidae

Mesovelia subvittata Horvath

Notonectidae

Enithares sp. undet. (prob. *gibbera* Brooks, immature only)

Ochteridae

Ochterus sp. undet.

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia browni Lansbury

ODONATA

Chlorocyphidae

Rhinocypha liberata Lieftinck

Coenagrionidae

Pseudagrion incisurum Lieftinck

Station 14 (cont.)

Protoneuridae

Nososticta salomonis (Selys) Many tandem pairs on wet wood at margins

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Station 15: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Tinahulu River above Gold Ridge road bridge at Bemuta village, 24 km. ESE of Honiara, 35 m., water temp. 27 °C, 27 November 2004, D. A. Polhemus and G. R. Allen, CL 7338.
9°30'26.8"S, 160°09'20.3"E

COLEOPTERA

Dytiscidae

Genus and species undet.

HETEROPTERA

Gerridae

Metrobatopsis browni J. Polhemus & D. Polhemus

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia browni Lansbury

ODONATA

Coenagrionidae

Agriocnemis sp. undet.

Pseudagrion microcephalum (Rambur)

Station 16: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., Puepue River and cascading trib. (Tarihau Creek), 3 km. S. of Kirakira, 15–50 m., water temp. 26 °C, 10 March 2005, 09:30–14:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7373.
10°28'40.3"S, 161°55'33.3"E (Fig. 16)

DIPTERA

Simuliidae

Simulium (Morops) sp. undet. (imm. only)

EPHEMEROPTERA

Leptophlebiidae

Station 16 (cont.)

Genus and species undet.

HETEROPTERA

Gerridae

Limnometra sp. undet. (immature only)

Metrobatopsis sp. undet.

Mesoveliidae

Mesovelia sp. undet.

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Microvelia sp. undet. #3 (compact orange species)

Rhagovelia n. sp. #9 (Makira #1)

Rhagovelia n. sp. # 10 (Makira #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Platycnemididae

Lieftinckia n. sp. (teneral specimens only)

Protoneuridae

Nososticta salomonis (Selys)

TRICHOPTERA

Hydropsychidae

Genus and species undet.

Station 17: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., Tawaitara Creek, SE of Tawaitara, 3 km. S. of Kirakira, 30 m., water temp. 26 °C, 10 March 2005, J. T. Polhemus, CL 7374. 10°27'34.8"S, 161°56'37.0"E

HETEROPTERA

Gerridae

Metrobatopsis sp. undet.

Mesoveliidae

Mesovelia subvittata Horvath (from seeps)

Station 17 (cont.)

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group) (sight record)

Rhagovelia n. sp. #10 (Makira #2)

ODONATA

Platycnemididae

Lieftinckia n. sp. (teneral specimens only)

Protoneuridae

Nososticta salomonis (Selys)

Station 18: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., Tagataga Creek, upper Puepue River basin, 4 km. S. of Kirakira, 160–190 m., water temp. 26 °C, 11 March 2005, 11:30–14:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7375.
10°29'33.6"S, 161°55'58.5"E

HETEROPTERA

Gerridae

Limnometra hysterema Nieser & Chen

Metrobatopsis sp. undet.

Mesoveliidae

Mesovelia sp. undet. (sight)

Veliidae

Microvelia sp. undet. #1 (= *gestroi* group)

Rhagovelia n. sp. #9 (Makira #1)

Rhagovelia n. sp. #11 (Makira #3)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Protoneuridae

Nososticta salomonis (Selys)

Station 19: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., small swamp on ridge crest E. of Puepue River valley, SE of Kirakira, 250 m., water temp. 26 °C, 11 March 2005, 09:30–09:45 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7376.
10°28'30.8"S, 161°56'20.7"E

COLEOPTERA

Dytiscidae

Genus and species undet. (3 spp.)

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Mesoveliidae

Mesovelia sp. undet.

Notonecta

Anisops sp. undet.

Enithares sp. undet. (prob. *gibbera* Brooks, immatures only)

ODONATA

Libellulidae

Agrionoptera insignis similis Selys

Station 20: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., rocky coast E. of Kirakira, sea level, sea temp. 29.5 °C, tide pools 28.5 °C, 11 March 2005, J. T. Polhemus, CL 7377.

Station 20a: Tawari Beach, 10°27'29.9"S, 161°57'15.6"E

Station 20b: Wairake Beach, 10°27'49.2"S, 161°57'25.4"E

HETEROPTERA

Veliidae

Halovelia n. sp. (nr. *lannae*)

Station 21: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., Naororo Beach, E. of Kirakira, sea level, sea temp. 28.5 °C, 11 March 2005, 13:00–14:00 hrs., J. T. Polhemus, CL 7378.
10°27'55.3"S, 161°57'23.6"E

HETEROPTERA

Omaniidae

Corallocoris sp. undet.

Saldidae

Salduncula n. sp.

Veliidae

Halovelia n. sp. (nr. *lannae*)

Station 22: SOLOMON ISLANDS, Makira and Ulawa Prov., Makira (San Christobal) Is., Waiana Kaurau Creek at Kaororo village, 10 m., water temp. 26.5 °C, 11 March 2005, 14:00–15:00 hrs., J. T. Polhemus, CL 7379.
10°27'59.0"S, 161°57'20.2"E

HETEROPTERA

Veliidae

Rhagovelia n. sp. # 10 (Makira #2)

Station 23: SOLOMON ISLANDS, Western Prov., Gizo Is., mangrove-lined bay on north coast, W. of Gizo, sea level, sea temp. 31 °C, salinity 36 ppt., 13 March 2005, 20:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7380.
8°02'41.1"S, 156°48'31.9"E

HETEROPTERA

Gerridae

Halobates calyptus Herring

Halobates maculatus Herring

Thetibates matawa (Lansbury)

Veliidae

Halovelia annemariae Andersen

Halovelia bergrothi Esaki

Station 23 (cont.)

Ocheovelia solomon (Andersen)

Station 24: SOLOMON ISLANDS, Western Prov., Ranongga Is., Paoroe Creek, above Boroi village, 50–70 m., water temp. 26 °C, 14 March 2005, 09:30–11:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7381.
8°04'59.7"S, 156°35'51.1"E

HETEROPTERA

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #4 (very small, orange-brown)

Rhagovelia n. sp. #1 (Vella Lavella #1)

ODONATA

Protoneuridae

Nososticta salomonis (Selys)

Station 25: SOLOMON ISLANDS, Western Prov., Ranongga Is., Kolomomola River, terminal reach from head of estuary to first major confluence, S. of Boroi village, 5–10 m., water temp. 27 °C, 14 March 2005, 12:00–14:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7382.
8°05'20.5"S, 156°35'55.8"E (Fig. 22)

HETEROPTERA

Gerridae

Metrobatopsis sp. undet.

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Rhagovelia n. sp. #1 (Vella Lavella #1)

Station 26: SOLOMON ISLANDS, Western Prov., Ranongga Is., Tutusú River, N. of Boroi village, 40 m., water temp. 28 °C, 14 March 2005, 14:30–15:30 hrs., D. A. Polhemus and R. Englund, CL 7383.
8°04'34.1"S, 156°35'52.4"E

HETEROPTERA

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Rhagovelia n. sp. #1 (Vella Lavella #1)

Station 27: SOLOMON ISLANDS, Western Prov., Ranongga Is., Koriovuku harbor, nr. Buri village, sea level, sea temp. 31 °C, salinity 36 ppt., 14 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7384.
7°56'36.8"S, 156°32'44.1"E

HETEROPTERA

Gerridae

Halobates sp. undet.

Veliidae

Halovelia annemariae Andersen

Haloveloides browni (Lansbury)

Ocheovelia solomon (Andersen)

Xenobates seminulum (Esaki)

Station 28: SOLOMON ISLANDS, Western Prov., Vella Lavella Is., Bainapo Kasi Creek, trib. to Sireri River, 5–15 m., water temp. 26 °C, 15 March 2005, 10:00–14:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 3855.
7°45'53.6"S, 156°36'17.0"E

HETEROPTERA

Gerridae

Halobates peronis Herring

Limnometra hysterema Nieser & Chen

Station 28 (cont.)

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Rhagdotarsus kraepelini Breddin

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #5

Rhagovelia n. sp. #1 (Vella Lavella #1)

Rhagovelia n. sp. #2 (Vella Lavella #2)

ODONATA

Coenagrionidae

Pseudagrion n. sp. (very red in coloration)

Teinobasis sp. undet.

Protoneuridae

Nososticta salomonis (Selys)

Station 29: SOLOMON ISLANDS, Western Prov., Bagi Is. (W. of Vella Lavella), Singgataravana, sea level, sea temp. 31 °C, salinity 36 ppt., 15 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7386. 7°47'50.7"S, 156°32'138.9"E

HETEROPTERA

Gerridae

Halobates maculatus Herring

Halobates princeps White

Hermatobatidae

Hermatobates weddi China

Veliidae

Halovelia sp. undet. (1 male only)

Ocheovelia solomon (Andersen)

Xenobates seminulum (Esaki)

Station 30: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., Sui River at Parasi Falls, 30–45 m., water temp. 26 °C, 16 March 2005, 13:30–16:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7387.

6°41'46.0"S, 156°26'28.3"E (Fig. 25)

COLEOPTERA

Gyrinidae

Dineutes (*Callistodineutus*) *choiseulicola* Brinck

HETEROPTERA

Gerridae

Limnometra hysterema Nieser & Chen

Metrobatopsis sp. undet.

Hebridae

Hebrus n. sp.

Mesoveliidae

Mesovelia sp. undet.

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Microvelia sp. undet. #6

Rhagovelia n. sp. # 12 (Choiseul #1)

Rhagovelia n. sp. # 13 (Choiseul #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Libellulidae

Neurothemys stigmatizans bramina (Guerin)

Platycnemididae

Lieftinckia ramosa Lieftinck

Protoneuridae

Nososticta salomonis (Selys)

Station 31: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., Choiseul Bay near Parama Island, sea level, sea temp. 31 °C, salinity 34 ppt., 16 March 2005, 19:30–23:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7388. 6°41'18.3"S, 156°24'20.0"E

HETEROPTERA

Gerridae

Halobates princeps White

Halobates calyptus Herring

Hermatobatidae

Hermatobates weddi China

Veliidae

Halovelia bergrothi Esaki

Station 32: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., Vangamole River, 3 km. N. of Mole, 25 m., water temp. 28.5 °C, 17 March 2005, 11:30–14:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7389. 6°48'39.7"S, 156°32'42.9"E

EPHEMEROPTERA

Leptophlebiidae

Genus and species undet.

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Hebridae

Hebrus n. sp.

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Microvelia sp. undet. #7 (subgenus *Picaultia*)

Rhagovelia n. sp. # 12 (Choiseul #1)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Station 32 (cont.)

Coenagrionidae

Pseudagrion incisurum Lieftinck

Libellulidae

Agrionoptera insignis similis Selys

Protoneuridae

Nososticta salomonis (Selys)

TRICHOPTERA

Hydropsychidae

Genus and species undet.

Station 33: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., terminal reach of Muma River, NW of Mole, 3 m., **water temp. 82° F.**, 17 March 2005, 12:00–15:00 hrs., G. R. Allen and J. T. Polhemus, CL 7390.

6°49'11.9"S, 156°31'48.0"E

HETEROPTERA

Gerridae

Limnometra hysterema Nieser & Chen (sight record)

Metrobatopsis sp. undet.

Rhagdotarsus kraepelini Breddin

Rheumatometroides browni Hungerford & Matsuda

Mesoveliidae

Mesovelia subvittata Horvath

Mesovelia vittigera Horvath

Saldidae

Saldula sp. undet. (immatures only, from midstream log)

Station 34: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., south coast, Mole harbor, sea level, sea temp. 31 °C, salinity 34 ppt., 17 March 2005, 19:00–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7391.
6°49'34.4"S, 156°31'12.9"E

HETEROPTERA

Gerridae

Halobates maculatus Herring

Hermatobatidae

Hermatobates weddi China

Veliidae

Halovelia bergrothi Esaki

Station 35: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., coastal springs and waterfalls at Katurasele, 0–30 m., water temp. 25 °C, 18 March 2005, 12:00–15:30 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7392.
7°10'51.7"S, 156°53'58.2"E (Fig. 24)

HETEROPTERA

Mesoveliidae

Mesovelia subvittata Horvath

Saldidae

Saldula sp. undet. (immatures only, from midstream log)

Salduncula n. sp. (from coastal rocks)

Veliidae

Rhagovelia n. sp. # 13 (Choiseul #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Papuagrion sp. undet.

Isostictidae

Cnemisticta n. sp. nr. *latilobata* Donnelly

Platycnemididae

Lieftinckia ramosa Lieftinck

Station 36: SOLOMON ISLANDS, Choiseul Prov., Choiseul Is., south coast, inlet 1 km. S. of Katurasele, sea level, sea temp. 28 °C, salinity 11 ppt., 18 March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7393.
7°12'02.9"S, 156°54'39.9"E

HETEROPTERA

Gerridae

Thetibates matawa (Lansbury)

Veliidae

Halovelia sp. undet.

Ocheovelia solomon (Andersen)

Xenobates seminulum (Esaki)

Station 37: SOLOMON ISLANDS, Western Prov., Kolombangara Is., rocky forest stream 5.5 km. N. of Ringgi harbor, 120 m., water temp. 26 °C, 19 March 2005, 13:00–16:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and J. T. Polhemus, CL 7394.
7°12'02.9"S, 156°54'39.9"E

COLOEPTERA

Dytiscidae

Genus and species undet.

Gyrinidae

Callistodineutus bufo Brinck

DIPTERA

Simuliidae

Simulium (Gomphostilbia) noroense Takaoka & Suzuki

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Mesoveliidae

Mesovelia subvittata Horvath

Notonectidae

Enithares gibbera Brooks

Saldidae

Saldula sp. undet.

Station 37 (cont.)

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Microvelia sp. undet. #8

Rhagovelia n. sp. # 14 (Kolombangara #1)

Rhagovelia n. sp. # 15 (Kolombangara #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion n. sp. 1 (very red in coloration)

Protoneuridae

Nososticta salomonis (Selys)

TRICHOPTERA

Family undet.

Genus and species undet.

Station 38: SOLOMON ISLANDS, Western Prov., Kolombangara Is., Ringgi harbor, sea level, sea temp. 29 °C, salinity 14 ppt., 19 March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7395. 8°07'14.2"S, 157°06'43.2"E

HETEROPTERA

Gerridae

Halobates browni Herring

Veliidae

Halovelia annemariae Andersen

Ocheovelia solomon (Andersen)

Station 39: SOLOMON ISLANDS, Western Prov., Kolombangara Is., mangrove shore on Tura Is., mouth of Ringgi harbor, sea level, sea temp. 29 °C, salinity 29 ppt., 20 March 2005, J. T. Polhemus, CL 7396.
8°07'34.0"S, 157°06'19.0"E

HETEROPTERA

Gerridae

Thetibates matawa (Lansbury)

Veliidae

Xenobates seminulum (Esaki)

Station 40: SOLOMON ISLANDS, Western Prov., Kolombangara Is., Vila River, 8.5 km. N. of Ringgi harbor, 140–150 m., water temp. 24 °C, 20 March 2005, 10:00–13:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, and D.Boseto, CL 7397.
8°02'38.7"S, 157°07'16.1"E

COLOEPTERA

Gyrinidae

Callistodineutus bufo Brinck

EPHEMEROPTERA

Baetidae

Genus and species undet.

Leptophlebiidae

Genus and species undet.

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Mesoveliidae

Mesovelia subvittata Horvath

Notonectidae

Enithares gibbera Brooks

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Station 40 (cont.)

Rhagovelia n. sp. # 14 (Kolombangara #1)

Rhagovelia n. sp. # 15 (Kolombangara #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion n. sp. 1 (very red in coloration)

Teinobasis sp. undet.

Libellulidae

Tapeinothemis boharti Lieftinck (sight)

Protoneuridae

Nososticta salomonis (Selys)

Station 41: SOLOMON ISLANDS, Western Prov., Mbanga Is., western shore near Goldie College, sea level, sea temp. 31 °C, salinity 36 ppt., 20 March 2005, D. A. Polhemus, and J. T. Polhemus, CL 7398.
8°16'27.4"S, 157°12'36.1"E

HETEROPTERA

Gerridae

Halobates browni Herring

Hermatobatidae

Hermatobates weddi China

Veliidae

Halovelia annemariae Andersen

Haloveloides browni (Lansbury)

Haloveloides papuensis (Esaki)

Ocheovelia solomon (Andersen)

Station 42: SOLOMON ISLANDS, Western Prov., Rendova Is., upper trib. to Toropi River at road crossing 5.5 km. SE of Kenole, 230–250 m., water temp. 26 °C, 21March 2005, 11:30–15:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7399.
8°30'30.0"S, 157°18'45.4"E

COLOEPTERA

Gyrinidae

Callistodineutus sp. undet.

DIPTERA

Simuliidae

Simulium (Morops) sp. undet. (imm. only)

HETEROPTERA

Gerridae

Limnometra hysterema Nieser & Chen

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Notonectidae

Anisops sp. undet.

Enithares gibbera Brooks

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #9 (subgenus Picaultia)

Microvelia sp. undet. #10

Rhagovelia n. sp. #6 (Rendova #1)

Rhagovelia n. sp. #7 (Rendova #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion n. sp. 1 (very red in coloration)

Libellulidae

Agrionoptera insignis similis Selys

Tapeinothemis boharti Lieftinck

Megapodagrionidae

Argiolestes n. sp.

Station 42 (cont.)

Protoneuridae

Nososticta salomonis (Selys)

Station 43: SOLOMON ISLANDS, Western Prov., Rendova Is., west coast, Kenole harbor, sea level, sea temp. 30 °C, salinity 28 ppt., 21March 2005, 19:30–22:00 hrs., D. A. Polhemus and J. T. Polhemus, CL 7400.
8°28'04.4"S, 157°16'45.6"E

HETEROPTERA

Veliidae

Halovelia sp. undet. (1 female only)

Station 44: SOLOMON ISLANDS, Western Prov., New Georgia Is., upper Sakumbare River near former Sakumbare logging camp, 15.5 km. E. of Putagita harbor, 190 m., water temp. 26 °C, 22 March 2005, 11:00–15:00 hrs., D. A. Polhemus, G. R. Allen, R. Englund, J. T. Polhemus, and D.Boseto, CL 7401.
8°24'27.9"S, 157°41'34.2"E (Fig. 21)

COLOEPTERA

Dysticidae

Genus and species undet.

Gyrinidae

Callistodineutus sp. undet.

DIPTERA

Simuliidae

Simulium (Gomphostilbia) noroense Takaoka & Suzuki

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis lannae J. & D. Polhemus

Mesoveliidae

Mesovelia subvittata Horvath (macropterous specimen)

Saldidae

Saldula sp. undet.

Station 44 (cont.)

Veliidae

Microvelia sp. undet. #11 (very small, orange-brown)

Rhagovelia n. sp. #4 (New Georgia #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion n. sp. 1 (very red in coloration)

Teinobasis sp. undet.

Platycnemididae

Lieftinckia salomonis Lieftinck

Protoneuridae

Nososticta salomonis (Selys)

TRICHOPTERA

Hydropsychidae

Genus and species undet.

Station 45: SOLOMON ISLANDS, Western Prov., New Georgia Is., forest streamlet crossing logging road, 12.5 km. E. of Putagita harbor, 180 m., water temp. 27 °C, 22 March 2005, 15:45–16:00 hrs., D. A. Polhemus, R. Englund, and J. T. Polhemus, CL 7402.

8°24'58.5"S, 157°39'52.9"E

COLOEPTERA

Gyrinidae

Callistodineutus sp. undet.

Gyrinus sp. undet.

HETEROPTERA

Veliidae

Rhagovelia n. sp. #5 (New Georgia #3)

Station 46: SOLOMON ISLANDS, Santa Isabel Prov., Santa Isabel Is., above Buala town, Blahitada Stream and large waterfalls, above hydropower plant, 268-280 m, 22 July 2005, R.A. Englund and D. Boseto, CL 1RE.
08.15681°S, 159.59264°E

HETEROPTERA

Saldidae

Saldula sp. undet.

Veliidae

Rhagovelia n. sp. #16 (Santa Isabel #1)

Rhagovelia n. sp. #17 (Santa Isabel #2)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Teinobasis chionopleura Lieftinck (new species near this)

Isostictidae

Cnemisticta latilobata Donnelly

Libellulidae

Genus and sp. undet.

Platycnemididae

Lieftinckia ramosa Lieftinck

Protoneuridae

Nososticta salomonis (Selys)

Station 47: SOLOMON ISLANDS, Santa Isabel Prov., Santa Isabel Is., above Jejovo village, Boboro Stream, 107 m, 22 July 2005, R.A. Englund and D. Boseto. CL 2RE.
08.15248°S, 159.59975°E (Fig, 26)

ODONATA

Genus and species undet.

Station 48: SOLOMON ISLANDS, Santa Isabel Prov., Santa Isabel Is., above Buala Town, Laticie River, 2-118 m, 23 July 2005, R.A. Englund and porters. CL 3RE.

08.14212°S, 159.58585°E

Station 48a: small tributary to Laticie River, 56-91 m

08.14350°S, 159.58498°E

EPHEMEROPTERA

Baetidae

Genus and species undet.

Leptophlebiidae

Genus and species undet.

HETEROPTERA

Veliidae

Rhagovelia n. sp. # 16 (Santa Isabel #1)

ODONATA

Protoneuridae

Nososticta salomonis (Selys)

Station 49: SOLOMON ISLANDS, Santa Isabel Prov., Santa Isabel Is., Garana River, one hour boatride from Buala, 0-23 m, water temp. not taken, 24 July 2005, R.A. Englund and D. Boseto, CL 4RE. River mouth, O m.

08.06301°S, 159.47723°E (Fig. 23)

Station 49a: 24 m elevation, 1.97 km upstream from Garana River mouth

08.07131°S, 159.46126°E

DIPTERA

Simuliidae

Simulium (Morops) sp. undet. (imm. only)

EPHEMEROPTERA

Baetidae

Genus and species undet.

Leptophlebiidae

Genus and species undet.

ODONATA

Coenagrionidae

Agriocnemis salomonis Lieftinck

Station 49 (cont.)

Libellulidae

Agrionoptera insignis similis Selys

Orthetrum villosovittatum bismarckianum Ris

TRICHOPTERA

Hydropsychidae

Genus and species undet.

Station 50: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Lungga River at mouth of gorge, near proposed dam site , SW of Mt. Austen, 25 m. [80 ft.], water temp. 25.5 °C, 28 July 2005, 11:30–13:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7407.
9°23'44.3"S, 159°50'47.6"E

DIPTERA

Dolichopodidae

Genus and species undet.

HETEROPTERA

Corixidae

Micronecta ludibunda ludibunda Breddin

Gerridae

Limnogonus luctuosus (Montrousier)

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis browni J. Polhemus & D. Polhemus

Leptopodidae

Valleriola n. sp.

Ochteridae

Ochterus sp. undet.

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. #1 (*gestroi* group)

Rhagovelia browni Lansbury

ODONATA

Coenagrionidae

Agriocnemis sp. undet.

Station 50 (cont.)

Pseudagrion sp. undet.

Libellulidae

Neurothemys stigmatizans bramina (Guerin)

Protoneuridae

Nososticta salomonis (Selys)

Station 51: SOLOMON ISLANDS, Malaita Prov., Malaita, Kwarea River at high bridge on road from Auki to Atori, 85 m., water temp. 25.5 °C, 29 July 2005, 13:30–16:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7408.

8°39'10.3"S, 160°45'33.5"E (Fig. 19)

COLEOPTERA

Dytiscidae

Genus and species undet.

EPHEMEROPTERA

Baetidae

Genus and species undet.

HETEROPTERA

Gerridae

Metrobatopsis solomonensis Hungerford & Matsuda

Mesoveliidae

Mesovelia subvittata Horvath

Notonectidae

Enithares sp. undet. (immatures only)

Ochteridae

Ochterus sp. undet.

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Rhagovelia amnicus Lansbury

Rhagovelia fulvus Lansbury

Station 51 (cont.)

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion sp. undet. (sight)

Protoneuridae

Nososticta salomonis (Selys)

Station 52: SOLOMON ISLANDS, Malaita Prov., Malaita, trib. to Kwarea River, E. of high bridge on road from Auki to Atori, 180 m., water temp. 25 °C, 29 July 2005, 16:15–16:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7409.

8°39'14.4"S, 160°45'50.1"E

HETEROPTERA

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Rhagovelia fulvus Lansbury

Station 53: SOLOMON ISLANDS, Malaita Prov., Malaita, Kwaisale River at Kwaisale Falls, nr. Anomasu village on road from Auki to Atori, 48 road km. NE of Auki, 120–200 m., water temp. 25.5 °C, 30 July 2005, 11:30–14:00 hrs., D. A. Polhemus and R. Englund, CL 7410.

8°41'53.3"S, 160°49'39.7"E

COLEOPTERA

Gyrinidae

Dineutes (*Callistodineutus*) *pagdeni* Brinck

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Mesoveliidae

Mesovelia subvittata Horvath

Station 53 (cont.)

Veliidae

Rhagovelia amnicus Lansbury

Rhagovelia fulvus Lansbury

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion sp. undet.

Teinobasis bradleyi Kimmins

Protoneuridae

Nososticta salomonis (Selys)

Station 54: SOLOMON ISLANDS, Malaita Prov., Malaita, Aluta River at bridge on road from Auki to Atori, 50 road km. NE of Auki, 75 m., water temp. 25.5 °C, 30 July 2005, 14:30–16:00 hrs., D. A. Polhemus and R. Englund, CL 7411.

8°41'46.5"S, 160°50'02.6"E

COLEOPTERA

Gyrinidae

Dineutes (*Callistodineutus*) sp. undet. (sight)

DIPTERA

Simuliidae

Simulium (Gomphostilbia) hiroshii Takaoka

Simulium (Morops) pohaense (imm. only) Takaoka & Suzuki

EPHEMEROPTERA

Baetidae

Genus and species undet.

Leptophlebiidae

Genus and species undet.

HETEROPTERA

Gerridae

Metrobatopsis solomonensis Hungerford & Matsuda

Mesoveliidae

Mesovelia vittigera Horvath

Station 54 (cont.)

Saldidae

Saldula sp. undet.

Veliidae

Rhagovelia amnicus Lansbury

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Protoneuridae

Nososticta salomonis (Selys)

TRICHOPTERA

Hydropsychidae

Genus and species undet.

Station 55: SOLOMON ISLANDS, Malaita Prov., Malaita, Kapolo Creek (trib. to Koa River), 7.5 km. N. of Auki on road to Dala, 5 m., water temp. 25.5 °C, 31 July 2005, 09:00–10:30 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7412.

8°42'09.3"S, 160°41'58.7"E

HETEROPTERA

Gerridae

Limnogonus luctuosus (Montrousier)

Metrobatopsis solomonensis Hungerford & Matsuda

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Rhagovelia amnicus Lansbury

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Coenagrionidae

Pseudagrion sp. undet.

Protoneuridae

Nososticta salomonis (Selys)

Station 56: SOLOMON ISLANDS, Malaita Prov., Malaita, Koa River, 9 km. N. of Auki on road to Dala, 10 m., water temp. 26 °C, 31 July 2005, 10:45–12:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7413.
8°41'25.1"S, 160°41'51.1"E

HETEROPTERA

Gerridae

Limnogonus luctuosus (Montrousier)

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis solomonensis Hungerford & Matsuda

Mesoveliidae

Mesovelia subvittata Horvath

Veliidae

Rhagovelia amnicus Lansbury (smaller than upland forms but otherwise similar)

ODONATA

Protoneuridae

Nososticta salomonis (Selys)

Station 57: SOLOMON ISLANDS, Malaita Prov., Malaita, pond in cattle pasture, 11 km. N. of Auki on road to Dala, 10 m., water temp. 31 °C, 31 July 2005, 13:00–14:00 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7414.
8°40'22.7"S, 160°40'56.9"E

COLEOPTERA

Dystiscidae

Cybister sp. undet.

Genus and species undet. (small and broad)

HETEROPTERA

Corixidae

Micronecta virgata Hale

Gerridae

Limnogonus fossarum skusei (Torre-Bueno)

Limnogonus luctuosus (Montrousier)

Mesoveliidae

Mesovelia vittigera Horvath

Station 57 (cont.)

Notonectidae

Anisops sp. undet. #1 (small)

Anisops nasuta Fieber

Enithares loria Brooks

ODONATA

Coenagrionidae

Agriocnemis femina (Brauer)

Ischnura heterosticta Burmeister

Ceriagrion erubescens Selys

Xiphiagrion cyanomelas Selys

Libellulidae

Neurothemys stigmatizans bramina (Guerin)

Station 58: SOLOMON ISLANDS, Malaita Prov., Malaita, rocky limestone coast at end of airstrip at Gwaunaruu, 7 km. N. of Auki, sea level, sea temp. 31 °C, 31 July 2005, 15:00–15:30 hrs., D. A. Polhemus and R. Englund, CL 7415.

8°42'26.4"S, 160°40'47.8"E

HETEROPTERA

Veliidae

Halovelia sp. undet.

Station 59: SOLOMON ISLANDS, Malaita Prov., Malaita, coast 1 km. NW of Auki, nr. Lake Osi, sea level, sea temp. 29.5 °C, 1 August 2005, 10:00–11:00 hrs., D. A. Polhemus, CL 7416.

8°46'23.6"S, 160°41'15.1"E

HETEROPTERA

Gerridae

Halobates princeps White

Veliidae

Halovelia sp. undet.

Station 60: SOLOMON ISLANDS, Malaita Prov., Malaita, mouth of Kelokwai Stream and adjacent coast, 2 km. NW of Auki, sea level, water temp. (stream) 28 °C, sea temp. 29 °C, 1 August 2005, 11:00–11:45 hrs., D. A. Polhemus, R. Englund, and D.Boseto, CL 7417.
8°44'35.9"S, 160°40'13.6"E (Fig. 18)

HETEROPTERA

Gerridae

Limnogonus luctuosus (Montrousier)

Mesoveliidae

Mesovelia vittigera Horvath

Station 61: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Sasaa River at road bridge, 6 km. SW of Cape Esperance, 31 km. NW of Honiara on coastal road, 5 m., water temp. 28 °C, 2 August 2005, 13:00–13:45 hrs., D. A. Polhemus, CL 7418.
9°17'23.2"S, 159°45'27.3"E

COLEOPTERA

Dytiscidae

Genus and species undet. #1

HETEROPTERA

Gerridae

Limnogonus luctuosus (Montrousier)

Mesoveliidae

Mesovelia sp. undet. (prob. *vittigera*)

Saldidae

Saldula sp. undet.

Veliidae

Microvelia sp. undet. #12 (subgenus *Picaultia*)

Rhagovelia browni Lansbury

ODONATA

Coenagrionidae

Agriocnemis salomonis Lieftinck

Pseudagrion microcephalum (Rambur)

Xiphiagrion cyanomelas Selys

Station 62: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Ndoma River at road bridge, 25 km. NW of Honiara on coastal road, 5 m., water temp. 27.5 °C, 2 August 2005, 14:00–15:00 hrs., D. A. Polhemus, CL 7419. 9°19'16.7"S, 159°48'03.4"E

COLEOPTERA

Dytiscidae

Genus and species undet. #2

HETEROPTERA

Gerridae

Limnogonus luctuosus (Montrousier)

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis browni J. Polhemus & D. Polhemus

Mesoveliidae

Mesovelia sp. undet. (prob. *vittigera*)

Veliidae

Microvelia sp. undet. #13 (small with spotted wings)

Rhagovelia browni Lansbury

ODONATA

Coenagrionidae

Agriocnemis salomonis Lieftinck

Pseudagrion microcephalum (Rambur)

Station 63: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, roadside pond in forest, 21 km. NW of Honiara on coastal road, 5 m., water temp. 26.5 °C, 2 August 2005, 15:00–15:20 hrs., D. A. Polhemus, CL 7420. 9°20'20.9"S, 159°49'17.3"E

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

ODONATA

Coenagrionidae

Agriocnemis salomonis Lieftinck

Station 64: SOLOMON ISLANDS, Guadalcanal Prov., Guadalcanal, Charebuma River, above Gold Ridge mine, 390–460 m., water temp. 23.5 °C, 3 August 2005, 11:00–15:00 hrs., D. A. Polhemus, CL 7421.
9°35'39.8"S, 160°07'28.4"E (Fig. 15)

CL 7241a: lower limit of reach sampled = 9°35'39.8"S, 160°07'28.4"E

CL 7241b: upper limit of reach sampled = 9°36'00.1"S, 160°07'23.5"E

COLEOPTERA

Dytiscidae

Genus and species undet. #3

Gyrinidae

Dineutes (*Callistodineutus*) *pagdeni* Brinck

DIPTERA

Simuliidae

Simulium (Gomphostilbia) sherwoodi Stone & Maffi

Simulium (Gomphostilbia) rhopaloides Craig, Englund and Takaoka

HETEROPTERA

Corixidae

Micronecta ludibunda ludibunda Breddin

Gerridae

Limnogonus sp. undet.

Limnometra sp. undet.

Metrobatopsis browni J. Polhemus & D. Polhemus

Mesoveliidae

Mesovelia sp. undet. (small, not vittigera)

Notonectidae

Anisops sp. undet.

Enithares gibbera Brooks

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Rhagovelia browni Lansbury

Rhagovelia n. sp. (orange brown with complete pale pronotal band)

ODONATA

Platycnemididae

Lieftinckia lairdi Lieftinck

Salomonocnemis gerdae Lieftinck

Chlorocyphidae

Rhinocypha liberata Lieftinck

Station 64 (cont.)

Coenagrionidae

Pseudagrion incisurum Lieftinck

Teinobasis bradleyi Kimmins

Protoneuridae

Nososticta salomonis (Selys)

Station 65: SOLOMON ISLANDS, *Western Prov*., Piraka River, near Munda, tributary and large estuary, 0 m (from mouth to 750 m upstream), 4 August 2005, R. Englund.
8°16'43.2"S, 157°21'46.6"E

Station 5a: Tributary 2.4 km upstream of Piraka River mouth
8°15'41.7"S, 157°21'55.0"E

HETEROPTERA

Gerridae

Halobates peronis Herring

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

Rheumatometroides browni Hungerford & Matsuda

Veliidae

Rhagovelia n. sp. (New Georgia #1)

Station 66: SOLOMON ISLANDS, *Western Prov*., Rendova, Ugehele Village, Maradeva Stream (Ugehele water supply stream), 1.5 km from village (GPS reading taken on trail to stream due to thick vegetation at stream), 235-296 m, 6 August 2005, R. Englund
8°27'28.8"S, 157°23'16.3"E

HETEROPTERA

Gerridae

Metrobatopsis sp. undet.

Veliidae

Microvelia sp. undet. #1 (*gestroi* group)

Rhagovelia n. sp. #6 (Rendova #1)

Statiion 66 (cont.)

ODONATA

Protoneuridae

Nososticta salomonis (Selys)

Station 67: SOLOMON ISLANDS, *Choiseul Prov.*, Choiseul, river at Sene village, 3 m, 16 August 2005, D. Boseto 7°18'04.6"S, 157°05'57.3"E

ODONATA

Libellulidae

Genus and species undet.

Station 68: SOLOMON ISLANDS, *Choiseul Prov.*, Choiseul, Lumoto River, 23 m, 17 August 2005, D. Boseto 7°14'49.9"S, 157°07'12.6"E

HETEROPTERA

Gerridae

Metrobatopsis sp. undet.

ODONATA

Libellulidae

Agrionoptera insignis similis Selys

Protoneuridae

Nososticta salomonis (Selys)

Station 69: SOLOMON ISLANDS, *Choiseul Prov.*, Choiseul, Kolobangara River, 6 m, 25 August 2005, D. Boseto 6°59'05.6"S, 156°45'57.8"E

ODONATA

Coenagrionidae

Agriocnemis femina (Brauer)

Libellulidae

Agrionoptera insignis similis Selys

Station 69 (cont.)

Neurothemys stigmatizans bramina (Guerin)

Genus and species undet.

Protoneuridae

Nososticta salomonis (Selys)

Station 70: SOLOMON ISLANDS, *Choiseul Prov*., Choiseul, Bisilata Creek, 54 m, 25 August 2005, D. Boseto 6°59'23.6"S, 156°46'34.8"E

HETEROPTERA

Gerridae

Limnometra lipovskii Hungerford & Matsuda

Metrobatopsis sp. undet.

ODONATA

Chlorocyphidae

Rhinocypha tincta Selys

Protoneuridae

Nososticta salomonis (Selys)

Discussion

The aquatic insect biota of streams in the Solomon Islands shows certain obvious patterns of biotic segregation, both horizontally along terminal reaches according to salinity gradients, and altitudinally in the mid- and headwater reaches. Many rivers in the Solomons have extensive slack water estuaries which are horizontally stratified in regard to surface salinity, and along the length of such estuaries one observes a predictable faunal turnover in Heteroptera genera when progressing from euhaline (32 ppt.) waters at the seaward terminus to limnetic (0 ppt.) waters at the head of the estuary. Taxa typical of euhaline waters include the genera *Halobates* (Gerridae), *Hermatobates* (Hermatobatidae), *Thetibates* (Gerridae) and *Halovelia* (Veliidae). As one enters the mixohaline waters of the lower estuary these taxa are largely left behind, except for *Halobates peronis*, and replaced instead with a new suite of heteropteran genera including *Rheumatometroides* (Gerridae) and *Xenobates* (Veliidae). On mildly mixohaline waters near the head of the estuary *H. peronis* drops out, but the assemblage is augmented by *Rhagadotarsus* (Gerridae). Once truly limnetic waters are reached, the entire suite of estuarine genera is left behind, and replaced by

genera typical of freshwater terminal reaches, most typically *Metrobatopsis* (Gerridae), *Microvelia* (Veliidae), *Mesovelia* (Mesoveliidae), and *Limogonus* (Gerridae).

In addition this type of horizontal stratification in the lowlands, there is a clear altitudinal replacement of taxa as one progresses upslope and upstream within the limnetic portion of a river system. Terminal reach taxa include a signature assemblage of Odonata (*Pseudagrion microcephalum, Xiphiagrion, Agriocnemis*), and Heteroptera (*Metrobatopsis*, *Microvelia, Mesovelia, Limnogonus*). In the midreach, these genera are largely replaced or augmented by a different assemblage of Odonata (*Pseudagrion incisurum* and allies, *Nososticta, Rhinocypha*) and Heteroptera (*Metrobatopsis, Rhagovelia, Limnometra, Ochterus, Micronecta, Microvelia*). Finally, in the headwater reaches, one encounters the most diverse freshwater insect assemblages in the Solomons, including a rich array of Odonata (*Teinobasis, Rhinocypha, Nososticta, Pseudagrion, Lieftinckia*), Heteroptera (*Rhagovelia, Limnometra, Metrobatopsis, Anisops, Enithares, Mesovelia*) and Coleoptera (*Callistodineutus*). The composition of these assemblages is detailed in the taxon lists for individual sampling stations provided in the previous section.

The success of the aquatic insect surveys associated with this project may also be assessed by the many new island records for species, genera (or even families) of aquatic insects that were added to the documented biota of the Solomons, as follows (asterisks = new family, genus, or species record for the Solomon Islands as a whole):

Coleoptera

Gyrinidae

Dineutus (*Callistodineutus*) – New Georgia, Rendova

Heteroptera

Gerridae

Metrobatopsis – Ranongga, Vella Lavella, Choiseul, Kolombangara, Rendova

Rheumatometroides – Choiseul

Notonectidae

Enithares – Kolombangara, Rendova

Omaniidae*

*Corallocoris** – Makira

Saldidae

*Salduncula** – Makira

Veliidae

Rhagovelia – Ranongga, Rendova, New Georgia, Choiseul, Santa Isabel

Odonata

Chlorocyphidae

Rhinocypha – Ranongga, Vella Lavella, Rendova, New Georgia, Kolombangara, Choiseul, Santa Isabel, Malaita

Coenagrionidae

Agriocnemis femina * – Choiseul, Malaita

Ceriagrion erubescens - Malaita

*Ischnura heterosticta** – Malaita

Pseudagrion – Vella Lavella, Kolombangara, Rendova, New Georgia, Choiseul, Malaita

Teinobasis – Choiseul, Kolombangara, Malaita

Xiphiagrion – Guadalcanal, Gizo, Malaita

Isostictidae

Cnemisticta – Choiseul, Santa Isabel

Megapodagrionidae

*Argiolestes gizo** – Rendova

Platycnemididae

Lieftinckia – New Georgia, Choiseul

Protoneuridae

Nososticta – Ranongga, Vella Lavella, Rendova, New Georgia, Kolombangara, Choiseul, Santa Isabel

Based on analysis of our collections to date, it is clear that several groups of aquatic insects contain assemblages of locally endemic, undescribed species that will prove extremely informative in regard to both biogeographic patterns and conservation planning. Foremost among these is the genus *Rhagovelia* (Heteroptera, Veliidae) (Fig. 54), which is represented by multiple species on nearly every island so far visited. Only three species of *Rhagovelia* have been described from the Solomons to date (Lansbury, 1993), and we estimate that at least 18 further species await description in our collections. Similarly, the genus *Metrobatopsis* (Heteroptera, Gerridae) is a ubiquitous faunal component in the mid- and terminal reaches of perennial streams, where it skates on pools. Three endemic species have been described from the Solomons to date, on New Georgia, Guadalcanal, and Malaita (Polhemus & Polhemus, 1993), and additional new species are in hand from Vella Lavella and Choiseul, at a minimum. In the Odonata, the genus *Rhinocypha* (Chlorocyphidae) (Fig. 42) presents a very complex picture, with obvious local color forms occurring on different islands. Many of these could probably be assigned as new subspecies of *Rhinocypha tincta*, a lineage distributed from the Raja Ampat Islands eastward through New Guinea and the Bismarcks to the Solomons, but there is also a separate lineage involving the Guadalcanal endemic *Rhinocypha liberata*, which has alliances to the Moluccan region rather than to New Guinea.

A pattern of relationship between the Solomons region and the Moluccas has been remarked upon by several past authors, who found it puzzling. Lieftinck (1949), in a very foresighted comment, noted of *Rhinocypha liberata* that "The isolated occurrence of *R. liberata* in the Solomons and its apparent close relationship to the S. Moluccan species *terminata* Brauer, is a problem for which no satisfactory explanation can at present be given unless theories of continental drift – which assume very considerable horizontal movements on the part of the earth's crust – are taken into account and applied to the Australasian Archipelago." Ochs (1954) also had difficulty in grasping the

possibility of relationships between the Solomons and the Celebes-Moluccas sector that might exclude New Guinea. In discussing the relationships of *Dineutes bougainvilleanus*, endemic to Bougainville, he noted that "*D. ritsemai*…closely related to *D. bougainvilleanus*, is said to originate from Celebes. However, I doubt that a representative of this oceanic group occurs there." In light of modern geological knowledge, however, it is now possible to see that the Solomons and Celebes-Moluccas sectors could have been linked via island arcs that formed at the margin of the Caroline Plate in the Oligocene (Hall, 2002). In light of this, the endemic Solomon taxa reflective of this pattern take on a high priority for biological conservation as a consequence of their biogeographic significance.

Photographs of certain exemplar species of aquatic insects are provided in Figs. 37–54.

Fig. 37. *Lieftinckia lairdi*, from Charebuma River, Guadalcanal

Fig. 38. *Lieftinckia salomonis*, from upper Sakumbare River, New Georgia

Fig. 39. *Lieftinckia ramosa*, specimen from Parasi Falls, northern Choiseul.

Fig. 40. *Teinobasis* new sp., specimen from upper Sakumbare River, New Georgia.

Fig. 41. *Agriocnemis salomonis*, from the Gizo area

Fig. 42. *Rhinocypha liberata*, from Teneru Falls, Guadalcanal

Fig. 43. *Nososticta salomonis*, specimen from Choiseul

Fig. 44. *Argiolestes gizo*, specimen from tributary to upper Toropi River, Rendova

Fig. 45. *Agrionoptera insignis*, Malaita

Fig. 46. *Rhyothemis phyllis*, Malaita

Fig. 47. *Neurothemis terminata*, Malaita

Fig. 48. *Tapeinothemis boharti*, Kolombangara

Fig. 49. *Pseudagrion* n. sp., specimen from tributary to upper Toropi River, Rendova

Fig. 50. *Pseudagrion incisurum*, specimen from Kwarea River, Malaita

Fig. 51. *Ischnura* sp., specimen from Malaita

Fig. 52. *Xiphiagrion cyanomelas*, specimen from Gizo

Fig. 53. *Nerthra macrostyla*, specimen from Oula River, Vella Lavella

Fig. 54. *Rhagovelia* n. sp., New Georgia

AREAS OF FRESHWATER SPECIES ENDEMISM IN THE SOLOMON ISLANDS

Dan A. Polhemus and Ron Englund

Areas of endemism as treated herein refer to regions within the Solomon Islands which contain assemblages of endemic freshwater species that appear on the basis of current knowledge to display similarly circumscribed distributions. These areas of endemism are considered to be equivalent to nested sets, with certain larger areas (ie., the New Georgia Group) sometimes containing smaller distinctive subdivisions within them (Vella Lavella, Kolombangara, Rendova, etc.). These areas of endemism are listed in Table 6, mapped in Fig. 55, and described in the text below. It must be stressed that the areas of endemism defined herein apply to freshwater aquatic organisms only, and may not be congruent with those exhibited by other groups of plants and animals.

The approach of defining areas of endemism on the basis of congruent species distributions was used in previous reports dealing with Celebes (Polhemus and Polhemus, 1990) and New Guinea (Polhemus et al., 2004; Polhemus & Allen, 2007). In those studies, it was found that the single large islands such as Celebes or New Guinea could be viewed as multiple faunal units in terms of the distribution of their freshwater biotas. The situation in the Solomons is on one hand more straightforward, because endemism is largely clustered on discrete individual islands or groups of islands in close proximity, but is complicated by what appears to be a large amount of local differentiation of "races" or "forms" within species, indicative of incipient speciation. As a result it has been difficult in some groups (ie., *Rhinocypha*) to unambiguously define species limits, and therefore to use such species as adequate criteria for defining areas of endemism.

In the analysis below, we have relied heavily on the composition of the biota as currently described, but have also included notes regarding new species or local forms that appear to have further utility in establishing patterns of freshwater endemism in the archipelago. We also acknowledge that current patterns of insular endemism among aquatic insects in the Solomon Islands are underestimated on the basis of current taxonomy. Based on recent surveys, we have a large number of undescribed, locally endemic species in both Odonata (Chlorocyphidae, genus *Rhinocypha*) and Heteroptera (Veliidae, genera *Rhagovelia* and *Microvelia*).

AREA 1. ***BOUGAINVILLE + SHORTLAND ISLANDS***

Bougainville is the largest and highest island in the Solomons, being approximately 170 km. long (over 200 km. if one adds the closely associated island of Buka), and 40–50 km. in width. The island is actively volcanic, reaching a maximum elevation of 2715 m. at Mt. Balbi, lying west of Wakuna in the northern third of the island. The terrain of Bougainville is for the most part mountainous, but in the southern third there are extensive lowlands surrounding the

foothills of the Mt. Loloru volcano. The island's drainage pattern is predominantly radial, descending from the volcanic massifs, but due to the large size of the island some of the rivers in the south, such as the Puriata, still attain lengths in excess of 40 km. Bougainville also has a large number of lentic features, including lowland Lahala Lake and extensive surrounding swamps in the east on the Laluai Plain, small lowland Lake Kathleen near the Torokina airstrip, and the upland crater lakes of Billy Mitchell Lake and a nearby unnamed lake in Mt. Bagana, and Lake Loloru in Mt. Loloru.

Due to continuing political instability, and the consequent reluctance of the government of Papua New Guinea to grant access to the island for research, no aquatic surveys were conducted on Bougainville during the course of this study. However, examination of the scientific literature and existing museum collections demonstrates that the island is faunistically a part of the greater Solomons chain, and a clear area of endemism for aquatic insects, supporting endemic Heteroptera (*Rhagovelia* n.sp.), Odonata (*Lieftinckia kimminsi*), and Coleoptera (*Dineutes bougainvilleanus*).

AREA 2. ***CHOISEUL + SANTA ISABEL***

Area 2a. ***Choiseul***

Choiseul is similar to Santa Isabel in being a narrow, elongate island (Fig. 9); with closely associated islands near its eastern tip included it is approximately 180 km. long, with a maximum width of about 35 km., and reaches a height of 1067 m. at Mt. Maetambe, which rises near the geographical center of the island. Slopes on Choiseul rise steadily from the coast to the interior ridges, the crests of which are relatively flat and even, with no prominent peaks, massifs, or steep escarpments. Unlike adjacent Santa Isabel, which it resembles in overall form, Choiseul has several large interior river systems, particularly at its west end, that flow parallel to the long axis of the island for much of their length. Two of these rivers, the Kolombangara and the Vacho, are over 30 km. in length, and have extensive networks of tributaries. Overall, the geomorphology of streams and rivers on Choiseul is very similar to those on Santa Isabel, with swift, rocky headwaters and midreaches giving way to long terminal estuaries. There are no significant lentic features.

Our aquatic surveys on Choiseul to date have been concentrated on the western half of the island, from Choiseul Bay southeast to Katurasele, spanning elevations from 0–50 m. (Fig. 9).

Area 2b. ***Santa Isabel***

Santa Isabel is similar in shape to Choiseul, being a very elongate, relatively narrow island; its length, including closely associated small islands at its northwest tip, is approximately 240 km., while its width is only 30 km. The higher mountains of Santa Isabel are concentrated in its eastern half, with the highest elevation of 1219 m. being

reached on the Mt. Sasari massif immediately south of the main port of Buala. Despite its length, Santa Isabel lacks large interior river systems, with the longest river, the Kaipito, being less than 25 km. in length. The interior of Santa Isabel is basically a single long ridge that follows the axis of the island, with short drainage basins dropping from it to the north and south coasts. Streams are typically swift and rocky in their headwater reaches, making a transition below 50 m. elevation to long, slack water terminal estuaries. There are no significant lentic features.

Our aquatic surveys on Santa Isabel were concentrated in the area immediately inland of Buala, spanning elevations from 0–280 m. The remainder of this large island is essentially unknown in terms of its aquatic biota.

Based on current data from Heteroptera and Odonata, Choiseul and Santa Isabel appear to form a single area of freshwater endemism, with the two islands sharing an endemic damselfly species (*Lieftinckia ramosa*). There are also indications of individual endemism between the two islands, however: Choiseul supports an endemic gyrinid beetle (*Dineutes choiseulicola*), while Santa Isabel harbors an endemic damselfly (*Lieftinckia isabellae*).

AREA 3. ***NEW GEORGIA GROUP***

The islands of the New Georgia Group form a cohesive faunal unit, and share at least one endemic species of damselfly (an undescribed, red-colored *Pseudagrion* species). In addition, the individual islands within the group display varying degrees of aquatic endemism among their individual biotas:

Area 3a. ***Ranongga + Vella Lavella + Gizo***

Ranongga is a relatively small island, approximately 28 km. long by 8 km. wide, in the form of an elongate, steep-sided dome with a roughly north-south axis centered around Mt. Kela, which rises to 869 m. behind the village of Renjo (Fig. 8). The island represents the remnant eastern half of a volcanic cone, and is considerably higher in elevation than neighboring Vella Lavella or Gizo; on a clear day, it is visible at sea level from Rendova. All streams on Ranongga are swift and rocky, with steep bed profiles. There are no large rivers or major lentic features.

Aquatic surveys on Ranongga were concentrated in the vicinity of Boroi village on the east coast, at elevations between 0–70 m. (Fig. 8). The higher elevation aquatic biota of the island, at elevations above 100 m., remains unsampled.

Vella Lavella is an irregularly shaped island formed from the eroded remnants of at least three volcanoes, which form ranges of hills separated by lowland tracts. The island is relatively low, with the highest point being Mt. Tambisala, which lies in the northern half of the island and reaches 808 m. The lowland basins of the island contain several relatively large, slow rivers, one of which, the Oula, is over 10 km. in length. Due to its relatively low

elevation and gentle slopes, there are fewer swift, rocky streams on Vella Lavella than on other islands in the New Georgia group. There are no significant lentic features.

Current surveys were concentrated entirely in the Oula River basin at elevations below 100 m. Collections were made far enough up the northern tributaries of the Oula to reach the first gravel bottomed, swifter water streams in the outlying foothills of Mt. Tandeako, but overall the upland aquatic fauna of this island remains unknown.

Based on the distributions of Heteroptera (*Rhagovelia*, n. sp.), Vella Lavella and Ranongga appear to represent a combined area of local species endemism within the New Georgia Group.

Gizo is a small island lying between Vella Lavella and Kolombangara, being about 12 km. long and 6 km. wide, and is remarkable for harboring an endemic bird, the Gizo Whiteye. The island is also a major port and air hub for the western Solomons, and therefore seen more activity by aquatic biologists than many other parts of the Solomons. The island has a maximum elevation of 180 m. at Maringe Hill, and contains only a few small, rocky streams, and no significant lentic features.

Our aquatic surveys on Gizo spanned an elevational range from 0–25 meters, ranging from lowland ponds and mangrove swamps to small rocky streams. This island does not appear to harbor locally endemic aquatic species.

AREA 3b. ***Kolombangara***

Kolombangara is a massive volcanic island in the New Georgia Group, being nearly round in shape with a maximum diameter of about 30 km (Fig. 12). The summit rises to 1768 m. at Mt. Veve, making it the third highest island in the Solomons after Bougainville and Guadalcanal. Streams on Kolombangara flow in a radial pattern off the cone, and are generally rocky and steeply dropping. A single large, swift river, the Vela, drains the crater and flows to the south coast. There are no significant lentic features.

Aquatic surveys on Kolombangara were concentrated on the southern section of the island behind the port of Ringgi (Figs. 10, 12), and included both small upland creeks and the larger Vela River, across an elevation range from 0–150 m. Mangrove estuaries were also sampled in the vicinity of Ringgi.

Based on current data, Kolombangara supports endemic species of Heteroptera (*Rhagovelia*, n. sp.) and Coleoptera (*Dineutes bufo*), and as such can be considered a discrete area of endemism within the New Georgia Group.

AREA 3c. ***New Georgia***

New Georgia is a very irregularly shaped island approximately 85 km. long and 41 km. wide (Fig. 10), but rising to a maximum elevation of only 843 m. at Mt. Mose. The island consists of the eroded remnants of multiple volcanic craters, which form a set of interior massifs with intervening lowlands, similar in some respects to a larger version of Vella Lavella. Streams on New Georgia are rocky in their upper reaches, then make a transition to elongate, horizontally stratified terminal reach estuaries. Because the pattern of drainage is one of modified short, radial drainages that formerly flowed off of the now-extinct volcanoes, there are no large interior rivers over 20 km. in length. Streams in the southwestern portion of the island, behind Munda, traverse a karst plateau and frequently flow through caves.

Our current aquatic surveys reached many portions of New Georgia (Figs. 10, 13, 14), spanning elevations from 0–180 m. A wide array of aquatic habitats were sampled, including estuaries, lowland rivers, upland rivers, and small headwater streams in hilly terrain.

Based on current data, New Georgia shares certain local endemic species, such as the undescribed *Pseudagrion* damselfly, with the remainder of the New Georgia Group, but also harbors certain single island endemics in Odonata (*Teinobasis simulans*), Heteroptera (*Metrobatopsis lannae*), and Diptera (*Morops solomonense, Simuliium kerei*). As such, it can be considered a discrete area of aquatic endemism within the New Georgia Group.

The islands of Vonavona and Kohinggo that lie adjacent to New Georgia are low islands with karst interiors, and seem unlikely to harbor freshwater endemics. The high islands of Vangunu and Nggatokae, which lie immediately east of New Georgia, do possess significant areas of upland habitat drained by rocky streams, and would be capable of harboring endemic freshwater invertebrates; both have been heavily logged, however, and neither was visited during our current surveys, so the composition of their freshwater biotas remains unknown.

AREA 3d. ***Rendova***

Rendova is another irregularly shaped island that is formed from the eroded remnants of at least three separate volcanoes (Fig. 11). Two of these form the main body of the island, which is approximately 42 km. long and 20 km. wide, with a maximum elevation of 1060 m. reached at Rendova Peak on the northernmost massif. Streams on the island are swift and rocky throughout, following radial drainage patterns off the old volcanoes. There are also several small upland lakes.

Aquatic surveys on Rendova were conducted in several sectors of the island (Figs. 10, 11), across an elevational range from 0–250 m. The island appears to be a discrete area of endemism for Heteroptera (*Rhagovelia*, n. sp.) and Odonata.

AREA 4. ***GUADALCANAL***

Guadalcanal is the second largest in the Solomon chain (after Bougainville), and is roughly ovate shape, being approximately 160 km. long and 48 km. wide, with a mountainous interior throughout. The actual summit of the island is a matter of some dispute, but on the 1:150,000 scale map compiled by the Department of Geological Surveys, Honiara in 1962, it is shown as being Mt. Makarakomburu, with an elevation of 2447 m. (8026 ft.), although some believe that nearby Mt. Popomanaseu is actually higher. The northern coast of Guadalcanal, from Lungga Point eastward to Aola Bay, is traversed by large rivers that head in the central ranges and then flow in a northerly direction; some of these rivers are nearly 40 km. in length. By contrast, streams on the south coast, or "weathercoast," have much steeper and shorter profiles. There are no significant lentic features.

Our aquatic surveys on Guadalcanal were confined to the northwest quadrant of the island, but spanned a wide elevational range, from 0–460 m., and included a wide range of both lotic and lentic habitats.

Being the seat of government following World War II, Guadalcanal has had a larger amount of visitation by biologists, and is undoubtedly the best sampled of the Solomon Islands limnologically. This probably accounts in part for the high degree of aquatic species endemism recorded from the island, which includes endemic species of Odonata (*Rhinocypha liberata, Teinobasis imitans, Lieftinckia lairdi, Salomonocnemis gerdae*), Heteroptera (*Rhagovelia browni*), Coleoptera (*Dineutes pagdeni*) , and Diptera (*Morops kawagishii, Morops pohaense, Simulium rhopaloides, Simulium sherwoodi*).

AREA 5. ***MALAITA***

Malaita is a large, irregularly elongate island with a mountainous interior. The main island is about 170 km. long by 45 km. wide, but if one includes the closely proximal Maramasike Island, or "small Malaita", then the total length of the Malaita complex approaches 200 km. The highest interior elevation of 1433 m. is reached at Mt. Kolovrat, near the center of the island southeast of Auki. The interior mountains of Malaita are arranged into several roughly parallel massifs, with deep valleys between them, and certain of the rivers in these interior valleys, particularly the Wairaha, exceed 30 km. in length. Because of the mountainous nature of the terrain, most of Malaita's rivers flow swiftly to the sea and lack long estuaries. The island also contains a large freshwater lake, Lake Osi, near Auki.

Aquatic surveys on Malaita were confined to the northern half of the island, from Auki north to Dala, and then along a road transect across the central mountains toward Atori. Based on current data, Malaita is clearly an area of freshwater endemism within the Solomon Islands, harboring multiple endemic species of Heteroptera (*Metrobatopsis solomonensis, Rhagovelia amnica, Rhagovelia fulvus*) and Coleoptera (*Dineutes dispar, Dineutes dispersus*), and an endemic damselfly (*Lieftinckia malaitae*).

AREA 6. ***MAKIRA***

Makira, also known as San Cristobal, is the southeasternmost of the main Solomon Islands, and is elongate in form, being about 140 km. long and 40 km. wide. The interior is quite rugged and mountainous, rising to an elevation of 1250 m. behind Kirakira. There are several rivers of moderate size draining the the island's northeast coast, with two, the Ravo and the Warihito, being over 20 km. in length. Given the relative absence of flat lowland terrane on Makira, all streams and rivers tend to be swift and rocky throughout their lengths. Although Makira itself contains no significant lentic features, Santa Ana Island, also known as Owa Rafa, lying immediately to the east, contains two freshwater lakes, Lake Wairafa and Lake Waipiapia.

Surveys on Makira were concentrated in the Puepue River basin behind Kirakira, and covered elevations from 0–250 m. The island is an obvious area of endemism, with endemic species of Heteroptera (*Rhagovelia* n. sp.), Odonata (*Teinobasis obtusilingua, Lieftinckia* n. sp.), and Coleoptera (*Dineutes christobalensis*).

AREA 7. ***FLORIDA GROUP***

The Florida Group is a set of relatively small, low islands lying between Guadalcanal and Malaita. The group is about 50 km. long by 15 km. wide, with a maximum elevation of less than 200 m. Based on current data, the group contains an endemic species of Odonata (*Teinobasis chionopleura*), indicating that it may represent a discrete area of aquatic endemism.

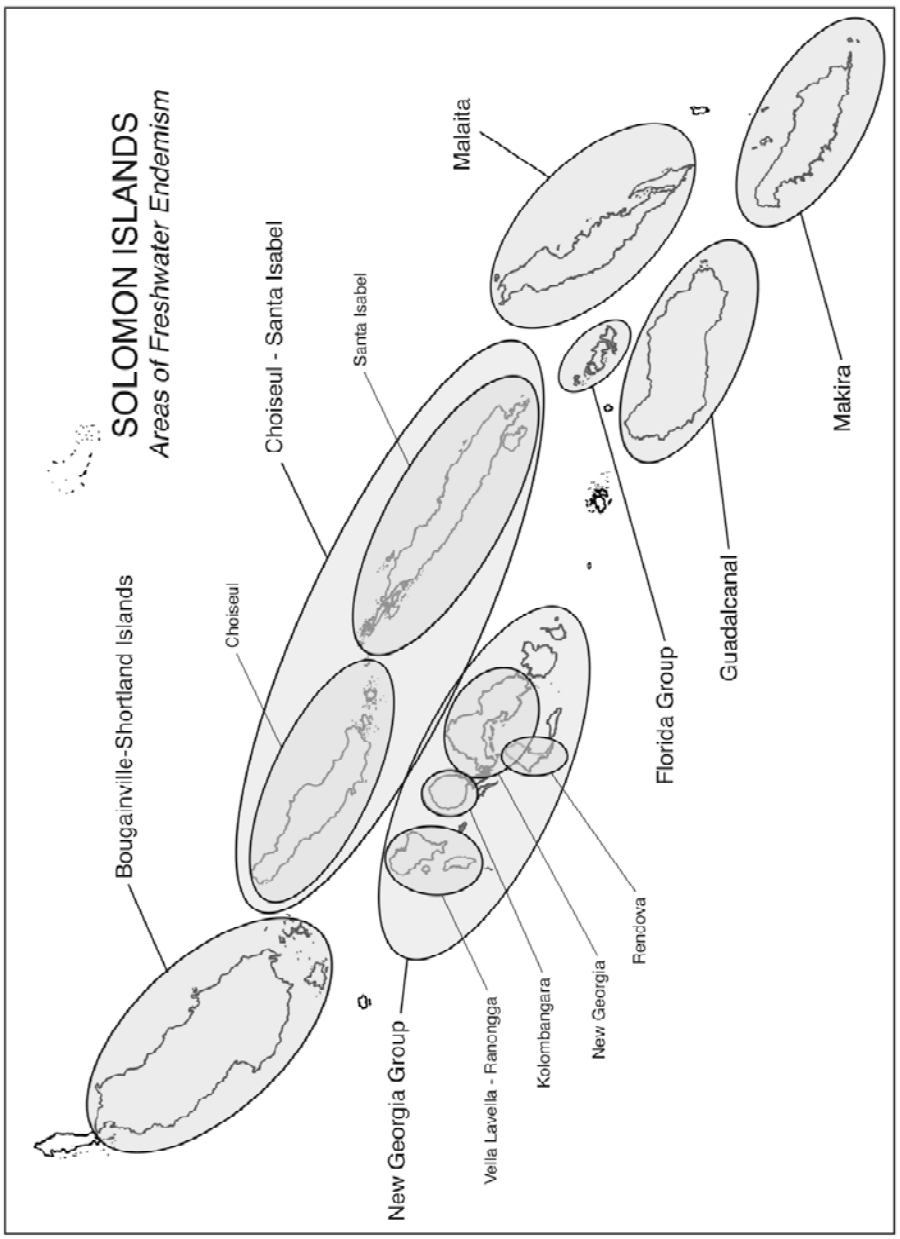

Fig. 55. Areas of freshwater endemism in the Solomon Islands as defined by combined evidence from fishes and aquatic insects.

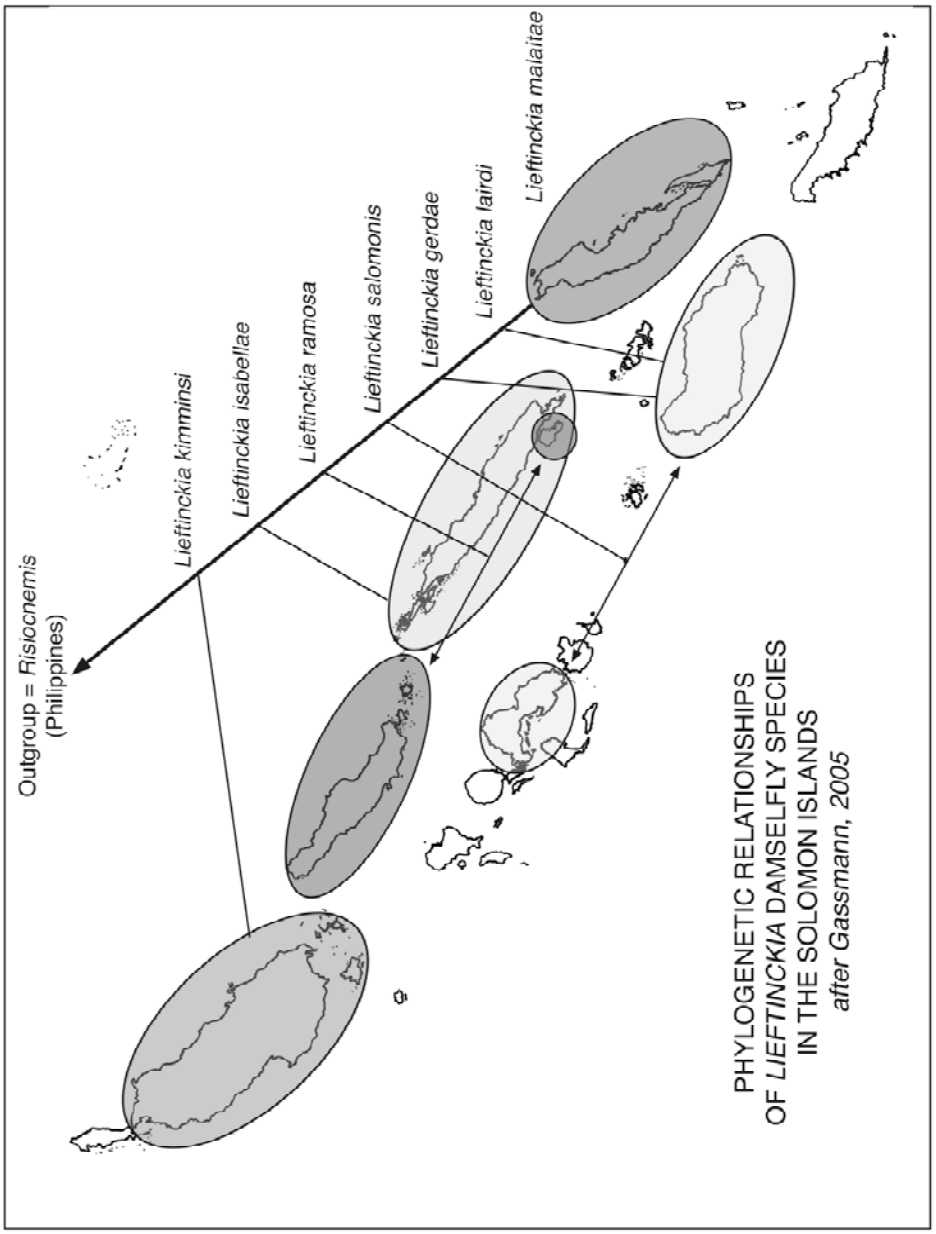

Fig. 56. Relationships between *Leiftinckia* damselfly species found in the Solomon Islands.

Table 6 – Taxa defining areas of freshwater endemism in the Solomon Islands

Area 1. **Bougainville** + **Buka** + **Shortland Islands**

COLEOPTERA

Gyrinidae

Dineutes (Callistodineutus) bougainvilleanus Ochs

ODONATA

Chlorocyphidae

Rhinocypha tincta adusta Lieftinck

Coenagrionidae

Papuagrion gurneyi Lieftinck

Note: Syn. with *Teinobasis aluensis* by Lieftinck (1986)

Teinobasis aluensis Campion

Teinobasis emarginata Lieftinck

Note: Syn. with *Teinobasis aluensis* by Lieftinck (1986)

Megapodagrionidae

Argiolestes bougainville Kalkman

Platycnemididae

Lieftinckia kimminsi Lieftinck

Area 2. **Choiseul** + **Santa Isabel**

COLEOPTERA

Gyrinidae

Dineutes (*Callistodineutus*) *choiseulicola* Brinck

HETEROPTERA

Veliidae

Microvelia sp. undet. #6

Microvelia sp. undet. #7 (subgenus *Picaultia*)

Rhagovelia n. sp. #12 (Choiseul #1)

Rhagovelia n. sp. #13 (Choiseul #2)

Rhagovelia n. sp. #16 (Santa Isabel #1)

Rhagovelia n. sp. #17 (Santa Isabel #2)

ODONATA

Platycnemididae

Lieftinckia isabellae Lieftinck

Lieftinckia ramosa Lieftinck

Area 3. **New Georgia Group**

Taxa defining Area 3 as a whole

ODONATA

Coenagrionidae

Pseudagrion n. sp.

Megapodagrionidae

Argiolestes bougainville Kalkman

Area 3a.**Vella Lavella + Ranongga**

HETEROPTERA

Veliidae

Microvelia sp. undet. #4

Microvelia sp. undet. #5

Rhagovelia n. sp. #1 (Vella Lavella #1)

Rhagovelia n. sp. #2 (Vella Lavella #2)

Area 3b. **Kolombangara**

COLEOPTERA

Gyrinidae

Dineutes (Callistodineutus) bufo Brinck

HETEROPTERA

Veliidae

Microvelia sp. undet. #8

Rhagovelia n. sp. #14 (Kolombangara #1)

Rhagovelia n. sp. #15 (Kolombangara #2)

Area 3c. **New Georgia**

DIPTERA

Simuliidae

Morops solomonense Takaoka & Suzuki

Simulium (Gomphostilbia) kerei Takaoka & Suzuki

HETEROPTERA

Gerridae

Metrobatopsis lannae J. & D. Polhemus

Veliidae

Microvelia sp. undet. #11

Rhagovelia n. sp. #3 (New Georgia #1)

Rhagovelia n. sp. #4 (New Georgia #2)

Rhagovelia n. sp. #5 (New Georgia #3)

ODONATA

Coenagrionidae

Teinobasis simulans Lieftinck

Area 3d. **Rendova**

HETEROPTERA

Veliidae

Microvelia sp. undet. #10

Rhagovelia n. sp. #6 (Rendova #1)

Rhagovelia n. sp. #7 (Rendova #2)

Rhagovelia n. sp. #8 (Rendova #3)

Area 4. **Guadalcanal**

COLEOPTERA

Gyrinidae

Dineutes (Callistodineutus) pagdeni Brinck

DIPTERA

Simuliidae

Morops kawagishii Takaoka & Suzuki

Morops pohaense Takaoka & Suzuki

Simulium (Gomphostilbia) rhopaloides Craig, Englund & Takaoka

Simulium (Gomphostilbia) sherwoodi Stone & Maffi

HETEROPTERA

Veliidae

Rhagovelia browni Lansbury

Rhagovelia n. sp. #18 (Guadalcanal #1)

ODONATA

Chlorocyphidae

Rhinocypha liberata Lieftinck (also on Ugi)

Coenagrionidae

Pseudagrion incisurum Lieftinck

Teinobasis imitans Lieftinck

Platycnemididae

Lieftinckia lairdi Lieftinck

Salomonocnemis gerdae Lieftinc

Area 5. **Malaita**

COLEOPTERA

Gyrinidae

Dineutes (Callistodineutus) dispar Brinck

Dineutes (Callistodineutus) dispersus Brinck

ODONATA

Megapodagrionidae

Argiolestes malaita Kalkman

Platycnemididae

Lieftinckia malaitae Lieftinck

HETEROPTERA

Gerridae

Metrobatopsis solomonensis Hungerford & Matsuda

Veliidae

Rhagovelia amnicus Lansbury

Rhagovelia fulvus Lansbury

Area 6. **Makira**

COLEOPTERA

Gyrinidae

Dineutes (*Callistodineutus*) *christobalensis* Brinck

HETEROPTERA

Veliidae

Microvelia sp. undet. #3

Rhagovelia n. sp. #9 (Makira #1)

Rhagovelia n. sp. # 10 (Makira #2)

Rhagovelia n. sp. #11 (Makira #3)

ODONATA

Coenagrionidae

Teinobasis obtusilingua Lieftinck

Area 7. **Florida Islands (Ngela Group)**

ODONATA

Coenagrionidae

Teinobasis chionopleura Lieftinck

THREATS TO FRESHWATER BIOTA IN THE SOLOMON ISLANDS

Dan A. Polhemus, Ron Englund and Gerald Allen

Although the overall condition of freshwater ecosystems in the Solomon Islands region is excellent, there are still obvious threats to the biota, which tend to manifest themselves on local rather than regional scales. These threats may be grouped into three general categories: 1.) physical alteration of habitat; 2.) use of biotic resources, and 3.) invasive species. Each of these threat categories is discussed separately below.

Physical Alteration of Habitat

Logging

Large-scale industrial logging, particularly by Malaysian and South Korean timber companies including Rimbunan Hijau, the Kumpulan Emas Group, Golden Springs International, and the Berjaya Group, is a clear threat to watershed integrity throughout the Solomon Islands. The country's weak economy has caused an undue reliance on logging exports, taxes on which represent over 60% of government income (even though such income is significantly diminished by unscupulous logging company practices such as transfer pricing and under-reporting of log prices), while at the same time the environmental impacts have been largely overlooked or ignored (Duncan, 1994). Between 1990 and 1995, logging by Asian companies was estimated to be at least twice the maximum sustainable yield of 325,000 cubic meters per year, and the government has issued licenses for up to 4 million cubic meters per year, which would amount to 12 times the sustainable rate (Lineback, 1998). The ubiquity and extent of logging operations in the Solomons (Fig. 57) is well illustrated by the fact that our aquatic survey teams were able to reach interior sites on Choiseul, New Georgia and Rendova primarily by making use of logging roads and trucks (Fig. 58).

The effects of logging are evident in every part of the country, and have had enormous impacts on streams and nearshore reefs. The obvious and disastrous effects of clear-cutting aside, even selective logging by such companies results in an extensive network of secondary roads that create widespread siltation and stream impoundment problems (Figs. 57–59, 62). Although tree-falls are a natural element of the Melanesian rainforest and the small impoundments resulting from them are encountered on nearly every forest stream in the region, particularly in the lowlands, logging tends to greatly increase the number of such channel obstructions, increasing pool habitat and decreasing riffles. Logging roads also tend to employ rudimentary bridges that subsequently collapse, creating further impoundments. Opening the forest canopy also increases insolation and thereby increases water temperature. The overall effect, then, is to create a stream that is warmer, more slowly flowing, and traps more sediment.

In addition, the extensive network of logging roads (Fig. 58) has provided a pathway by which invasive species, particularly the little fire ant (*Wasmannia auropunctata*), have spread into previously intact native ecosystems, with significant negative impacts to certain elements of the aquatic invertebrate biota (see subsequent discussion).

Shifting cultivation

The impacts of shifting cultivation are similar to those of clearcut logging, but on a far more localized scale (Fig. 60). In traditional village settings, the effects of shifting cultivation were mitigated over time by the fact that such garden patches were relatively small and widely dispersed. In many cases, if all available garden areas had been used at least once, entire villages simply relocated to alternative sites, allowing the old gardens to go back to forest. This latter trend has intensified over the last one hundred years as the population base has gradually shifted from inland to coastal locations (Bayliss-Smith et al., 2003), producing dense forest cover in formerly cultivated areas.

In general, shifting cultivation tends to have disproportionate impacts on first order streams (the smallest streams in a given drainage network), which are characteristic of the ridge slopes on which gardens are usually established. Creeks passing through newly cleared garden areas are usually exposed to intense sunlight and air high temperatures, and obstructed by massive tangles of vines and tree branches that in many cases make them nearly impossible to traverse. These ecosystem impacts can produce significant faunal changes, with deep forest species that require cooling shade, particularly certain genera of Odonata, being absent in such areas. Provided that a patchwork of forest and garden plots remains intact, however, such forest biota will eventually recolonize streams in former garden areas once a canopy of native trees is re-established.

Plantations

Like logging, cocoa and oil palm plantations result in wholesale ecosystem conversion that has broad impacts across entire stream catchments (Fig. 60–62). The creation of a plantation requires initial land clearing equivalent to clear cut logging (which may in fact be the first step if the proposed plantation area is covered with primary forest), after which a new monocultural canopy structure eventually becomes established (Fig. 62). Nutrient inputs from such plantations into adjacent streams appear to be high, probably due to fertilizer and other agrochemical runoff, leading to a proliferation of algae and consequent impacts on the benthic biota. Because plantation development is generally undertaken on relatively flat lowland sites, particularly The Plains area of northern Guadalcanal and in the Russell Group (Fig. 61), it disproportionately impacts the terminal reaches of streams via clearance of alluvial and swamp forests, with consequent impacts on diadromous biota similar to those described subsequently for mining. On New Britain, for instance, two of us (DP and GA) have noted that the channelization of lowland stream reaches in plantation areas has created a barrier to the upstream migration of diadromous species, leaving the upper reaches of such streams devoid of itinerant prawns and fishes, and similar effects can be expected in the Solomon Islands.

Mining

At present, mining operations in the Solomon Islands are relatively limited, with the largest being the Gold Ridge mine on Guadalcanal. This prospect was first identified in the 1930s, but active mining and milling did not begin there until August 1998, and was curtailed a mere two years later, in June 2000, due civil unrest. During this two year period, the mine produced 210,000 ounces of gold. The mine is now under new ownership, Australian Solomons Gold Limited, which in late 2005 received government approval to reopen the mine, is refurbishing the project infrastructure, and intends to resume production in December 2007, with a target output of 150,000 ounces of gold per year (data taken from the ASG website). The Panguna copper mine on Bougainville was formerly an even larger operation, employing 4000 people in the 1980s to exploit an ore body estimated at 900 million tons (Holdsworth, 1982), but closed in 1989 due to a separatist movement that targeted the mine over failure to pay adequate compensation. The Solomon Islands also contain documented but as yet unexploited deposits of gold-silver (notably on Vangunu), lead-zinc, nickel, phosphate, bauxite, chromite and manganese, providing clear potential for increased mining development in the future.

Large-scale mines such as those mentioned above have had obvious negative impacts in regard to river systems immediately downstream, notably the Tinahulu River on Guadalcanal, and the Jaba River on Bougainville. Attempts to mitigate these impacts, which include siltation and chemical contamination, particularly from cyanide, appear to have been limited in the past, although the current owner of the Gold Ridge mine, Australian Solomons Gold Limited, has promised improvements in this regard.

Although large-scale mining produces dramatic local impacts that are highly visible, a more pernicious set of impacts often arises from small-scale gold mining efforts that often spring up around the margins of larger operations. During our upland surveys near Gold Ridge, for instance, we noticed small-scale placer mines contaminating the local mountain creeks with plumes of sediment. At present, it does not appear that these artisanal miners in the Solomons are using mercury to the same extent as occurs in New Guinea (Polhemus et al., 2004), and any such practice should be discouraged. Being non-soluble, mercury remains in river sediments indefinitely, and may be difficult to detect, since it is possible for river water to flow clear of mercury even when high levels of mercury are present in the river bed. Such mercury contamination, however, frequently enters the riverine food chain, where it is amplified through successive trophic levels, eventually posing severe risks to local human populations who consume fish and crustaceans.

In contrast to logging or oil palm plantations, which degrade entire catchments via wholesale landscape conversion, mining effluents generally impact only the main stem of any given catchment, leaving most tributaries undisturbed and available as potential reservoirs of biotic recolonization. The degradation of main stem rivers, however, particularly in the terminal reaches, can have serious impacts on certain diadromous faunal elements such as fish and

prawns, preventing completion of the longitudinal migrations essential to their life cycles and thereby potentially extirpating them from certain river systems.

Dams

There are currently no large hydropower dams in the Solomon Islands, and given the geologically unstable nature of this volcanically active and earthquake-prone archipelago, their future development seems uncertain at best. A few dam sites have been scouted on Guadalcanal, notably at the mouth of the Lungga River gorge near Honiara, but there are no development plans actively underway.

Even if currently envisioned dams were constructed, their impacts would be confined to the mid- and terminal reaches of a few individual river catchments. Given the short, discrete nature of many Solomon Islands drainage basins, and the sharp topographical divides separating them, the environmental changes caused by any one dam, although locally dramatic, would have little overall effect on the aquatic biota of a given island, and would not serve to endanger any endemic species in a global sense.

Ungulates

The impacts of introduced ungulates, particularly pigs, on aquatic systems in the Solomon Islands are probably underappreciated. In New Guinea, Polhemus *et al*. (2004) noted that in some upland areas such impacts were significant and extensive, creating slope terracing, converting valley bottoms into muddy marshes, and increasing river siltation and water turbidity. Given the heavily forested nature of the Solomon Islands, the absence of a significant population base in upland areas (except on Malaita), and the general absence of horse and cattle grazing, impacts such as those described above are largely confined to a few circumscribed areas in the coastal lowlands near the larger towns. Pigs are widely kept throughout the Solomon Islands, and can have localized impacts on forests and streams in the vicinity of villages, particularly in regard to loss of understory vegetation. Feral pigs are intensively hunted throughout the Solomons, which probably serves to keep their numbers in check to some extent. It is unknown if they act as vectors of the water-borne disease leptospirosis, as they do in the Hawaiian Islands, but this seems likely.

Utilization of Biotic Resources

Live aquarium fish trade

Based on our observations, there appears to be little impact on the native fauna due to the live aquarium fish trade. As far as we can determine there is little or no commercial harvesting of wild fishes for such purposes, probably due to the absence of reliable air international air service which would be necessary to transport them. In addition, the

highly desirable rainbow fishes, which form a major component of such trade in New Guinea, are absent in the Solomon Islands, whereas the native sicidyine gobies, although colorful at certain life stages, command little interest from aquarium enthusiasts.

Impact of food fish harvesting on native fishes

There is virtually no data on the harvest of native fishes for human consumption or the possible impact of this activity on native fishes in general. Compared to the considerable harvest of marine fishes, the amount of freshwater fish harvest seems relatively insignificant. Nevertheless, people living along some of the terminal reaches of major river systems probably depend on freshwater fishes for a significant portion of their diet. Traditional fishing methods appear to have minimal impact on the native fish fauna, given that they have been used for centuries and continue to be sustainable.

A variety of fishing methods are employed, including hook and line from canoes, homemade traps, and various nets ranging from simple one-person hoop nets to large seines and gill nets. Streams, some of considerable size, are sometimes diverted and the former channel containing isolated pools with dense fish concentrations are then netted or speared. Some villages also employ derris root to poison ponds, stagnant pools or slow flowing sections of creeks. In addition, local fishers are usually adept at catching by hand gudgeons and other fishes that hide in crevices.

Recreational Fishing

Recreational fishing is a booming worldwide business fueled by growing numbers of fanatical anglers that have proven their willingness to spend large sums of money to seek out the most remote and pristine fishing experiences available on the planet. To capitalise on this recent trend, numerous fishing lodges and charter boat operations have been established throughout the South Pacific region during the past decade. These businesses, usually owned and operated by foreign expatriates and staffed by local villagers, specialise in providing a memorable “trip of a lifetime” experience for anglers in wild and exotic locations.

The Solomon Islands is one such exotic location that is now home to at least half a dozen privately operated tourist lodges and charter boats that offer angling for guests. The pristine aquatic and marine environments of the Islands allow guests the opportunity of a variety of angling experiences ranging from big game fishing on the open ocean to lure fishing in the serene creeks and rivers. The fishing tourism industry is very much in it’s infancy in the Solomons, hence the impact on both the country’s economy and its fisheries stocks is minimal at this stage. No doubt more of these businesses will be established in the future, which will be a valuable boost for the local economy and should assist in the protection and enhancement of local fish stocks because of the practice of “catch-and-release” angling that predominates among keen sports fishermen.

The development of a sport fishing sector would also be likely to promote conservation of those remaining rivers which are still surrounded by tracts of native forest, because such areas are prime habitat for *Lutjanus fuscescens*, colloquially known to fishermen as the "Papuan Spot-tail Bass." One example of such a system is the lower Pundokona River on New Georgia island near Jericho, which has been spared from logging due to the efforts of local residents, and is also renowned for the quality of its spot-tail bass fishing (Fig. 63).

Invasive Species

Fishes

No invasive freshwater fishes were detected during the aquatic surveys associated with this project, but apparently tilapia (*Oreochromis mossambica*) were introduced for aquaculture purposes in the 1950 and are present in certain lowland rivers on Guadalcanal, as well as in the lake on Rennel Island (which our team did not visit). In addition, ornamental Poeciliidae (*Poecilia reticulata*) and goldfish were observed in an aquarium at a Chinese restaurant in Honiara, although they had apparently not been released into local streams.

It is vital that the spread of *Tilapia* be controlled in the Solomon Islands, as it is notorious for drastically changing stream ecology to the detriment of native species. The same can be said for mosquitofish (*Gambusia* spp.) and carp (*Cyprinus carpio*), which have been widely introduced on New Guinea, sometimes under the auspices of foreign aid donors. We know of no introductions of gamefishes for sport fishing, due to the lack of large upland rivers or reservoirs, and we are similarly unaware of any biocontrol introductions of mosquitofishes or other poeciliids, although their presence on Guadalcanal would not be surprising. There is absolutely no justification for the introduction of exotic species anywhere in the Solomon Islands, and the government should strive to maintain the current relative absence of such species.

Aquatic Weeds

Although not widespread, nusiance aquatic weeds were encountered at several locations in the Solomon Islands during the course of our surveys. In particular, water hyacinth (*Eichornia crassipes*) was observed by our survey team to have extensively infested the terminal reach of the Oula River on western Vella Lavella, above the reach of tidal influence. This weed was also observed to be choking the outlet area of Lake Osi on Malaita.

Ants

By far the most pernicious invasive species in regard to its impact on the native aquatic biota of the Solomon Islands is the little fire ant, *Wasmannia auropunctata*. This species, only 1–2 mm in length and native to South and Central America, was introduced to the Solomon Islands sometime after World War II, and has subsequently spread

throughout the archipelago. In its native range in South America, *Wasmannia* may become a pest in disturbed forests and agricultural areas (Wetterer, 2006), and in the Solomons this species also appears to prefer fragmented or forest edge habitats, including village gardens, stream riparian zones, and logging roads; it has been spread by the proliferation of the latter far into the interior of most large islands in the Solomons chain. *Wasmannia* been documented to reduce native arthropod diversity in West Africa (Wetterer et al., 1999), the Galapagos (Lubin, 1985), and New Caledonia (Jourdan, 1997), and appears to be having similar effects in the Solomon Islands.

Along streams in the Solomons, *Wasmannia* will colonize the wet riparian zone and adjacent rheocrenes, where it appears to have a significant impact on the species richness and abundance of native arthropods, including the heteropteran familes Salididae, Ochteridae, Hebridae, Mesoveliidae and Gerridae, and on emerging Odonata, particularly Zygoptera. We often observed that in areas where *Wasmannia* was abundant in the riparian zone, littoral dwelling Heteroptera such as Salididae would only be found on wet, mossy midstream rocks that *Wasmannia* could not reach due the the intervening water barrier. In addition, a *Metrobatopsis* water strider taken at the Tenaru River on Guadalcanal was found to have a *Wassmannia* attached to its antennae by the ant's tightly clamped jaws, demonstrating that even species skating on the open water surface are not immune to this pest if they shelter under banks with overhanging vegetation that harbors *Wassmannia*. We have also observed that higher elevations and in the "big bush" of the deeper forests, *Wasmannia* is noticably less abundant, which may explain why native aquatic insects now display increased abundance and diversity in such areas.

Fig. 57. Logging depot at Putagita harbor New Georgia. Such logging provides over 50 percent of the Solomon Islands' export earnings, but is unsustainable at current rates.

Fig. 58. Logging roads onVangunu Island, New Georgia Group. Such roads fragment the rainforest landscape, contribute to siltation of headwater streams, and provide corridors for invasive species such as the little fire ant, *Wassmannia auropunctata*.

Fig. 59. Siltation of nearshore reefs and estuaries from logging operations, Vangunu Island, New Georgia Group.

Fig. 60. Burning anthropogenic grasslands in the lower foothills of northern Guadalcanal.

Fig. 61. Oil palm plantations, Russell Islands. Plantation agriculture, unlike shifting cultivation, results in wholescale landscape conversion, with corresponding loss of native biodiversity,

Fig. 62. Clearcut lowland rainforest converted to incipient plantations, New Georgia.

CONCLUDING REMARKS

The foregoing analysis of endemism and threats clearly demonstrates that even though the aquatic biota of the Solomon Islands is still largely intact, it faces increasing dangers on many fronts, a situation reflective of aquatic biotas across Melanesia as a whole. Unlike the situation in New Guinea, where invasive species appear to be the most pressing threat facing the regional aquatic biota (Polhemus et al., 2004), in the case of the Solomons it is clearly physical destruction or alteration of aquatic habitats by logging that poses the greatest risk. Curtailing such destruction will be difficult, given the substantial contribution that logging currently makes to the country's economy, but it is also clear that the current rate of extraction is unsustainable, so that in the long run the impacts from logging will be self-limiting, albeit only after an exceptional amount of ecological damage has been inflicted.

For the few invasive aquatic species already present, particularly *Wassmannia* fire ants, it is important to understand what effects they are having, and how quickly they are expanding their ranges. Such studies would make excellent research projects for local students at universities and secondary schools in the region. Of further concern are continuing fish introductions promoted by the U.N. and its various agencies such as Food and Agriculture Organization to provide alternative protein sources and cash earning opportunities. Werry (1998) documented the introduction of six invasive fish species to New Guinea between 1991 and 1997 through FAO programs, and a similar government-sponsored introduction of *Tilapia* has also occurred in the Solomon Islands. These introductions threaten the unique vertebrate and invertebrate biodiversity found in the streams of Melanesia. Only through a proper base of scientific knowledge can such impacts be mitigated or avoided, thereby conserving these remarkable freshwater communities for future generations.

Fig. 63. Chris Filardi with Papuan spot-tail bass (*Lutjanus fuscescens*), on the lower Pundokona River, New Georgia. Sport fisheries offer a viable tourist industry that can be developed on the remaining undisturbed rivers of the Solomon Islands.

APPENDICES 1–5

FAUNAL CHECKLISTS FOR SOLOMON ISLANDS FRESHWATER SURVEYS

APPENDIX 1

CHECKLIST OF THE FRESHWATER FISHES OF THE SOLOMON ISLANDS
COLLECTED DURING THE PRESENT SURVEYS

PERCIFORMES

- Anguillidae
  - *Anguilla marmorata*
- Ambassidae
  - *Ambassis interrupta*
  - *Ambassis miops*
- Apogonidae
  - *Apogon* sp.
- Carangidae
  - *Caranx papuensis*
- Eleotridae
  - *Belobranchus belobranchus*
  - *Butis amboinenis*
  - *Eleotris fusca*
  - *Hypseleotris guentheri*
  - *Ophieleotris hoedti*
  - *Ophieleotris margaritacea*
- Gobiidae
  - *Awaous* sp.
  - *Glossogobius* sp. 1
  - *Glossogobius* sp. 2
  - *Lentipes multiradiatus*
  - *Lentipes* sp.
  - *Redigobius bikolanus*
  - *Redigobius leptochilus*
  - *Schismatogobius marmoratus*
  - *Sicyopterus lagocephalus*

Sicyopterus longifilis?

Sicyopterus sp. 1

Sicyopterus sp. 2

Sicyopus discordipinnis

Sicyopus mystax

Sicyopus zosterophorum

Stenogobius hoesei

Stiphodon atratus

Stiphodon birdsong

Stiphodon rutilaureus

Stiphodon semoni

Hemirhamphidae

Zenarchopterus dispar

Kuhlidae

Kuhlia marginata

Kuhlia rupestris

Lutjanidae

Lutjanus argentimaculatus

Lutjanus fuscescens

Mugilidae

Liza vaigiensis

Muraenidae

Gymnothorax polyuranodon

Rhyacichthydae

Rhyacichthys aspro

Scatophagidae

Scatophagus argus

Syngnathidae

Microphis brachyurus

Microphis leiaspis

Microphis retzi

Terapontidae

Mesopristes argenteus

Mesopristes cancellatus

Terapon jarbuas

Toxotidae

Toxotes jaculatrix

APPENDIX 2

CHECKLIST OF THE AQUATIC HETEROPTERA OF THE SOLOMON ISLANDS

Endemic species marked with an asterisk (*)

GERROMORPHA

Gerridae

Halobates browni Herring	New Georgia, Kolombangara, Mbanga
Halobates calyptus Herring	Lola Is. (Vonavona Lagoon), Gizo, Choiseul
Halobates maculatus Herring	Lola Is. (Vonavona Lagoon), Gizo, Vella Lavella, Choiseul
Halobates micans Eschscholtz	Solomons
Halobates peronis Herring *	Vella Lavella, New Georgia
Halobates princeps White	Solomons
Halobates proavus White	Solomons
Limnogonus fossarum skusei Andersen	Widespread
Limnogonus fossarum rennellensis Brown*	Rennell Is.
Limnogonus luctuosus Montrouzier	Widespread
Limnometra hysterema Nieser & Chen*	Guadalcanal
Limnometra lipovskyi Hungerford & Matsuda	Guadalcanal
Metrobatopsis browni J. & D. Polhemus*	Guadalcanal, San Cristoval
Metrobatopsis lannae J. & D. Polhemus*	New Georgia
Metrobatopsis solomonensis H. & M*.	Malaita
Neogerris parvula (Stal)	Guadalcanal
Rhagdotarsus kraepelini Breddin	Vella Lavella, New Georgia
Rheumatometroides browni H. & M	Bougainville
Thetibates matawa (Lansbury)*	New Georgia, Kolombangara

Hermatobatidae

Hermatobates weddi China	New Georgia (Munda), Vella Lavella, Choiseul, Mbanga

Hydrometridae

Hydrometra horvathi H. & E.	Guadalcanal

Mesoveliidae	
Mesovelia subvittata Horvath	Guadalcanal
Mesovelia vittigera Horvath	Guadalcanal
Veliidae	
Halovelia annemariae Andersen	New Georgia; Lola Is. (Vonavona Lagoon), Kolombangara, Mbanga, Ranongga
Halovelia bergrothi Esaki	New Georgia, Lola Is. (Vonavona Lagoon), Gizo, Choiseul
Halovelia esakii Andersen	Olu Malu (Three Sisters)
Halovelia oculata Lansbury*	Kolombangara (1 female)
Halovelia n. sp. (nr. *lannae*) *	Makira
Haloveloides browni (Lansbury)*	Rendova, Mbanga, Ranongga, Ulawa, Lola Is. (Vonavona Lagoon)
Haloveloides papuensis (Esaki) (= *carinata* Lansbury)	Lola Is. (Vonavona Lagoon), New Georgia, Mbanga
Microvelia rennellensis Brown	Rennell Is.
Microvelia sp. undet. #1 (= *gestroi* group)*	Vella Lavella, Ranongga, New Georgia, Rendova, Guadalcanal, Makira, Choiseul, Malaita
Microvelia sp. undet. #2 (subgenus *Picaultia*)	Gizo
Microvelia sp. undet. #3*	Makira
Microvelia sp. undet. #4*	Ranongga
Microvelia sp. undet. #5*	Vella Lavella
Microvelia sp. undet. #6*	Choiseul
Microvelia sp. undet. #7 (subgenus *Picaultia*)	Choiseul
Microvelia sp. undet. #8*	Kolombangara
Microvelia sp. undet. #9 (subgenus *Picaultia*)	Rendova
Microvelia sp. undet. #10*	Rendova
Microvelia sp. undet. #11*	New Georgia
Microvelia sp. undet. #12 (subgenus *Picaultia*)	Guadalcanal
Microvelia sp. undet. #13 (subgenus *Microvelia*)	Guadalcanal
Ocheovelia solomon (Andersen)*	Gizo, Kolombangara, Choiseul, Mbangga, Makira, Lola Is. (Vonavona Lagoon), Vella Lavella
Phoreticovelia n. sp.*	Gizo

Rhagovelia amnicus Lansbury*	Malaita
Rhagovelia browni Lansbury*	Guadalcanal
Rhagovelia fulvus Lansbury*	Malaita
Rhagovelia n. sp. #1 (Vella Lavella #1)*	Vella Lavella,Ranongga
Rhagovelia n. sp. #2 (Vella Lavella #2)*	Vella Lavella
Rhagovelia n. sp. #3 (New Georgia #1)*	New Georgia
Rhagovelia n. sp. #4 (New Georgia #2)*	New Georgia
Rhagovelia n. sp. #5 (New Georgia #3)*	New Georgia
Rhagovelia n. sp. #6 (Rendova #1)*	Rendova
Rhagovelia n. sp. #7 (Rendova #2)*	Rendova
Rhagovelia n. sp. #8 (Rendova #3)*	Rendova
Rhagovelia n. sp. #9 (Makira #1)*	Makira
Rhagovelia n. sp. # 10 (Makira #2)*	Makira
Rhagovelia n. sp. #11 (Makira #3)*	Makira
Rhagovelia n. sp. #12 (Choiseul #1)*	Choiseul
Rhagovelia n. sp. #13 (Choiseul #2)*	Choiseul
Rhagovelia n. sp. #14 (Kolombangara #1)*	Kolombangara
Rhagovelia n. sp. #15 (Kolombangara #2)*	Kolombangara
Rhagovelia n. sp. #16 (Santa Isabel #1)*	Santa Isabel
Rhagovelia n. sp. #17 (Santa Isabel #2)*	Santa Isabel
Rhagovelia n. sp. #18 (Guadalcanal #1)*	Guadalcanal
Xenobates oculata Lansbury*	Kolombangara
Xenobates seminulum Esaki	Kolombangara, Vella Lavella, Ranongga
Xenobates solomonensis Lansbury*	New Georgia

NEPOMORPHA

Corixidae

Micronecta ludibunda ludibunda Breddin	Solomons
Micronecta virgata Hale	Solomons

Gelastocoridae

Nerthra gurneyi Todd*	Guadalcanal
Nerthra macrostyla Todd*	Bougainville, Kolombangara, New Georgia, Vella Lavella
Nerthra macrothorax (Montrousier)	Guadalcanal
Nerthra omani Todd*	Guadalcanal

Nerthra parallelus Lansbury*	New Georgia
Notonectidae	
Anisops browni Lansbury*	Guadalcanal, Ugi Is.
Anisops capitata Lansbury* (synonym of *A. elstoni*?)	Solomons
Anisops cheesmanae Lansbury*	Solomons
Anisops leucothea Esaki	Solomons
Anisops nasuta Fieber	Solomons
Anisops philippiensis Brooks	Guadalcanal
Anisops tahitiensis Lundblad	Guadalcanal
Enithares gibbera Brooks*	Guadalcanal
Enithares loria Brooks	Solomons
Ochteridae	
Ochterus nigrinus Baehr*	Guadalcanal
LEPTOPODOMORPHA	
Leptopodidae	
Valleriola "*solomonensis*" manuscript species*	Solomons
Omaniidae	
Corallocoris sp. undet.	Makira
Saldidae	
Micracanthia ornatula (Reuter)	Vella Lavella
Saldula sonneveldti Blote	Ontong Java
Saldula parens Cobben*	Guadalcanal, Kolombangara
Saldula solomonensis Cobben*	Guadalcanal
Salduncula n. sp.*	Makira, Choiseul

Total recorded genera: 28

Endemic genera: 0

Percentage endemism at the generic level = 0%

Total recorded species: 94

Endemic species: 56

Percentage endemism at the species level = 60%

Known endemic species awaiting description: 31

APPENDIX 3

CHECKLIST OF THE ODONATA OF THE SOLOMON ISLANDS

Endemic species marked with an asterisk (*)

ZYGOPTERA	
Chlorocyphidae	
Rhinocypha tincta adusta Lieftinck*	Shortland Islands; Bougainville (?)
Rhinocypha liberata Lieftinck*	Guadalcanal; Ugi
Coenagrionidae	
Agriocnemis exsudans Selys	Santa Cruz Is. (Anuda Is.)
Agriocnemis femina Brauer	Choiseul, Malaita
Agriocnemis pygmaea (Rambur)	Guadalcanal
Agriocnemis salomonis Lieftinck*	Guadalcanal; Ganonga Is. (nr. Vella Lavella), Santa Isabel
Ceriagrion erubescens Selys	Guadalcanal, Malaita
Ischnura aurora aurora Brauer	Guadalcanal, Sikiana Is. (E, of Malaita)
Ischnura heterosticta Burmeister	Malaita
Papuagrion gurneyi Lieftinck*	Bougainville
Note: Syn. with *Teinobasis aluensis* by Lieftinck (1986)	
Pseudagrion incisurum Lieftinck*	Guadalcanal
Pseudagrion microcephalum (Rambur)	Rennell; Russell
Pseudagrion n. sp.*	Vella Lavella, New Georgia, Kolombanaga
Teinobasis aluensis Campion*	Shortland Islands, Bougainville, ?Santa Cruz Is. (Materan Is.)
Teinobasis bradleyi Kimmins*	Guadalcanal, Malaita, Santa Isabel, Bougainville
Teinobasis chionopleura Lieftinck*	Florida Is. (Ngela Group)
Teinobasis emarginata Lieftinck*	Shortland Islands
Note: Syn. with *Teinobasis aluensis* by Lieftinck (1986)	
Teinobasis imitans Lieftinck*	Guadalcanal
Teinobasis obtusilingua Lieftinck*	Makira
Teinobasis rufithorax (Selys)	Guadalcanal; Shortland Islands; Rennell
Teinobasis simulans Lieftinck*	New Georgia
Xiphiagrion cyanomelas Selys	Rennell, Guadalcanal, Gizo, Malaita
Isostictidae	
Cnemisticta latilobata Donnelly*	Malaita, Guadalcanal, Gizo, Bougainville

Megapodagrionidae	
Argiolestes bougainville Kalkman*	Bougainville
Argiolestes gizo Kalkman*	Gizo, Vella Lavella, Rendova
Argiolestes malaita Kalkman*	Malaita
Platycnemididae	
Lieftinckia isabellae Lieftinck*	Santa Isabel
Lieftinckia kimminsi Lieftinck*	Bougainville
Lieftinckia lairdi Lieftinck*	Guadalcanal
Lieftinckia malaitae Lieftinck*	Malaita
Lieftinckia ramosa Lieftinck*	San Jorge Is. (nr. Santa Isabel), Choiseul
Lieftinckia salomonis Kimmins*	Guadalcanal, New Georgia
Salomonocnemis gerdae Lieftinck*	Guadalcanal

Note: This genus probably belongs in *Lieftinckia*, according to phylogenetic analysis of Gassmann (2005). Otherwise *Lieftinckia* is paraphyletic. Lieftinck (1986) also notes two new *Lieftinckia* species from Makira, which he did not describe because the material was teneral or immature

Protoneuridae	
Nososticta salomonis (Selys)	Bougainville; Shortland Is.; Guadalcanal; Malaita
ANISOPTERA	
Gomphidae	
Ictinogomphus australis lieftincki (Schmidt)*	Guadalcanal; Rennell
Aeschnidae	
Agyrtacantha dirupta (Karsch)	Bougainville; Shortland Islands
Anasciaeschna melanostoma Lieftinck*	Guadalcanal
Anax sp. undet. (prob. *guttatus* Burmeister)	Rennell
Gynacantha mocsaryi Forster	Bougainville
Gynacantha rosenbergi Brauer	Guadalcanal
Corduliidae	
Eusynthemis frontalis Lieftinck*	Guadalcanal
Guadalca insularis Kimmins*	Guadalcanal
Hemicordulia oceania Selys	Bougainville; Rennell
Libellulidae	
Aethriamanta subsignata Selys	Guadalcanal
Agrionoptera insignis insularis Kirby	Santa Anna, Alu, Sikaiana Atoll, Ugi, Rennell
Agrionoptera insignis similis Selys	Bougainville, Shortland Islands, Treasury Is., Guadalcanal

Agrionoptera papuensis allogenes Tillyard	Guadalcanal
Brachydiplax denticauda (Brauer)	Guadalcanal
Brachydiplax duivenbodei (Brauer)	Guadalcanal
Crocothemis nigrifrons Kirby	Guadalcanal
Diplacodes trivialis (Rambur)	Guadalcanal
Hydrobasileus brevistylus (Brauer)	Guadalcanal
Macrodiplax cora Brauer	Rennell
Nesoxenia mysis cingulata Kirby*	Bougainville; Shortland Islands
Neurothemys stigmatizans bramina (Guerin)	Bougainville; Shortland Is.; Treasury Is.; Guadalcanal; Russell; Rennell
Orthetrum sabina sabina (Drury)	Guadalcanal; Treasury Is.; Rennell
Orthetrum villosovittatum bismarckianum Ris	Bougainville; Guadalcanal; Florida
Pantala flavescens (F.)	Solomon Is., Guadalcanal; Treasury Is.
Protorthemis woodfordi (Kirby)*	Bougainville; Buka; Treasury Is.; New Georgia; Guadalcanal; Savo
Rhodothemis rufa (Rambur)	Guadalcanal (golden spots at wing bases)
Rhyothemis phyllis marginata Ris	Bougainville; Shortland Islands; Guadalcanal
Rhyothemis phyllis chloe Kirby	Guadalcanal
Rhyothemis regia juliana Lieftinck	Solomon Is.
Rhyothemis resplendens Selys	Bougainville
Tapeinothemis boharti Lieftinck*	Guadalcanal; Little Florida
Thylomys tillarga (F.)	Rennell
Tramea liberata Lieftinck*	Guadalcanal; Shortland Is.

Total recorded genera: 38

Endemic genera: 4

Lieftinckia (Platycnemididae) - 6 species

Guadalca (Corduliidae) - 1 species

Salomonocnemis - 1 species

Tapeinothemis (Libellulidae) - 1 species

Percentage endemism at the generic level = 10%

Total recorded species: 63

Endemic species: 28

Percentage endemism at the species level = 44%

APPENDIX 4

CHECKLIST OF THE GYRINIDAE (COLEOPTERA) OF THE SOLOMON ISLANDS

Endemic species marked with an asterisk (*)

COLEOPTERA

Gyrinidae

Dineutes (Callistodineutus) bougainvilleanus Ochs*	Bougainville
Dineutes (Callistodineutus) bufo Brinck*	Kolombangara
Dineutes (Callistodineutus) choiseulicola Brinck*	Choiseul
Dineutes (Callistodineutus) christobalensis Brinck*	Makira (San Cristobal)
Dineutes (Callistodineutus) dispar Brinck*	Malaita
Dineutes (Callistodineutus) dispersus Brinck*	Malaita
Dineutes (Callistodineutus) pagdeni Brinck*	Guadalcanal
Dineutes (Spinosodineutes) heterandrus Ochs*	Bougainville
Gyrinus sericeolimbatus Regimbart	Widespread

Total recorded genera and subgenera: **3**

Endemic subgenera: 1

Callistodineutus - 7 species

Percentage endemism at the generic level = 33%

Total recorded species: **9**

Endemic species: 8

Percentage endemism at the species level = 89%

APPENDIX 5

CHECKLIST OF THE SIMULIIDAE (DIPTERA) OF THE SOLOMON ISLANDS

Endemic species marked with an asterisk (*)

DIPTERA

Simuliidae

Morops kawagishii Takaoka & Suzuki*	Guadalcanal
Morops papuense Wharton	New Guinea, Guadalcanal
Morops pohaense Takaoka & Suzuki*	Guadalcanal
Morops selwynense Takaoka & Suzuki*	Guadalcanal, Santa Isabel
Morops solomonense Takaoka & Suzuki*	New Georgia
Simulium (Gomphostilbia) hiroshii Takaoka*	Bougainville, New Georgia, Malaita, Guadalcanal
Simulium (Gomphostilbia) kerei Takaoka & Suzuki*	New Georgia
Simulium (Gomphostilbia) noroense Takaoka & Suzuki*	Bougainville, New Georgia, Kolombangara
Simulium (Gomphostilbia) rhopaloides Craig, Englund & Takaoka*	Guadalcanal
Simulium (Gomphostilbia) sherwoodi Stone & Maffi*	Guadalcanal

Total recorded genera: **2**

Endemic genera: 0

Percentage endemism at the generic level = 0%

Total recorded species: **10**

Endemic species: 9

Percentage endemism at the species level = 90%

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