Freshwater Invertebrates of Tiritiri Matangi Island

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Supporters of Tiritiri Matangi, Auckland 2016

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BACKGROUND

Wetlands are considered among the most productive ecosystems in the world. They provide numerous ecological functions including improvement of water quality, atmospheric maintenance, providing habitat for wildlife, biogeochemical cycling, and flood protection (Adamus & Stockwell, 1983). Invertebrates are vital to many wetland functions such as through water filtration and quality control, nutrient cycling, and development of habitat structure (Covich, Palmer & Crowl, 1999).

Tiritiri Matangi Island contains both natural and artificial wetland habitat. A survey of the freshwater ecosystems on Tiritiri Matangi (Surrey, 2015) detailed the condition of freshwater habitats and established the composition of riparian vegetation and fish species. The diadromous fish species, banded kokopu (*Galaxias fasciatus*) and shortfin eel (*Anguilla australis*), were observed in three of the island's dams. Although macroinvertebrates were not sampled by Surrey (2015), those found in the fish traps were noted. These included diving beetles in the family Dytiscidae, damselfly (*Xanthocnemis* sp.) larvae, stick caddis (*Triplectides*) larvae and water boatman (*Sigara* sp.).

Freshwater invertebrates are likely an important food source on the island for banded kokopu and short fin eel as well as birds such as welcome swallow/warou (*Hirundo tahitica neoxena*), brown teal/ pāteke (*Anas chlorotis*) and spotless crake/ pūweto (*Porzana tabuensis plumbea*) (Heather & Robertson, 2000).

Recommendation 7.1 of the Tiritiri Matangi Biodiversity Plan (2013) states *"Increase knowledge of the presence and distribution of invertebrates in all habitats on Tiritiri Matangi"*. The aims of this study were to:

- build on the earlier freshwater survey of Tiritiri Matangi (Surrey 2015), by establishing the macroinvertebrate species presence in some of the freshwater habitats
- to provide a basis for future studies and possible management activity.

STUDY SITES

A number of dams have been established on the island over the past ~60 years (Surrey, 2015), both to store water and create habitat for endangered species such as brown teal/pāteke (Supporters of Tiritiri Matangi, 2013). Some of the dams contain the only year round water on Tiritiri Matangi, as the short steep catchments cause streams to flow intermittently (Surrey, 2015).

Three artificial dams (Lower Silvester, Bunkhouse and Upper Emergency Landing Dam) and one ponded stream (Kawerau Stream) were surveyed. Although there are numerous freshwater habitats on the island, the sites chosen provide good coverage of the area: Lower Silvester Dam is located to the north, Bunkhouse Dam to the south, Kawerau Stream to the west and Upper Emergency Landing Dam to the east (Fig.1).

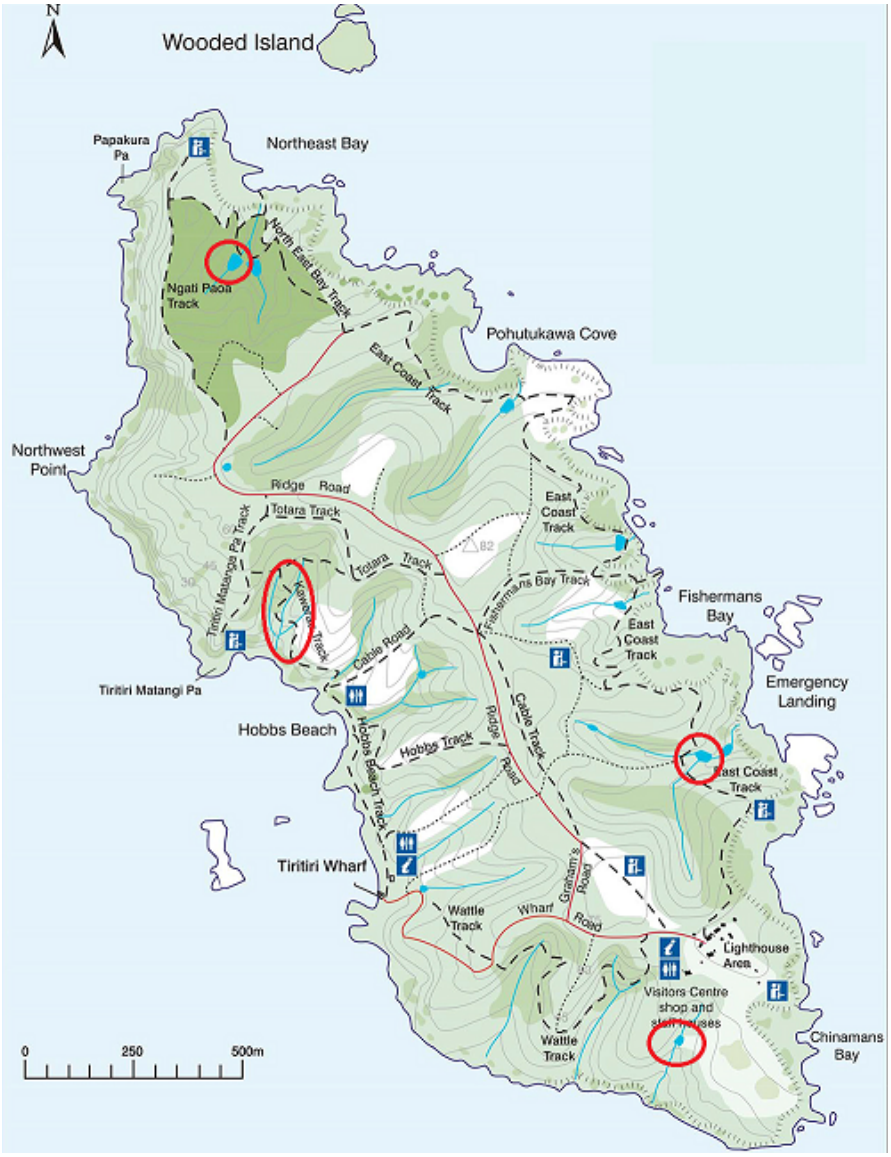
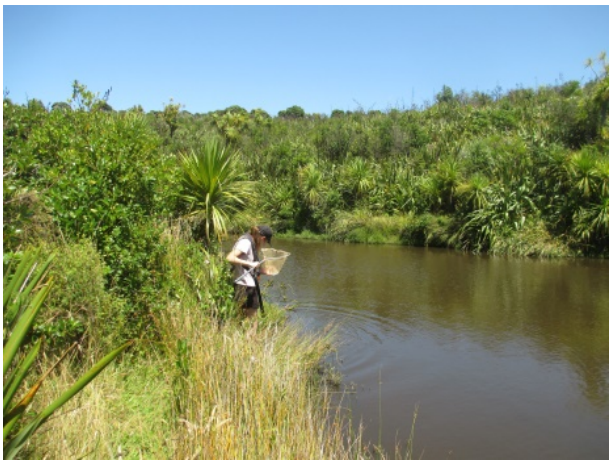


Figure 1: Tiritiri Matangi Island showing study sites circled red. Sites are, from north to south, Lower Silvester Dam, Kawerau Stream, Upper Emergency Landing Dam and Bunkhouse Dam.

The weather was warm and generally sunny, over the course of the survey. Water levels declined in all dams, due to a lack of rain over this period in summer.

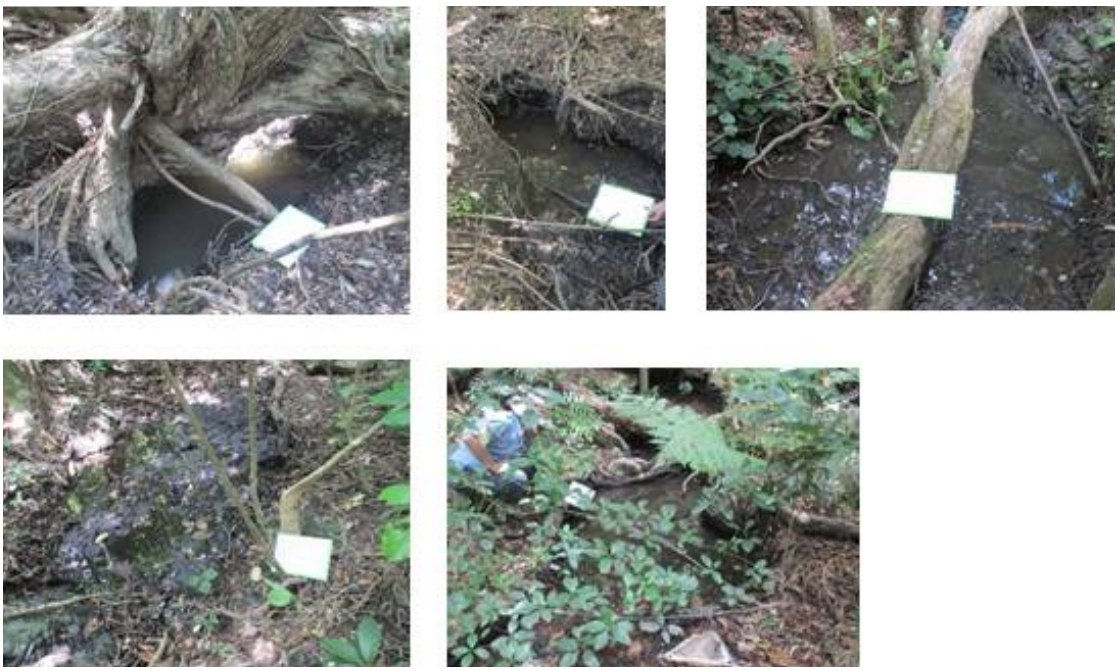
The Lower Dam in the Silvester Wetlands is in the far north of the island (Fig.1). It is the largest of the studied sites at 412m² and was constructed around 16 years ago. The water is a dark brown colour and riparian plants consist of cabbage tree (*Cordyline australis*) and flax (*Phormium tenax*) (Surrey, 2015) (Fig.2).

Figure 2: Lower Silvester Dam.



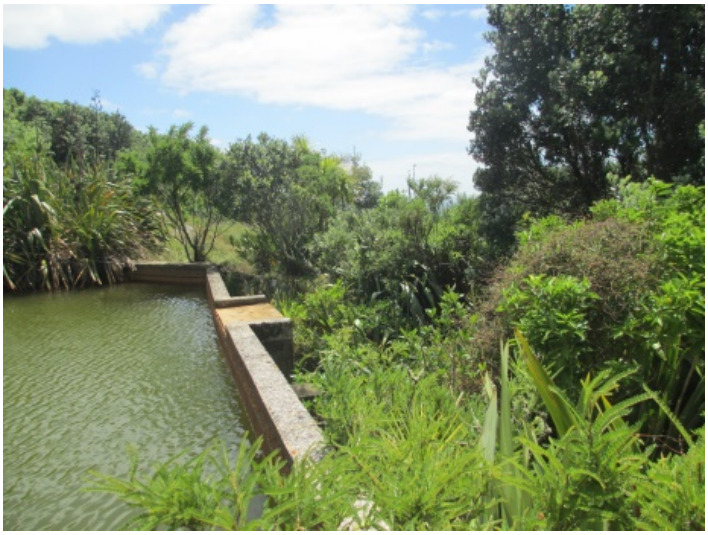
Kawerau Stream is located in Bush One, to the west of the island (Fig.1). It has a series of small pools joined by mostly dry (at the time of the survey) lengths of stream bed. The stream flows intermittently throughout the year (Surrey, 2015). Five small pools, from the beach outlet to the footbridge were studied, the largest measuring approximately 4.5m². The pools, unlike the dams, were completely shaded by vegetation and contained large quantities of organic debris (Fig.3).

Figure 3: Pools sampled in Kawerau Stream (with A4-sized clipboard for scale).



Upper Emergency Landing Dam, constructed around 1991, is located in the Lighthouse Valley to the east of the island (Fig.1). It is 324m² with a 3m concrete dam face, beyond which is another dam (Surrey, 2015) (Fig.4).

Figure 4: Edge of Upper Emergency Landing Dam.



Bunkhouse Dam is the smallest of the studied dams at 130m². It was constructed in 1984 and is located in Little Wattle Valley. Reeds and sedges border the dam and the water is a dark brown colour. There are two shelters for brown teal/ pāteke, made of shadecloth (Surrey, 2015) (Fig.5).

Figure 5: Bunkhouse Dam.

METHOD

A survey of four freshwater habitats on Tiritiri Matangi Island was carried out from December 2015- January 2016, in order to identify and quantify invertebrate species present. Each dam was surveyed three times, whilst Kawerau Stream was only sampled once. Kawerau Stream is a much smaller body of water and was a later addition to the survey.

Prior to disturbing the water, the surface and immediate surrounding habitat was observed. Next a handheld net was used to scoop in the water column without disturbing the bottom sediments. Any invertebrates found were identified, or photographed for later identification, counted and released. This was replicated four times at varying depths. Bottom sediments were then prodded with the front of the net (where shallow enough) and the net was swept through the turbid water. Again this was replicated four times, picking through the sediments to find invertebrates. Samples were taken around the entire dam/pond, moving a few steps over after each set of samples.

Passive observations of flying invertebrates were taken, using binoculars where appropriate. Particular attention was paid to riparian vegetation and mud flats. Any rocks were lifted and the underside observed.

Invertebrate taxa were placed into four abundance categories (Table 1).

Table 1: Abundance categories for freshwater macroinvertebrates.

Number of individuals	Abundance
1-4	Rare (R)
5-14	Common (C)
15-39	Abundant (A)
40+	Very abundant (VA)

RESULTS

Thirty six macroinvertebrate taxa were observed amongst the four surveyed sites. The greatest number of taxa was found at Bunkhouse Dam followed by Upper Emergency Landing Dam, then Silvester Dam. Fewest taxa were found at Kawerau Stream though this site was only sampled once. Only non-biting midges (Chironomidae) and pond skaters (*Microvelia* sp.) were found at all sites, however nine taxa were found at all the dams (Table 2).

The most abundant arachnid taxa found were water mites (*Hydroma* sp.), which were very abundant in Lower Silvester Dam and common in Bunkhouse dam. The other three arachnids observed: wolf spiders (*Anopteris* sp.), pseudoscorpians (Pseudoscorpionida) and stetch spiders (*Tetragnatha* sp.) were rarely observed in the dams. No arachnids were found in Kawerau Stream (Table 2).

Ten beetle (Coleoptera) taxa were observed, five of which were diving beetles (*Antiporus*, *Hyphydrus*, *Liodessus*, *Onychohydrus* and *Rhantus* species). No diving beetles were present in Kawerau Stream. *Antiporus* were the most common genus of diving beetle, with particularly high abundance in Lower Silvester Dam. The long-toed water beetle (*Dryopidae* sp.) was only found in Kawerau Stream where it was rare. Other Coleoptera included marsh beetles (Scirtidae) which were common in Kawerau Stream and Upper Emergency Landing Dam, water scavenger beetles *Dactyloternum abdominal* and Hydrophylidae and the weevil species *Oreda notata* (Table 2).

Horney cased caddisflies (*Olinga feredayi*) and stick caddisflies (*Triplectides* sp.) were very abundant in Lower Silvester Dam and common in Upper Emergency Landing Dam. At Bunkhouse Dam the stick caddisfly was more abundant than the horney cased species. Neither caddisfly taxa were observed in Kawerau Stream (Table 2).

Two damselfly (Odonata) species were found at all dam sites. Blue damselflies (*Austrolestes colensonis*) were common in Lower Silvester Dam and Bunkhouse Dam, whilst gossamer damselflies (*Ishnura aurora*) were abundant at these sites. Both species were rare at Upper Emergency Landing Dam (Table 2).

Nine fly (Diptera) taxa were observed. Non-biting midges were very abundant at all dam sites though rare at Kawerau Stream. Fly taxa found rarely and only at one site were: striped mosquitoes (*Aedes notoscriptus*), sandflies (*Austrosimulium* sp.) and rat tail maggots (Syrphidae). Biting midges (Ceratopogonidae), green longlegged flies (*Parentia* sp.), craneflies (*Leptotarsus* sp.), marshflies (Sciomyzidae) and the brown striped litter flies (*Sapromyza neozealandica*) were also observed (Table 2).

The three true bug (Hemiptera) taxa observed, were very abundant at all dams surveyed. These were backswimmer (*Anisops* sp.), water boatman (*Sigara* sp.) and pond skater (*Microvelia* sp.). Pond skaters were the only true bug taxa found at Kawerau Stream, where they were abundant (Table 2).

Springtails (Collembola) and oligachaete worms (Oligochaeta) were found only at one site where they were rare. Flatworms (*Neppia* sp.) and mud snails (*Potamopyrgus antipodarum*) were each found at two surveyed sites, with the mud snail commonly observed at Kawerau Stream. Pond moths (*Hygraula nitens*) were found at all dam sites (Table 2).

No dragonflies (Odonata) were observed throughout the duration of this survey though they have been recently sighted on the island (Mel Galbraith, pers. comm.).