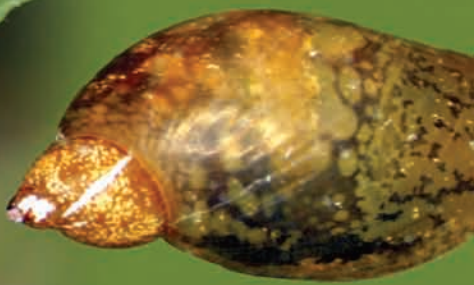
NIWA
Taihoro Nukurangi

Identification Guide



Freshwater Pests of New Zealand

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Identification guide:

freshwater pests of New Zealand

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Freshwater pests of New Zealand

Invasion of our freshwaters by alien species is a major issue. Today, few if any New Zealand water bodies support a biota that is wholly native. Over 200 freshwater plant and animal species have been introduced to New Zealand, many of which have naturalised and become pests, or have the potential to become pests. Impacts from these species are significant, including reduction in indigenous biodiversity, destabilisation of aquatic habitats, economic losses through lost power generation, impeded drainage or irrigation, and reduced opportunity for recreational activities like boating and fishing. The Ministry for the Environment publication Alien Invaders (Champion et al. 2002) outlines the entry pathways, methods of spread, and impacts and management of freshwater pests, and is recommended for anyone interested in this field.

This freshwater pest identification guide is divided into three sections: fish, invertebrates, and plants. It provides keys to the identity of pest fish (7 species) and aquatic weeds (38 species) and provides photographs and information on the known distribution, identification features, similar species and how to distinguish them, dispersal mechanisms, and biosecurity risks for these and an additional 12 introduced invertebrates. The technical terms used in the keys are explained in a glossary at the back of the guide.

If you find a pest species in a different locality to those listed in the guide, please forward this information to P. Champion, NIWA, P O Box 11115, Hamilton.

Fish

Fish

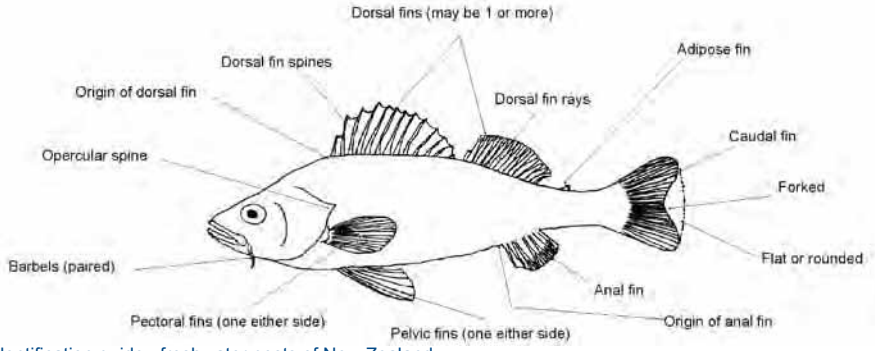
Fish

Field key for identifying the main exotic fish in New Zealand freshwater

(Italics indicate fish that key out as native species. These are not a concern. Potential pest species are in bold.)

1.	Scales absent or not visible	2.
	Scales present	3.
2.	Eight barbels, and sharp spines at front of dorsal and pectoral fins	**Catfish** (page 8)
	No barbels, no sharp spines	*Eels, Lamprey, Galaxiids*
3.	Barbels present either side of mouth	4.
	Barbels absent	5.
4.	Two sets of barbels, large scales, patchy coloration	**Koi carp** (page 10)
	One set of barbels, small scales, red eyes	**Tench** (page 12)
5.	Two dorsal fins	6.
	Single dorsal fin and no adipose fin	7.
	Single dorsal fin and adipose fin present	11.
6.	Sharp opercular spines, vertical stripes, forked caudal fin	**Perch** (page 14)
	No opercular spines, no vertical stripes, forked caudal fin	*Mullet*
	No opercular spines, may have stripes, rounded caudal fin, blunt head	Bullies
7.	Dorsal fin originates above or in front of origin of pelvic fin	8.
	Dorsal fin originates behind pelvic fins	10.
8.	Last of dorsal fin spines (not rays) is stout and serrated	**Goldfish** (page 16)
	Last of dorsal fin spines not stout and serrated	9.
9.	Body flattened ventrally, dark stripe across eyes	*Torrentfish*
	Rounded body and no stripes	Grass carp
10.	Dorsal fin originates in front of anal fin	**Rudd** (page 18)
	Dorsal fin originates behind anal fin	**Gambusia** (page 20)
11.	Dorsal fin origin in front of or above pelvic fin origin	**Salmonids***
	Dorsal fin origin is well behind pelvic fin origin	Smelt

*See species key in McDowall (1990).



Ameiurus nebulosus Le Sueur, 1819

Catfish

Known distribution

Mainly northern North Island, especially the Waikato catchment, with isolated populations in Lake Mahinapua and Kaituna Lagoon in the South Island (see distribution map opposite).

ID features

Eight distinctive, long barbels around the mouth, relatively small eyes, and a smooth skin. Leading edge of dorsal and pectoral fins with a sharp spine.

Similar species

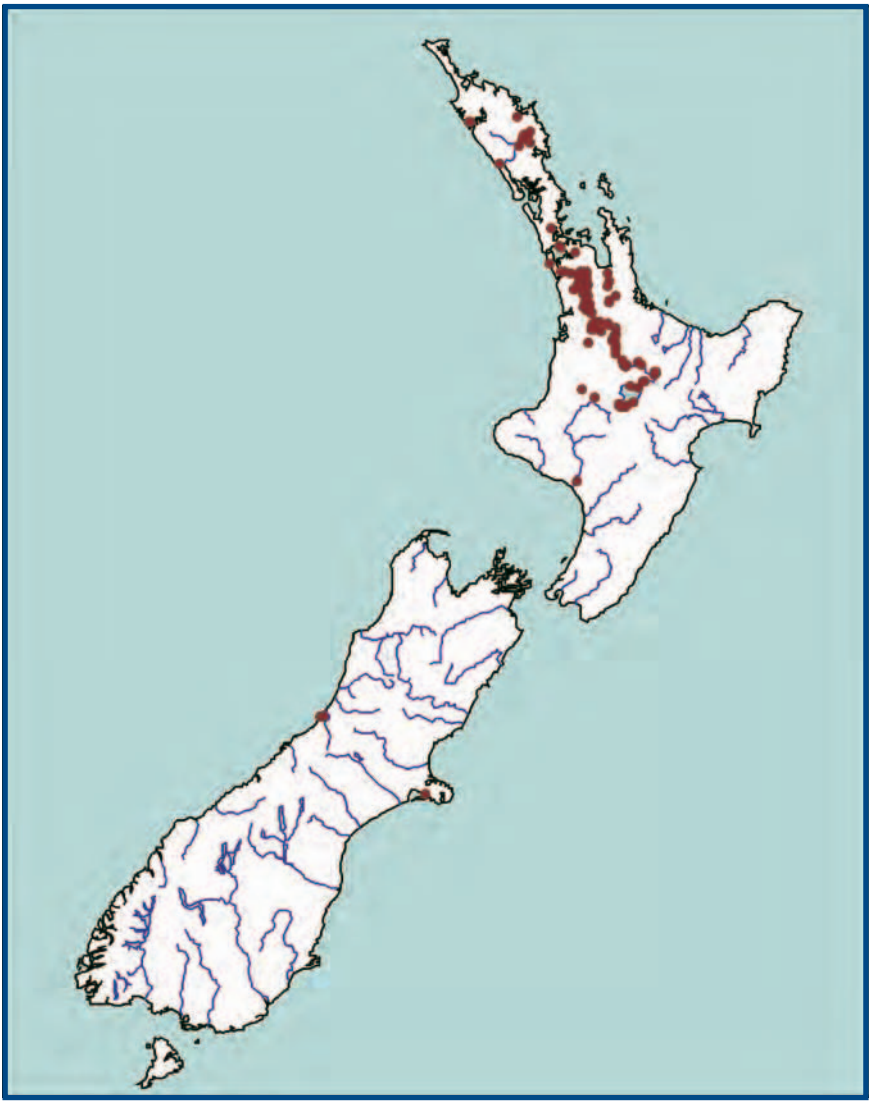
None.

Dispersal mechanism

Probably accidentally via eel fishers, nets, boats, and boat trailers; then downstream during floods.

Biosecurity risk

As yet unknown. Adults feed heavily on freshwater crayfish in Lake Taupo. Adults may interact with eels.



Distribution of catfish

Cyprinus carpio Linnaeus, 1758

Koi carp

Known distribution

Mainly North Island; recent populations around Nelson probably eradicated (see distribution map opposite).

ID features

Two small barbels near each corner of mouth; origin of dorsal fin is in front of pelvic fin. Large scales. Adults exhibit a calico pattern of black, red, orange, gold, and white blotches.

Similar species

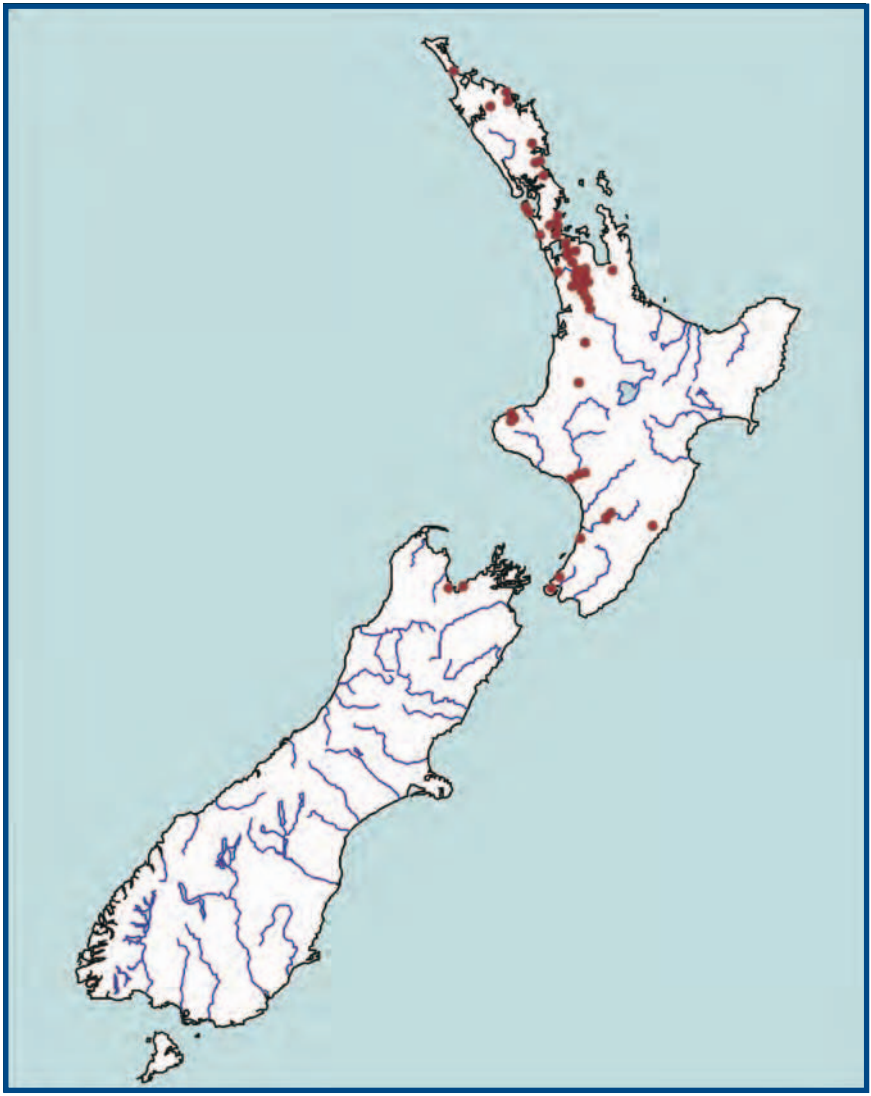
Goldfish and rudd. Also mullet and grass carp, although these lack colour. Hybrids between koi carp and goldfish may also confuse.

Dispersal mechanism

Stocking and then downstream colonisation during floods.

Biosecurity risk

At high densities can increase turbidity, reduce macrophytes, and degrade benthic habitats in lakes.



Distribution of koi carp

Tinca tinca Linnaeus, 1758

Tench

Known distribution

Scattered populations in the northern and southern North Island and in Nelson/Marlborough and Canterbury in the South Island (see distribution map opposite).

ID features

One small barbel at each corner of mouth; thick, fleshy fins and small scales. Eyes bright red.

Similar species

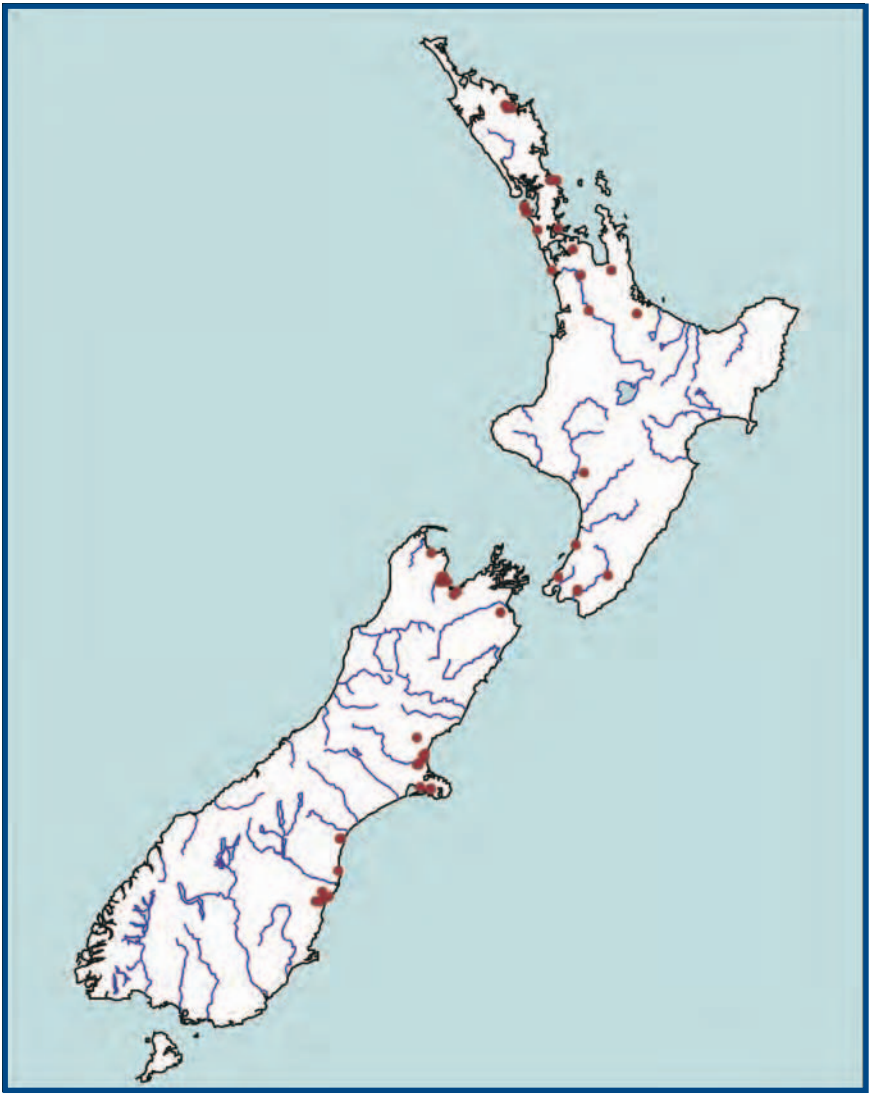
None.

Dispersal mechanism

Stocking to create coarse fisheries.

Biosecurity risk

None known, but with other cyprinids may reduce water clarity in shallow lakes.



Distribution of tench

Perca fluviatilis Linnaeus, 1758

Perch

Known distribution

Widespread in southwest of the North Island and southeast of the South Island (see distribution map opposite).

ID features

Two dorsal fins; six or more dark vertical bands along sides. Spines on operculum. Bottom edge of caudal, anal, and pectoral fins bright red-orange.

Similar species

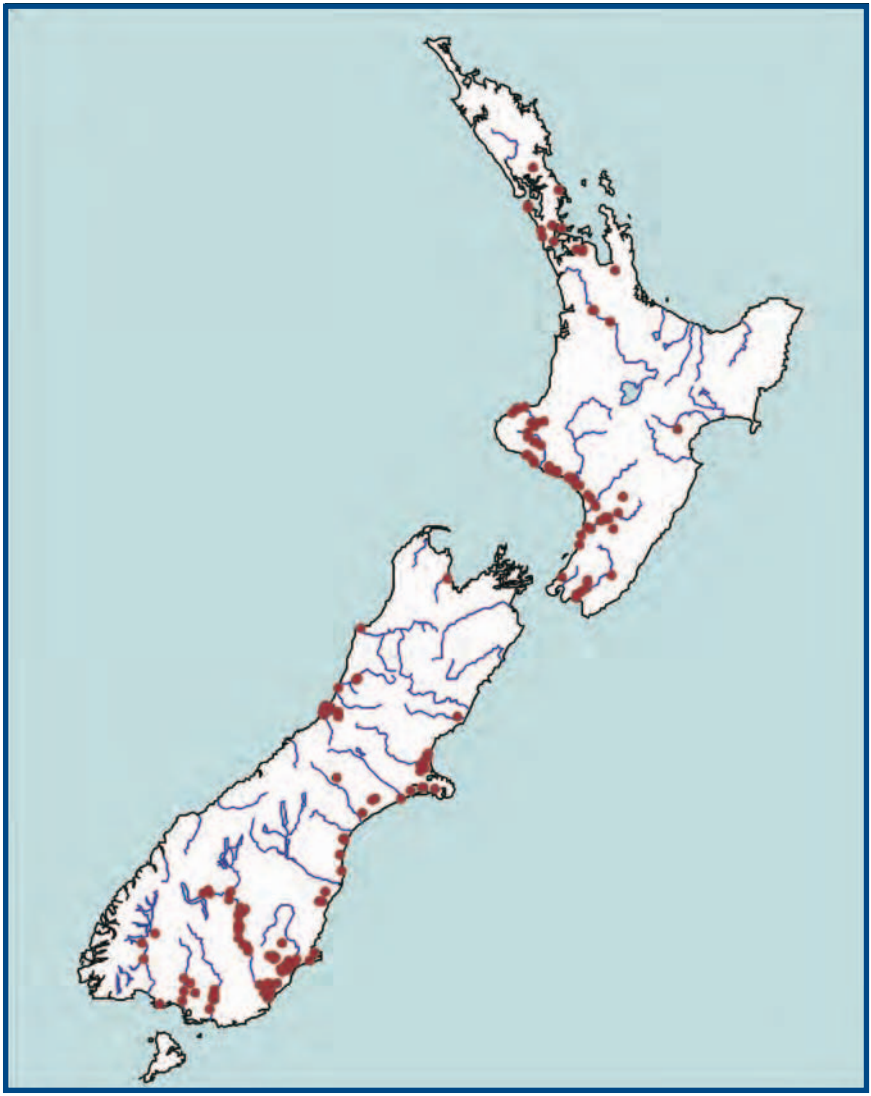
Rudd, goldfish.

Dispersal mechanism

Stocking to create coarse fisheries.

Biosecurity risk

Reduces the abundance of common bullies and probably planktivorous fish (i.e., smelt and galaxiids) in lakes.



Distribution of perch

Carassius auratus Linnaeus, 1758

Goldfish

Known distribution

Widespread, but more prevalent in the North Island (see distribution map opposite).

ID features

No barbels around mouth; dorsal fin originates directly above pelvic fin. Last spine in dorsal fin is stout and serrated. Colour varies from red to olive-bronze to deep gold.

Similar species

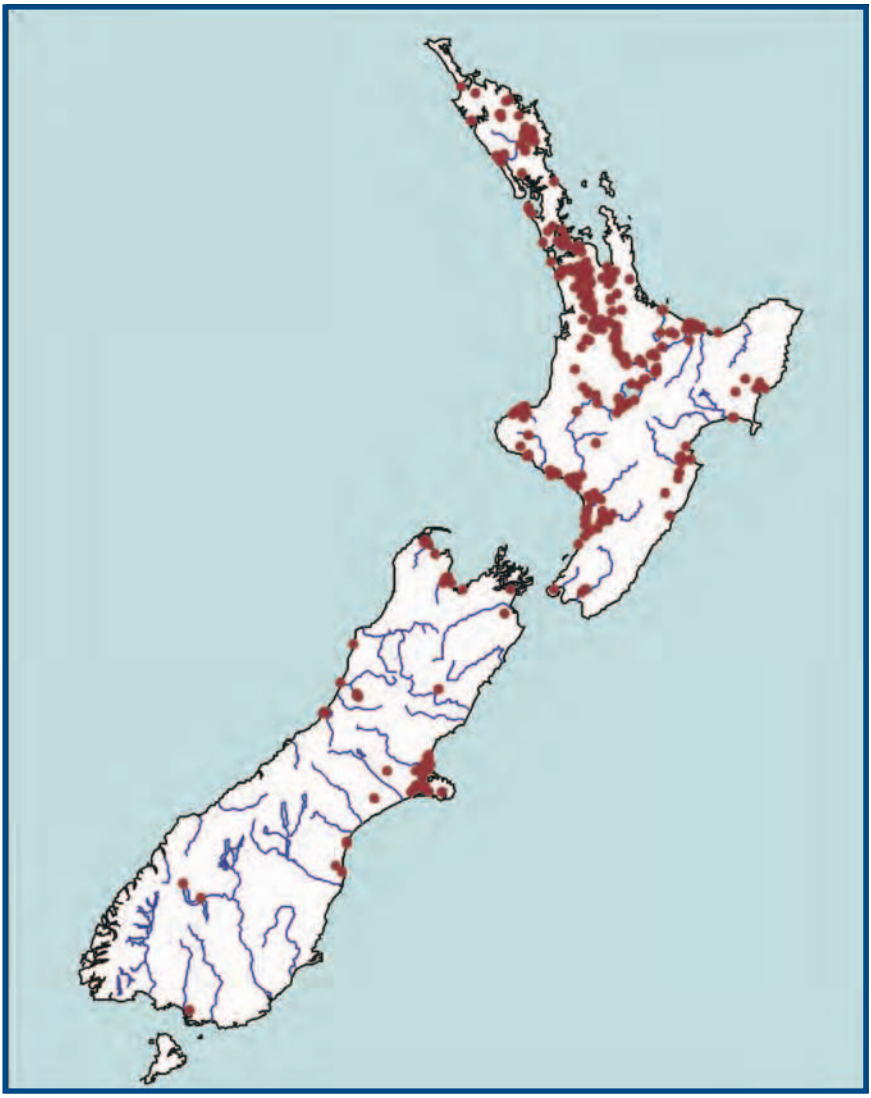
Koi carp, rudd.

Dispersal mechanism

Stocking. Was widely distributed in early 1900s by European settlers. Will have spread downstream during floods.

Biosecurity risk

None known in New Zealand. With other cyprinids may contribute to reduced water clarity in shallow lakes. High density populations increased turbidity in Canadian ponds.



Distribution of goldfish

Scardinius erythrophthalmus (Linnaeus, 1758)

Rudd

Known distribution

Widespread throughout the Waikato catchment, also occurs in other areas of the North Island, Nelson/ Marlborough, and Canterbury (see distribution map opposite).

ID features

No barbels around mouth; dorsal fin originates behind pelvic fin; no stout spine in dorsal fin; fins usually bright reddish orange.

Similar species

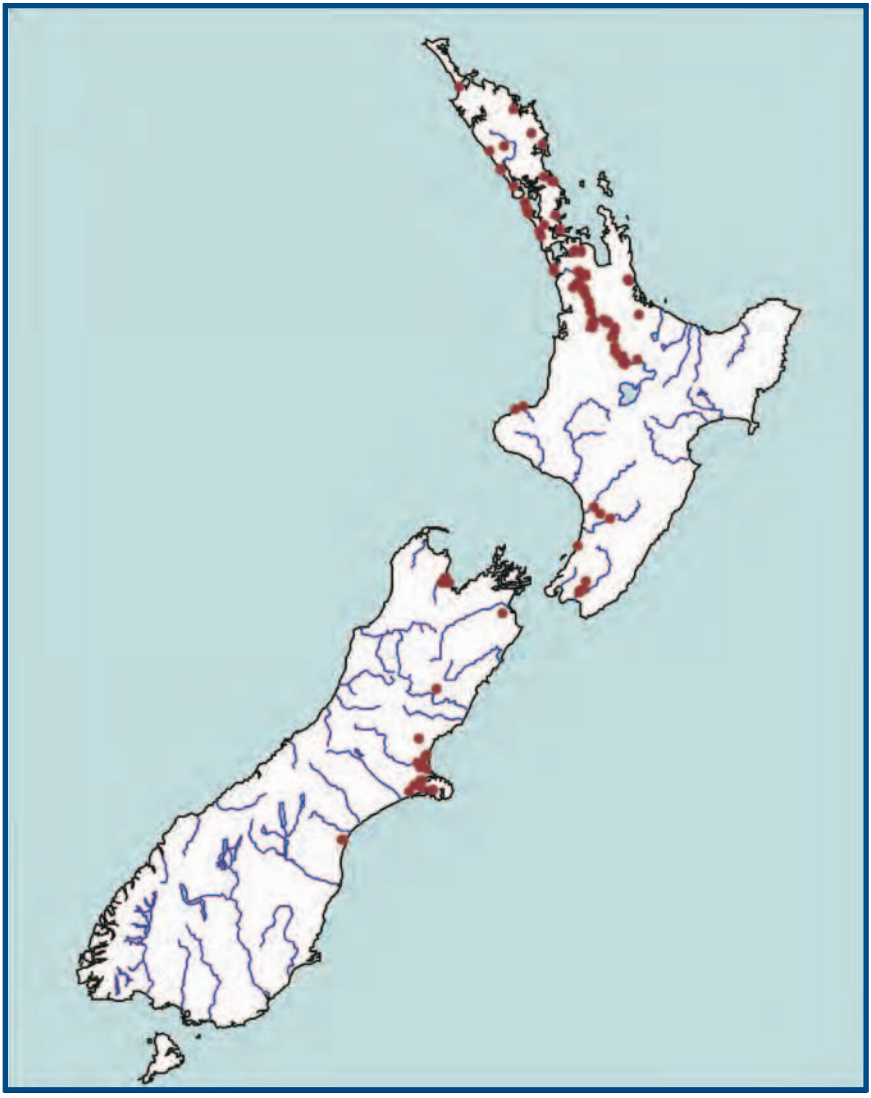
Goldfish, koi carp.

Dispersal mechanism

Stocking to create coarse fisheries.

Biosecurity risk

High density population ruined trout fishery in Lake Parkinson. Likely to have a role in suppressing regeneration of macrophyte plants in turbid lakes. With other cyprinid species may contribute to reduced water clarity in shallow lakes.



Distribution of rudd

Gambusia affinis (Baird & Girard, 1854)

Gambusia

Known distribution

Widespread in nouthern North Island and Bay of Plenty, also occurs in Hawke's Bay. Populations in Nelson are recent discoveries (see distribution map opposite).

ID features

Rounded caudal fin and a single, high, rounded dorsal fin; origin of dorsal fin behind the origin of the anal fin. Mouth dorsally oriented.

Similar species

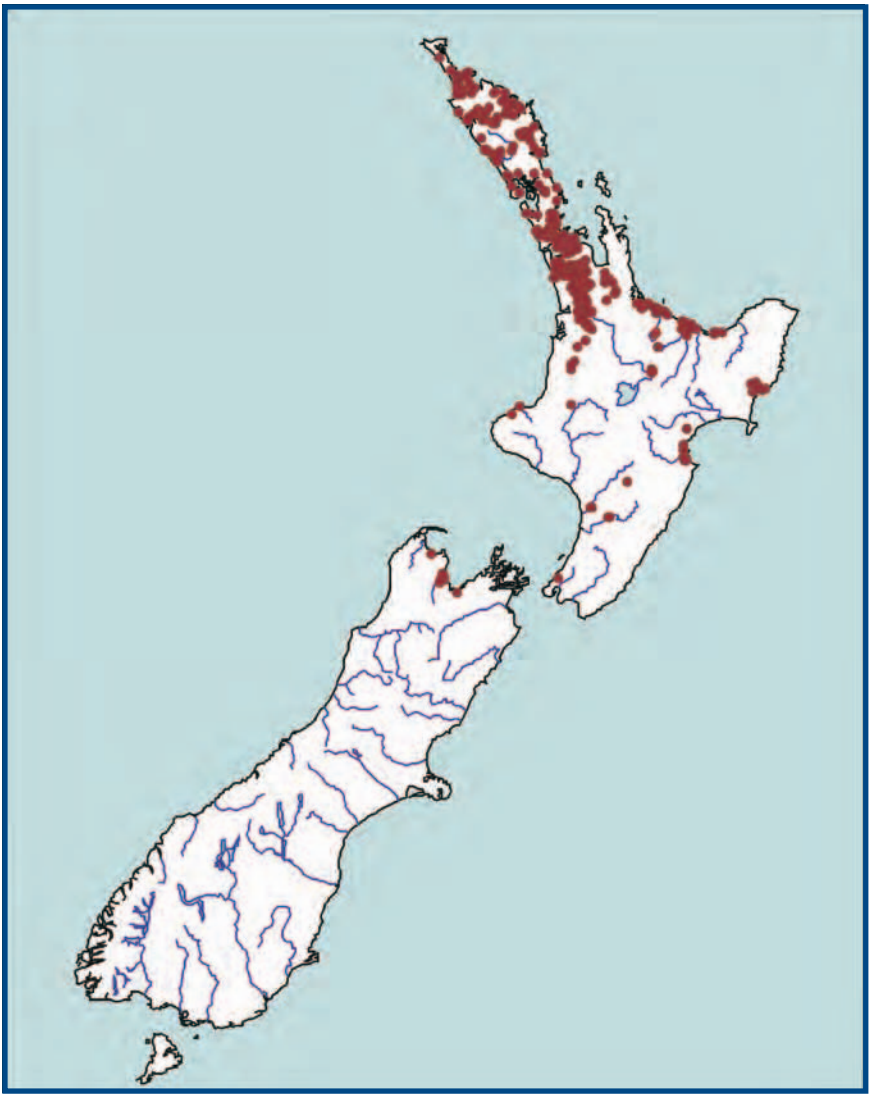
Common bullies, guppy, sailfin molly, caudo.

Dispersal mechanism

Stocking for control of mosquito larvae, followed by downstream dispersal during floods. Can tolerate high salinity and colonise adjacent river systems.

Biosecurity risk

Known to reduce vulnerable native fish. In New Zealand, reduces galaxiids in shallow lakes. May also affect mudfish.



Distribution of gambusia

Invertebrates

Invertebrates

Invertebrates

Melanoides tuberculata (Müller, 1774)

(*Nertia tuberculata, Thiara tuberculata, T. tuberculatus, Melanoides tuberculatus*)

Red-rimmed melania, Malayan snail

Known distribution

Golden Springs volcanic plateau, Taupo, probably since 1920s; widespread in Hamilton pet shops.

ID features

Shell an elongate conical shape; length typically up to 32 mm; whorls with prominent grooves; usually <15 mm in pet shops.

Similar species

Unlikely to be confused with other freshwater snails in New Zealand.

Dispersal mechanism

Potential to be spread by aquatic birds, but may be limited to warm ponds and thermal habitats (18–30 °C); readily available through the aquarium trade.

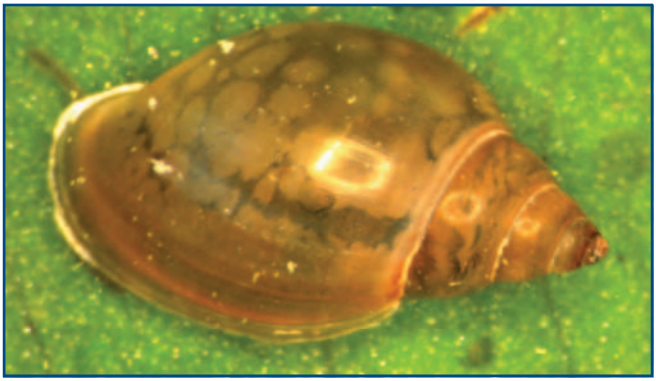
Biosecurity risk

Overseas information indicates competitive abilities over native freshwater snails; herbivorous; known vectors for Chinese liver fluke (*Clonorchis sinensis)* and oriental lung fluke (*Opisthorchis felineus* and *O. viverrini*); risk of spreading probably limited by water temperature; unfertilised females able to reproduce.

Physella acuta (Draparnaud, 1805)

(*Physa acuta*)

Left-handed pond snail



Known distribution

Widely distributed in lakes, ditches, ponds, and streams; observed in tropical fish tanks in Hamilton pet stores.

ID features

Thin shelled, smoothly coiled; white-lipped opening on left-hand side; the yellowish-grey shell may be transparent with mottled pigmentation; mature specimens up to 12 mm long, but usually about 7–8 mm.

Similar species

Similar to *Glyptophysa variabilis* (native), which is larger (12–16 mm) and reddish.

Dispersal mechanism

Dispersal enhanced artificially through transport of infected pond weed; aquarium trade.d

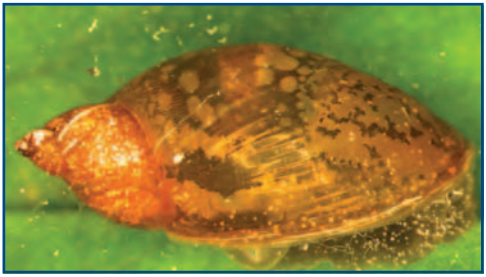
Biosecurity risk

P. acuta has to some degree displaced the native mollusc *Glyptophysa variabilis*.

Pseudosuccinea columella (Say, 1817)

(*Lymnaea columella*)

American ribbed fluke snail, mimic Lymnaea



Known distribution

Relatively widespread, but may not be present south of Canterbury; known from the Waikato River since 1940; also recorded from thermal streams up to 35 ºC.

ID features

Shell opening on right-hand side with a narrow lip; wide triangular tentacles present.

Similar species

Similar to *Austropeplea tormentosa* (native), which has a more globular shape and a thicker lipped opening.

Dispersal mechanism

Dispersal enhanced artificially through transport of infected pond weed; prolific breeder able to self fertilise; aquarium trade.

Biosecurity risk

Known vector for liver fluke (*Fasicola hepatica*); although liver fluke infection rate in the wild can be <10%, an 85% infection rate has been recorded in the laboratory.

Lymnaea stagnalis (Linnaeus, 1758)

Great pond snail

Known distribution

Widespread in lakes and ponds.

ID features

Shell spire acute and long; adult up to 50 mm; shell fragile with whitish markings.

Similar species

Unlikely to be misidentified.

Dispersal mechanism

Dispersal enhanced artificially through transport of infected pond weed; readily available through the aquarium trade.

Biosecurity risk

Thought to be an intermediate host for swimmer's itch or duck itch (schistosome cercarial dermatitis); known to occur in great numbers in the Rotorua Lakes.

Lymnaea truncatula (Müller, 1774)

(*Lymnaea truncata*)

Dwarf pond snail, mud snail

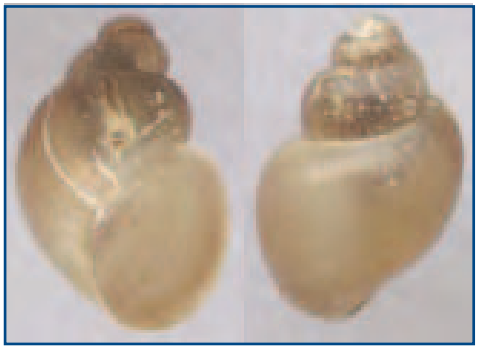


Photo: www.bioimages.org.uk/HTML/P137383.HTM

Known distribution

Believed to be restricted to Nelson and Marlborough; possibly introduced as far back as 1880s.

ID features

Shell with a right-hand coil and deep sutures (joins); each coil distinctly stepped.

Similar species

Similar to *Lymnaea. tormentosa* (native) and *P. columella*, but the coils of these shells are not as stepped.

Dispersal mechanism

Distribution may be enhanced artificially through transport of infected pond weed; aquarium trade.

Biosecurity risk

Lymnaea truncatula is the main intermediate host of the liver fluke (*Fasicola hepatica*) in Europe.

Lymnaea auricularia (Linnaeus, 1758)

(*Radix auricularia*)

Ear pond snail

Known distribution

Probably widespread in the central North Island, with records from Hamilton, Taranaki, and Palmerston North; first recorded in New Zealand in 1977.

ID features

Easily identified from other lymnaeids by its relatively large size, short spire, and large lower coil; black blotches visble through the shell.

Similar species

Morphologically similar to *Lymnaea peregra*, which has not been recorded in New Zealand.

Dispersal mechanism

Dispersal enhanced artificially through transport of infected pond weed; aquarium trade.

Biosecurity risk

Serves as an intermediate host to flukes such as echinostomes and trematodes parasitic in aquatic birds; studies have shown that *L. auricularia* is an unlikely host for the liver fluke (*Fasiola hepatica*).

Pomacea spp. (Lamark, 1819)

(*Ampullarius* spp., *Conchylium* spp.)

Apple snail, mystery snail

Pomacea canaliculata

Pomacea bridgesi

Known distribution

Widely distributed in pet shops, but not known to be naturalised.

ID features

Large snails (up to 50 mm diameter) with left-hand coiled shell with a large operculum; very long tentacles visible when mobile; shells either yellow (*P. canaliculata)* or brownish with pale stripes (*P. bridgesi*).

Similar species

Easily identified in New Zealand by size and coloration, and unlikely to be confused with other snails.

Dispersal mechanism

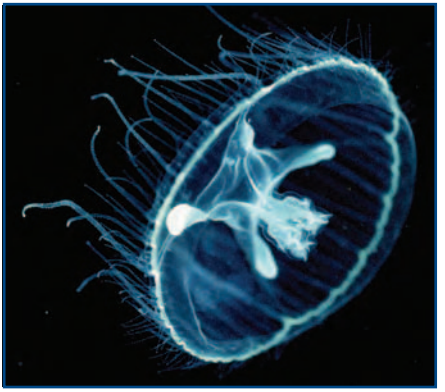
Aquarium trade.

Biosecurity risk

Known vector for rat lungworm (*Angiostrongylus cantonensis*), which can cause the brain disease eosinophilic meningoencephalitus; serious pest of rice and taro; will eat other snail eggs; observed eating *Lymnaea stagnalis* in laboratory.

Craspedacusta sowerbyi (Lankester, 1880)

Freshwater jellyfish



Photo; Barry O'Brien.

Known distribution

Widely distributed in North and South Island lakes, including lakes on the Waikato River; first recorded in New Zealand in the 1950s.

ID features

Classic jellyfish shape - umbrella - type (5–25 mm in diameter) with tentacles around the circumference.

Similar species

Unlikely to be misidentified.

Dispersal mechanism

Can reproduce only by 'budding' when water temperatures reach 25 ºC; juveniles (polyps) may attach to aquatic weed or boats.

Biosecurity risk

Unlikely to affect zooplankton populations, but may compete with native zooplankton feeders.

Planorbarius corneus (Linnaeus, 1758)

(*Planorbis corneus*)

Great ramshorn, trumpet snail, brilliant red ramshorn snail

Known distribution

Known in New Zealand prior to 1968 near Taupo, inhabitating waters up to 35 ºC; wild populations in northern North Island; readily available in pet shops in Auckland and Hamilton.

ID features

Shell reddish brown to olive brown; shell height up to 14 mm and width up to 30 mm.

Similar species

Similar to native species *Gyraulus corinna* and *G. kahuica*, which are much smaller (5 mm diameter) and have a yellowish-brown shell.

Dispersal mechanism

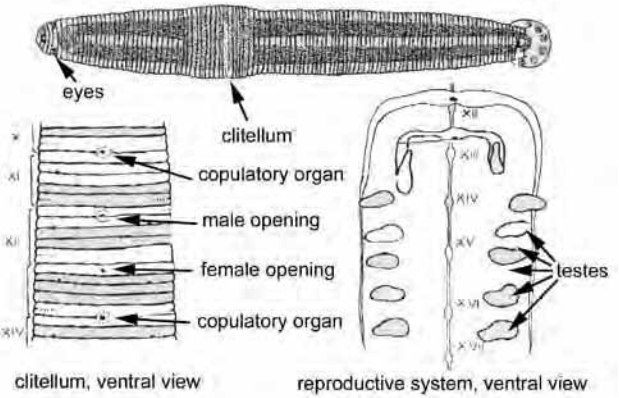
Dispersal enhanced artificially through transport of infected pond weed; aquarium trade.

Biosecurity risk

May survive several weeks out of water during drought; may serve as second intermediate host of *Echinostoma echinatum*; final hosts are mammals. Human infection is through consumption of the host, and results in the clinical symptoms of echinostomiasis. Light infections can cause anaemia, headache, and gastric pain; heavy infections can cause abdominal pain, emaciation, weakness, anaemia, profuse watery diarrhoea, haemorrhage, and anorexia.

Barbronia weberi (Blanchard, 1897)

Asian freshwater leech



Known distribution

First recorded in New Zealand in 1976; known only from artifical environments; current distribution and status unknown, although recently found in Hamilton.

ID features

Long narrow body (worm-like) up to 50 mm; lacks jaws; 3–4 pairs of eyes; 2 copulatory pores on ventral surface; 5–6 testes on each side of body; fresh specimens dark red brown with green markings.

Similar species

Similar general appearance to *Dina Maoriana* (native); 2–4 pairs of eyes; 32 testes on each side; copulatory pores on ventral surface.

Dispersal mechanism

Close association with pond weeds by both adult and cocoon (eggs); dispersal enhanced artifically through transport of infected pond weed; aquarium trade.

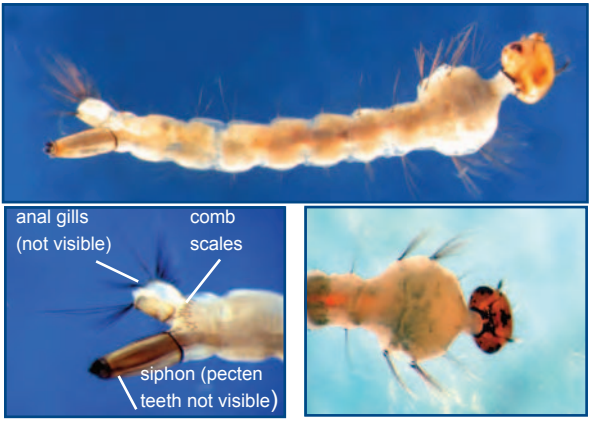
Biosecurity risk

Rapid developer; preys on aquatic worms and snails, and possibly other New Zealand aquatic invertebrates (consumes whole invertebrate).

Ochlerotatus camptorhynchus (Thomson, 1869)

(Aedes camptorhyncus)

Southern salt marsh mosquito



Known distribution

Introduced in 1998 from Australia; currently restricted to coastal regions of the North Island from Kaipara Harbour (west coast) to Porangahau (east coast).

ID features

Requires specialist identification using a compound microscope; anal gills small and round; pecten teeth in single row on siphon; comb scales cockscomb-like.

Similar species

Two other native species occur with O. *camptorhynchus* (*O. antipodeus* and *Culex pervigilans*).

Dispersal mechanism

Thought to have arrived accidentally, possibly via containers or imported tyres from Australia. Under favourable conditions, the entire life cycle from egg to adult can take only 5 days; adults have a 5 km flight range.

Biosecurity risk

Ross River virus; infected possums or farm livestock may act as reservoirs for disease; secondary hazard in the form of 'nuisance biting behaviour'.

Plants

Plants

Plants

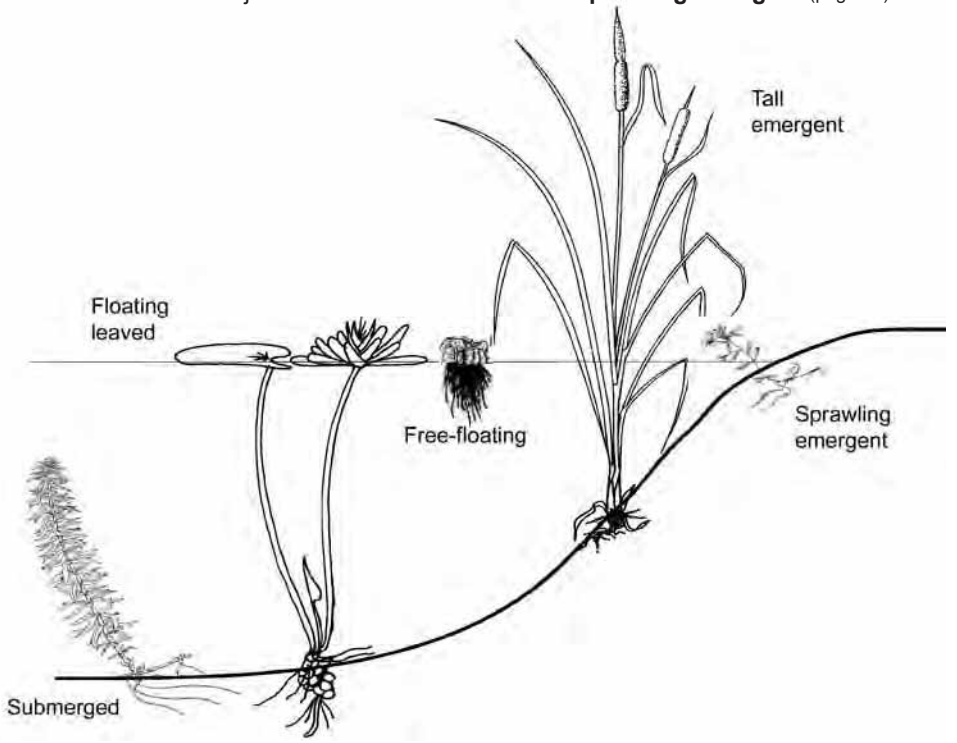
Field key for identifying the aquatic plant life-forms in New Zealand freshwater

1. Leafy shoots predominantly under water — **Submerged** (page 40)
   Leaves on surface or above surface

2. Plants attached to bottom sediments — 3.
   Plants not attached to bottom sediments — 4.

3. Leaves mostly floating or slightly above surface — **Floating leaved** (page 51)
   Leaves mostly emerging above surface — **Erect emergent** (page 59)

4. Plants not attached to water body margin — **Free-floating** (page 69)
   Plants attached to adjacent bank/shore — **Sprawling emergent** (page 75)



Field key for identifying the main alien submerged weeds in New Zealand freshwater

1.	Leaves basal, strap-like	***Vallisneria* spp.** (page 41)
	Some leaves cauline	2.
2.	Leaves spirally arranged, banding downwards	***Lagarosiphon major*** (page 42)
	Leaves not spirally arranged	3.
3.	Leaves whorled	4.
	Leaves opposite, with filiform leaflets	***Cabomba caroliniana*** (page 43)
	Leaves alternate	7.
4.	Leaves filiform, divided	***Ceratophyllum demersum*** (page 42)
	Leaves not filiform, entire	5.
5.	Leaves conspicuously toothed	***Hydrilla verticillata*** (page 44)
	Leaves not conspicuously toothed	6.
6.	Leaves in whorls of 3	***Elodea canadensis*** (page 45)
	Leaves in whorls of more than 3	***Egeria densa*** (page 47)
7.	Leaves filiform, divided	***Ranunculus trichophyllus*** (page 48)
	Leaves not filiform, entire	8.
8.	Leaf-bases clasping stem	**Potamogeton *perfoliatus*** (page 49)
	Leaf-bases not clasping stem	***Potamogeton crispus*** (page 50)

Vallisneria spp.

Eel grass

The strap-like leaves of eel grass.

Eel grass dominating the bed of a stream.

Known distribution

Currently, distribution is restricted to several sites in the North Island, which include Meola Creek and Lake Pupuke (Auckland), Lake Wiritoa (Wanganui), Waikanae, and Masterton. Also occurs at two locations in the South Island, both in Blenheim.

ID features

The leaves are strap-like and arise from long creeping stems. Leaves are up to 5 m in deep water and are 0.4–2 cm in width. The leaf tips when intact are obtuse to acute, with fine toothed margins towards the apex.

Similar species

Sagittaria subulata, S. platyphylla, and swamp lily (*Ottelia ovalifolia)*. The submerged leaves of these species look similar to the submerged leaves of eel grass; however, eel grass never has emergent leaves or conspicuous white flowers.

Dispersal mechanism

Spread by stem fragmentation. There is no evidence of viable seed production in New Zealand.

Biosecurity risk

First naturalised record 1897 (Lake Pupuke). Unwanted organism. A potentially important submerged weed; poor dispersal capacity has limited current spread.

Lagarosiphon major (Ridley) Moss ex Wager

Lagarosiphon

Lagarosiphon shoot.

Lagarosiphon growing above a characean meadow.

Known distribution

Scattered throughout the North Island. More local in northern and eastern South Island, reaching Southland. Its distribution is still increasing.

ID features

Leaves are alternate and curved downwards and 6–20 mm long. Stems are slender, brittle, and much branched.

Similar species

Canadian pondweed and egeria. Both of these species have leaves arranged in whorls on the stem, whereas lagarosiphon has leaves arranged alternately in a spiral pattern.

Dispersal mechanism

New plants develop from stem fragments. There is no seed production in New Zealand, with only the female plants of this species being present here.

Biosecurity risk

First naturalised record 1950 (Hutt Valley). Unwanted organism. Currently has major impacts on indigenous biodiversity and recreation.

Cabomba caroliniana A. Gray

Fanwort

A fanwort stem is shown on the left. Note the paired arrangement of leaves on the stem. On the right is a submerged leaf of hornwort which clearly shows their fan-like shape.

Known distribution

Not naturalised, but sold widely in the aquarium trade.

ID features

Submerged perennial herb. Shoots are grass green to olive green or sometimes reddish brown. The leaves are of two types: submersed and floating. The submersed leaves are finely divided and arranged in pairs on the stem. They are fan-shaped, hence the name fanwort. The floating leaves, when present, are linear and inconspicuous, with an alternate arrangement. They are less than 15 mm long and narrow. The flowers are white and small (less than 15 mm in diameter), and float on the water surface.

Similar species

Hornwort *(Ceratophyllum demersum)* and *Myriophyllum* spp. Differs from hornwort and *Myriophyllum* spp. in that fanwort has leaves arranged in pairs, whereas the others have leaves arranged in whorls.

Dispersal mechanism

Stem fragments and rhizomes.

Biosecurity risk

Currently undergoing evaluation to determine invasion potential. One of the Australian Weeds of National Significance, but only problematic in Queensland.

Ceratophyllum demersum L.

Hornwort

Shoots of hornwort.

The forked leaves of hornwort are shown on the top. Below are the pinnate or feathered leaves of parrots feather

Known distribution

Hornwort occurs from Northland to Wairarapa and is still actively spreading. Recently found at Motueka. It is particularly common in the Waikato River and Rotorua lakes.

ID features

Leaves are whorled and 10–40 mm long. The leaves fork once or more into linear segments which are toothed (the teeth look like tiny horns – hence the name hornwort, wort being old English for plant). Flowers are minute and located at the base of the leaves. Hornwort has no roots, instead its lower leaves anchor it to sediment. It can survive as a free floating mat absorbing all the nutrients it needs from the surrounding water.

Similar species

Fanwort *(Cabomba caroliniana), Myriophyllum* spp. – see figures above that show the difference between hornwort and *Myriophyllum aquaticum.* Differs from fanwort in that the leaves are arranged in pairs on fanwort, whereas hornwort has leaves arranged in whorls.

Dispersal mechanism

Propagation by fragmentation of its brittle stems. Flowers occur on this species, but there is no evidence of seed production in New Zealand.

Biosecurity risk

First naturalised record 1961 (Napier). Unwanted organism. Currently our worst submerged weed, affecting indigenous biodiversity, hydrogeneration, and recreation.

Hydrilla verticillata (L.*f.*) Royle

Hydrilla

Hydrilla stem.

Turions (green) and tubers (yellow) of hydrilla.

Known distribution

Hydrilla occurs only in the Hawke's Bay having been recorded in Lakes Tutira, Waikopiro, and Opouahi and Elands Lake.

ID features

The leaves are 6–20 mm long and occur in whorls of 3–10, often varying greatly on the same shoot. They generally have sharp teeth along the leaf margin.

Similar species

Egeria and Canadian pondweed. Hydrilla is most easily distinguished from these two species by its toothed leaf margins.

Dispersal mechanism

The most common method of spread is from stem fragments. Hydrilla also spreads via tubers and turions, underground rhizomes, and above ground stolons.

Biosecurity risk

First naturalised record 1963 (Lake Tutira). Unwanted organism. A potentially major submerged weed, with management efforts to prevent spread and reduce biomass at known sites. A major weed in the USA.

Elodea canadensis Michaux

Canadian pondweed

Stems of Canadian pondweed.

Known distribution

Occurs throughout the country and is the most widely distributed of the tall-growing submerged weed species.

ID features

Leaves in whorls of 3 or in opposite pairs on lower stems. Leaves 6–12 mm long, rounded at tip.

Similar species

Egeria and lagarosiphon. Canadian pondweed is much smaller than egeria and almost always has leaves arranged in whorls of 3 compared with egeria which is usually in whorls of at least 4. Lagarosiphon has leaves that curl downwards and are arranged in spirals around the stem (not whorls).

Dispersal mechanism

Spreads by vegetative fragmentation from stem material.

Biosecurity risk

First naturalised record 1872 (Christchurch). Still commonly sold. Relatively minor impacts, usually co-exists with indigenous vegetation.

Egeria densa Planchon

Egeria

Stem apex of egeria.

Flowering egeria at the water surface.

Known distribution

Egeria is abundant in the Waikato district, and scattered throughout the North Island, with an increasing distribution. It is well established in Marlborough and has recently been found at several sites in Canterbury.

ID features

Submerged perennial. Leaves usually in whorls of 4–5 (sometimes 3–8). Leaves 10–30 mm long, narrowing to an acute tip. Egeria is the only oxygen weed with visible white flowers.

Similar species

Canadian pondweed *(Elodea canadensis)* and lagarosiphon *(Lagarosiphon major)*. Egeria can be differentiated from the others by its size (larger than the other two). Canadian pondweed almost always has leaves arranged in whorls of three. Lagarosiphon has leaves that curl downwards and are not arranged in whorls.

Dispersal mechanism

Egeria propagates from stem fragments containing lateral buds that give rise to new plants. Egeria does not produce seed in New Zealand, with only male flowering plants being present.

Biosecurity risk

First naturalised record 1946 (Tuakau). Unwanted organism. Currently has major impacts on indigenous biodiversity, hydrogeneration, and recreation.

Ranunculus trichophyllus Chaix

Water buttercup

A water buttercup stem showing the alternately arranged, highly-divided, thread-like leaves.

Water buttercup in flower.

Known distribution

Common throughout New Zealand except for the northern North Island and Westland.

ID features

Leaves are 2–3 times forked, ending in thread-like segments, and are between 30–60 mm long. Leaves are arranged alternately on the stem. Stems are up to 3 m long, often rooting at the nodes. Flowers have white petals and a yellow centre and are up to 15 mm across.

Similar species

Fanwort and egeria have similar flowers. Differs from fanwort in that the leaves are not fan-shaped. Differs from egeria in that the leaves are forked and not arranged in whorls.

Dispersal mechanism

Spreads by seeds or stem fragments.

Biosecurity risk

First naturalised record 1906. Relatively minor impacts, usually co-exists with indigenous vegetation.

Potamogeton perfoliatus L.

Clasped pondweed

Submerged leaves of clasped pondweed. Note the way the base of the leaves clasp the stem.

Known distribution

Not naturalised. Recorded in ponds in Otago and Canterbury.

ID features

Leaves are usually narrow to broadly ovate and greater than 6 mm wide. The submerged leaves clasp the stem.

Similar species

Potamogeton spp. *Potamogeton perfoliatus* can be distinguished from all other potamogetons by the way the leaf clasps the stem.

Dispersal mechanism

Stem fragments and seeds.

Biosecurity risk

Unwanted organism. A potential major submerged weed, with potential to hybridise with native *Potamogeton* spp., with management efforts to eradicate it from known sites.

Potamogeton crispus L.

Curled pondweed

Leaves of curled pondweed. Note the wavy leaf margins and the reddish centre vein.

Curled pondweed.

Known distribution

Almost throughout both North & South Islands.

ID features

All leaves are submerged, without stalks, and arranged alternately on the stem. They are green to reddish brown, about 10 mm in width, and up to 80 mm long. Leaf margins are markedly wavy and crimped (hence the name 'crispus'), with fine teeth near the tip. Centre veins of the leaves are normally reddish.

Similar species

Potamogeton ochreatus and *P.cheesemanii. Potamogeton ochreatus* has a straight edged leaf and a blunt leaf tip, whereas curled pondweed has a rounded leaf tip. It can be distinguished from *P. cheesemanii* by the submerged leaves, which are narrower and much more crimped in curled pondweed.

Dispersal mechanism

Spreads by rhizomes, seeds, or turions.

Biosecurity risk

First naturalised record 1940 (Fielding). Relatively minor impacts, usually co-exists with indigenous vegetation.

Field key for identifying the main alien floating-leaved weeds in New Zealand freshwater

1.	Leaves attached at margin	***Aponogeton distachyus*** (page 52)
	Leaves peltate	2.
2.	Plant with long stolons	3.
	Plant lacking long stolons	7.
3.	Basal sinus <10% leaf length	***Hydrocleys nymphoides*** (page 53)
	Cleft >10% leaf length	4.
4.	Leaf margins shallowly crenate-sinuate	5.
	Leaf margins not crenate-sinuate	6.
5.	Main vein protruding on ventral side of leaf	***Nymphaea mexicana*** (page 54)
	Main vein not protruding on ventral side of leaf	***Nymphoides peltata*** (page 55)
6.	Main vein protruding on ventral side of leaf	***Nymphaea mexicana*** (page 54)
	Main vein not protruding on ventral side of leaf	***Nymphoides geminata*** (page 56)
7.	Leaves ovate	***Nuphar lutea*** (page 57)
	Leaves orbicular	***Nymphaea alba*** (page 58)

Aponogeton distachyus L.f.

Cape pondweed

The unusual flower of Cape pondweed.

Known distribution

Scattered throughout New Zealand.

ID features

Cape pondweed has a basal globose tuber, 3–4 cm in diameter. Floating leaves are basal, dark green, up to 25 cm long, narrow-lanceolate in shape, and with many distinctive cross veins. Submerged leaves are linear in shape. Flowers are on a two-forked spike with fleshy white lobes and very fragrant.

Similar species

Swamp lily (*Ottelia ovalifolia*). Swamp lily has fibrous roots compared with the tuberous rootstock of Cape pondweed.

Dispersal mechanism

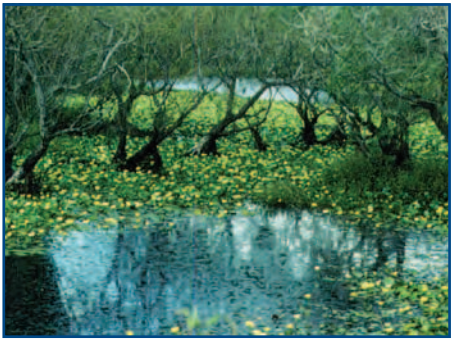
Seeds prolifically.

Biosecurity risk

First naturalised record 1870 (Waimate North). Minor impact in still and flowing water, apparently disappeared from many former northern sites.

Hydrocleys nymphoides (Humb. et Bonpl.) Buchneau

Water poppy flower, note the inflated main vein on the leaves.



Water poppy covering a large area of a shallow pond. Photo by J. Jeffery

Known distribution

Scattered in the northern North Island. Now been eradicated from many sites.

ID features

Underwater stem is elastic, creeping, or floating near the water surface. Leaves and roots attached at each node along the stem. Leaf is a bright glossy green, oval, 7 cm long, and with an inflated main vein on the underside. The leaf sinus is shallow. Flowers consist of 3 yellow petals with a purple centre (filaments) and are up to 8 cm across.

Similar species

Yellow water lily, marshwort, and fringed water lily. Yellow water lily has very thick spongy stolons (up to 10 cm) and much larger floating leaves (up to 40 cm long and 30 cm wide). Marshwort and fringed water lily do not have an inflated mid-vein on the underside of the leaves. They also have wings on the outer edges of their petals.

Dispersal mechanism

Vegetative spread by stolon fragments.

Biosecurity risk

First naturalised record 1914 (Te Aroha). Unwanted organism. Problem weed in still and floating water bodies, poor dispersal capacity has limited spread.

Nymphaea mexicana Zucc.

Mexican water lily

The pale yellow flower of Mexican water lily.

Mexican water lily smothering a shallow lake.

Known distribution

Auckland and Waikato.

ID features

Stout erect rhizome with creeping stolons. Leaves are almost round to elliptical in shape, with a deep sinus. Leaves are up to 20 cm across, green or pink on the lower surface, and with brown blotches on the upper surface. Flower is yellow and up to 15 cm across.

Similar species

Common water lily, marshwort, and fringed water lily. Common water lily has a horizontal rhizome distinguishing it from Mexican water lily, which has an erect rhizome and also often has brown blotches on the upper surface of leaves, which don't occur on the leaves of common water lily. Marshwort and fringed water lily have thin stolons which loop across the sediment surface or lie just beneath the water surface, whereas water lilies have thick rhizomes.

Dispersal mechanism

Rhizomes, tubers, and seed. Deliberate plantings.

Biosecurity risk

First naturalised record 1982 (Lake Ohakuri, Waikato River). Problem in still water bodies, much more so than *N. alba*, but poor dispersal capacity has limited spread.

Nymphoides peltata (Gmel) Kuntze

Fringed water lily

Known distribution

One site in the Auckland region, now eradicated from New Zealand.

ID features

Underwater stem creeping or floating near the surface with leaves and roots at each node. Leaves are almost round, with a scalloped margin, deep sinus, and up to 10 cm across. Green on upperside of leaf with purple blotches. Flowers are golden with 5 petals and solid marginal wings.

Similar species

Yellow water lily, marshwort, and water poppy. Yellow water lily has very thick spongy stolons (up to 10 cm) and much larger floating leaves (up to 40 cm long and 30 cm wide). Marshwort has entire leaf margins compared with the scalloped leaf margins of fringed water lily and no purple blotches on the upperside of the leaf. Water poppy has an inflated mid-vein on the underside of the leaves.

Dispersal mechanism

Vegetative spread by stoloniferous growth and by floating seeds which are fringed with many bristles. Deliberate plantings.

Biosecurity risk

First naturalised record 1988 (Whangaparoa Peninsula). Unwanted organism. Huge potential for spread because seeds are adapted for water bird dispersal.

Nymphoides geminata (R. Br.) Kuntze

Marshwort

Marshwort flowers and floating leaves.

A dense mat of marshwort.

Known distribution

Scattered from Waikato to Canterbury. Has been eradicated from many sites.

ID features

Underwater stem creeping or floating near the surface, with leaves and roots at each node. Leaves are heart-shaped and up to 10 cm across. Bright green on upperside and often pinkish on the underside. The main vein is indistinct. Flowers are bright yellow, with 5 petals that have fringed marginal wings.

Similar species

Fringed water lily, water poppy, water lily, and yellow water lily. Fringed water lily has leaves with scalloped margins, whereas marshwort has entire leaf margins. Yellow water lily has very thick spongy stolons (up to 10 cm) and much larger floating leaves (up to 40 cm long and 30 cm wide). Water lily has a larger leaf with a distinct main vein. Water poppy has an ovate leaf with an inflated mid-vein on the underside.

Dispersal mechanism

Vegetative spread by creeping stem growth and fragmentation. Deliberate plantings.

Biosecurity risk

First naturalised record 1985 (Lake Okareka, Rotorua). Unwanted organism. Problem in still water bodies, poor dispersal capacity has limited spread.

Nuphar lutea (L.) Sibth. et Sm.

Yellow water lily

Flower of yellow water lily.

An infestation of yellow water lily showing the massive rhizomes formed by this species.

Known distribution

One site in Hawke's Bay, almost eradicated.

ID features

Stout spongy, tuberous rhizome that is up to 10 cm across. The floating leaf is ovate, with entire leaf margins, a deep sinus, and up to 30 cm long. The submerged leaf is very thin and lettuce-like. Flower is golden yellow with 6 petals and up to 6 cm across with a strong alcoholic aroma. The flower is held above the water surface by a stout stalk.

Similar species

Nymphaea spp. water poppy, marshwort, and fringed water lily. *Nymphaea* species have a much rounder leaf and lack the thick spongy rhizomes that are so distinctive in yellow water lily. Water poppy, marshwort, and fringed water lily have much smaller floating leaves (up to 10 cm across) than the large leaves of yellow water lily, and also lack the distinctive rhizome.

Dispersal mechanism

Rhizome fragments and seed.

Biosecurity risk

First naturalised record 1975 (Central Hawke's Bay). Unwanted organism. Problem in still water bodies, poor dispersal capacity has limited spread.

Nymphaea alba L.

Common water lily

Flowers and floating leaves of common water lily.

Known distribution

Scattered throughout New Zealand, but most common in the north.

ID features

Stout horizontal rhizome up to 60 mm across. Leaves are almost round to elliptical in shape, with a deep sinus. Leaves are up to 25 cm across, green or pink on the lower surface, with a distinct main vein. Flower is either white or pale pink (hybrids can have red, yellow, or blue flowers) and are up to 20 cm across.

Similar species

Mexican water lily, marshwort, and fringed water lily. Mexican water lily has an erect rhizome distinguishing it from common water lily, which has a horizontal rhizome. Mexican water lily also often has brown blotches on the upper surface of leaves, which don't occur on the leaves of common water lily. Marshwort and fringed water lily have thin stolons which loop across the sediment surface or lie just beneath the water surface, whereas common water lily has thick rhizomes.

Dispersal mechanism

Rhizome extension and fragmentation, rarely by seed. Deliberate plantings.

Biosecurity risk

First naturalised record 1950. Planted in many water bodies where it may spread and become a minor nuisance, especially in shallow lakes. Poor dispersal capacity has limited spread.

Field key for identifying the main alien erect emergent weeds in New Zealand freshwater

1.	Leaves linear	2.
	Leaves not linear	5.
2.	Leaves arranged flabellately	3.
	Leaves not arranged flabellately	4.
3.	Leaves with sharp scabrid margins	***Zizania latifolia*** (page 60)
	Leaves with smooth margins	***Iris pseudacorus*** (page 61)
4.	Ligule hairy	***Phragmites australis*** (page 62)
	Ligule membranous	***Glyceria maxima*** (page 63)
5.	Leaves opposite or in threes, cauline	6.
	Leaves basal	7.
6.	Leaves deeply toothed	***Lycopus europaeus*** (page 64)
	Leaves not conspicuously toothed	***Lythrum salicaria*** (page 65)
7.	Leaves hastate	***Sagittaria montevidensis*** (page 66)
	Leaves lanceolate	***Sagittaria platyphylla*** (page 67)
	Leaves oblong-spathulate	***Sagittaria subulata*** (page 68)

Zizania latifolia (Griseb.) Stapf

Manchurian wild rice

Flower head of Manchurian wild rice.

A tall dense stand of Manchurian wild rice.

Known distribution

Widespread near Dargaville, scattered elsewhere in Northland, Auckland, Waikato, and Wellington.

ID features

Tall marginal perennial. Coarse tufts, 2–4 m in height. Stout spreading rhizomes. Leaves light green, up to 1 m or more long and 1–2 cm wide. Inflorescenses purplish or reddish brown. Lower part is spreading and male, the upper part is more closed and with female flowers.

Similar species

Raupo (*Typha orientalis*). Raupo is usually shorter (1–3 m) than Manchurian wild rice, with bluish-green leaves with a characteristic twist in the leaf blade and a cylindrical brown flower spike.

Dispersal mechanism

Rhizome fragments, seeds, floating mats.

Biosecurity risk

First naturalised record 1900s (Dargaville). Unwanted organism. Problem in still and flowing water bodies, poor dispersal capacity has limited spread, although local spread occurs through contaminated drainage machinery.

Iris pseudacorus L.

Yellow flag

The bright yellow flower of yellow flag.

Known distribution

Waikato southwards. Scattered, but locally abundant.

ID features

Tall marginal summer-green perennial.
Dark green, leafy clumps. Leaves sword-shaped, 2–3 cm wide that shred to fibres when old. Flower stalk is stout, flowers are yellow and up to 12 cm across. Plants growing over water can form rafts of floating rhizomes, strong enough to support the weight of a human.

Similar species

Raupo (*Typha orientalis*) has a narrower leaf than yellow flag and has a characteristic twist in the top of the leaf blade. Manchurian wild rice (*Zizania latifolia*) is much taller and has sharp-edged leaves.

Dispersal mechanism

Spreads by rhizomes and seed.

Biosecurity risk

First naturalised record 1878. Unwanted organism. Problem in still and flowing water bodies, also in flooded pasture because the species is extremely toxic to livestock. A potential weed of salt marsh vegetation.

Phragmites australis (Cav.) Steudel

Phragmites

Dense stand of phragmites. Photo by MAF.

Known distribution

Scattered around Napier, and two small sites in Murchison and Christchurch.

ID features

Robust grass, growing to 3 m or more tall, with stout far-reaching rhizomes. Stalks are leafy, rigid, erect, bamboo-like, with many nodes. Leaves bluish-green, up to 60 cm long and 3 cm wide, often aligning in one direction when older. Flower head is purplish, silky, and almost up to 40 cm long.

Similar species

Giant reed (*Arundo donax*) and bamboos. Giant reed is taller with arching stems. Bamboos have stalked leaves rather than leaves that attach directly to the stalk in the case of phragmites.

Dispersal mechanism

Rhizome fragments or deliberate plantings.

Biosecurity risk

Unwanted organism. New Zealand's worst potential problem aquatic weed, fortunately not yet introduced to suitable habitat and not sexually reproducing.

Glyceria maxima (Hartman) Holmb.

Reed sweetgrass

Dense stand of reed sweetgrass.

Floating mats of reed sweetgrass.

Known distribution

Scattered throughout the country, but locally common in Waikato, Hauraki Plains, and parts of Otago.

ID features

Has stout erect leaves (30–60 cm long and up to 20 mm wide), with creeping rhizomes that form large patches excluding all other plants. The tip of the leaf is boat-shaped. The panicles are branched, rather dense, and have numerous spikelets. The sheath has obvious cross veins. Reed sweetgrass can grow to 0.5–2 m tall and is bright green.

Similar species

Glyceria declinata and *G. fluitans.* Both of the other *Glyceria* species present in New Zealand are much smaller in size (up to 50 cm) and form low clumps as opposed to the tall erect clumps formed by reed sweetgrass.

Dispersal mechanism

Spreads by seed and rhizomes.

Biosecurity risk

Problem sprawling emergent weed, affecting drains and slow flowing waterways. Can be toxic to cattle.

Lycopus europaeus L.

Gypsywort

Gypsywort stem showing flowers in whorls. Photo by T. James

Gypsywort growing through native sedges.

Known distribution

North and South Island, but mainly in Waikato and Rotorua lakes, rare in Westland.

ID features

Stems erect to 1 m and four-sided. Leaves green with a deeply toothed margin. Flowers are white with purple spots in whorls where the leaves meet the stem.

Similar species

Spearmint (*Mentha spicata*). Spearmint has a distinct minty aroma and purple flowers that occur at the end of the stem.

Dispersal mechanism

Produces far reaching stolons, also seed.

Biosecurity risk

First naturalised record 1940 (Waikato). Problematic on the margins of still water bodies where it invades other erect emergent vegetation (e.g., raupo, *Baumea articulata*).

Lythrum salicaria L.

Purple loosestrife

Showy flower of purple loosestrife. Photo by N. Procter.

Purple loosestrife in a drain.

Known distribution

Manawatu to Southland.

ID features

Tall emergent perennial herb. Normally 60–100 cm tall, but can grow taller. Purple flowers in dense terminal spikes. Stems are angled (4–6 sided). The stalkless leaves can be opposite, often with alternating pairs at 90 degree angles, or sometimes in whorls of 3 near the base. The upper leaves and floral bracts can be alternate. The leaves are 5–12 cm long, wider and rounded or heart-shaped at the base. Leaf shape varies from lanceolate to narrowly oblong. Leaf sometimes covered with fine hairs.

Similar species

None.

Dispersal mechanism

Seed or vegetative fragments.

Biosecurity risk

First naturalised record 1958. Unwanted organism. Major potential problem in still water bodies and wetlands, a major weed in North America.

Sagittaria montevidensis Cham. & Schlecht

Arrowhead

Arrow-shaped leaves of arrowhead.

Known distribution

Two sites in the Auckland region.

ID features

Tall emergent perennial or annual herb. Stems are erect from 7 cm to 2 m tall. Emergent leaves have a distinctive arrow-shape with basal lobes up to 15 cm long. The rest of the leaf is up to 25 cm long and 20 cm wide. Flowers are white with a purple basal spot, about 2.5 cm in diameter, arranged in whorls.

Similar species

Other *Sagittaria* species. The two other *Sagittaria* species present in New Zealand (*S. subulata and S. platyphylla*) do not have arrow-shaped emergent leaves.

Dispersal mechanism

Seeds and deliberate plantings.

Biosecurity risk

First naturalised record 1996 (Manukau). Unwanted organism. Problem in still and flowing water bodies, massive seed output, therefore important to attempt early eradication. A major irrigation weed in New South Wales.

Sagittaria platyphylla (Engelmann) Smith

Sagittaria

The emergent leaves and flowers of sagittaria. Photo by R. Smart.

Known distribution

A few sites in Auckland and Waikato.

ID features

Emergent perennial herb. Submerged leaves are strap-shaped, 10–50 cm long and 3 cm wide with clearly visible longitudinal veins. Leaves above the water have a long petiole (about 40 cm) which is triangular in cross section and a lance–shaped leaf blade. Flowers are white with 3 petals and about 6 cm across. Tubers form on rhizomes.

Similar species

Alisma spp. *Alisma* species have D-shaped petioles and much larger inflorescenses with smaller flowers.

Dispersal mechanism

Spreads by seed, rhizomes, and tubers.

Biosecurity risk

First naturalised record 1989 (North Shore). Unwanted organism. Problem in still and flowing water bodies, massive seed output, therefore important to attempt early eradication. A major irrigation weed in Victoria.

Sagittaria subulata (L.) Buchenau

The straplike leaves can be seen below the surface of the water, while the spathulate ends are floating on the surface. The large white flowers can also be seen in this photo. The small red floating plant is ferny azolla.

Known distribution

Lake Waahi in the Waikato, Auckland, Coromandel, and Nelson.

ID features

This plant has long submerged straplike leaves which are spathulate on the ends where they float on the water surface. Emergent leaves are oval. The flowers have 3 white petals which are usually just above the surface of the water.

Similar species

Vallisneria spp. *Vallisneria* species never have floating leaves or conspicuous white flowers.

Dispersal mechanism

Seed.

Biosecurity risk

First naturalised record 1993 (Lake Waahi). Lower weed potential than other *Sagittaria* and *Vallisneria* species.

Field key for identifying the main alien free-floating weeds in New Zealand freshwater

1.	Plant floating subsurface	***Utricularia gibba*** (page 70)
	Plant floating above the water surface	2.
2.	Leaves bearing hairs	3.
	Leaves glabrous	4.
3.	Plant a rosette	***Pistia stratiotes*** (page 71)
	Plant arranged on a horizontal stem	***Salvinia molesta*** (page 72)
4.	Plants flat with overlapping scales	***Azolla pinnata*** (page 73)
	Plants erect with fleshy leaves	***Eichhornia crassipes*** (page 74)

Utricularia gibba Lam.

Bladderwort

Leaves and flowers of Utricularia gibba.

Known distribution

A few sites in Northland, Auckland, and the Waikato. Appears to be spreading.

ID features

Leaves are filamentous, up to 1 cm long, usually entire but occasionally branched. Bladders are up to 1.5 mm long and obliquely ovoid, situated on the leaves on short stalks. Small yellow flowers are commonly produced above the water surface.

Similar species

Utricularia australis. Utricularia. gibba has entire or nearly entire leaves, whereas *U. australis* has leaves divided many times into filiform segments and has large bladders up to 3 mm long.

Dispersal mechanism

Vegetative fragments, possibly seed.

Biosecurity risk

First naturalised record 1978 (Bethells Beach). Unwanted organism. Problem in farm dams and irrigation ponds, unknown impact on indigenous aquatic vegetation.

Pistia stratiotes L.

Water lettuce

Side view of water lettuce showing root system. Photo by R. Thompson.

Water lettuce (from above).

Known distribution

Two North Island sites. Now eradicated.

ID features

Free floating perennial herb. Plants are stoloniferous with daughter plants often attached. Leaves are velvety hairy, pale yellow-green, often with a spongy thickened base. Roots are long and finely divided. Flowers are small (about 1 cm long), arranged as a spike enclosed by a hairy green bract.

Similar species

None.

Dispersal mechanism

Older stolons between individual plants decay to release young plants. Also spreads by seed.

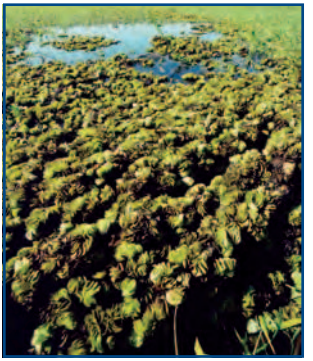
Biosecurity risk

First naturalised record 1975 (Welcome Bay, Tauranga). Notifiable organism. Eradicated from all known field sites. A major weed in many warm temperate and tropical countries.

Salvinia molesta Mitchell

Salvinia

The folded adult leaves of salvinia. Photo by MAF.



Salvinia almost covering the surface of this lake. Photo by P. Ryan.

Known distribution

Found mostly in the northern North Island because it prefers warm conditions.

ID features

Free-floating fern. Salvinia has a horizontal stem with paired aerial (above the water) leaves. Adult leaves are folded, whereas young leaves are flat. Aerial leaves have hairs shaped like egg-beaters. Lower submerged leaves look more like roots and can be up to 30 cm long.

Similar species

None.

Dispersal mechanism

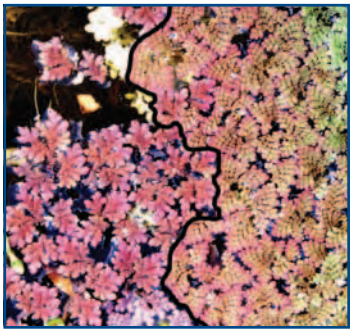
Spreads rapidly by fragmentation and producing plantlets from the old end of the horizontal axis, and can grow from a singe node. The plant is apparently a sterile hybrid.

Biosecurity risk

First naturalised record 1963 (Western Springs). Notifiable organism. Subject to nationally funded eradication programme since 1983. A major weed in many warm temperate and tropical countries.

Azolla pinnata R. Br.

Ferny azolla



*The native Pacific azolla (*Azolla rubra*) is shown on the left of the photo with ferny azolla on the right.*

A lake covered in ferny azolla, giving the surface a bright red appearance.

Known distribution

Mainly the top half of the North Island, as far south as Rotorua.

ID features

Floating fern**.** Plants are 1–3 cm long, triangular in outline, and regularly branched. Leaves green to red (almost purple). Roots densely covered with branched, fine, hair-like rootlets.

Similar species

Azolla rubra (Pacific azolla) – a native floating fern. Pacific azolla is more ovate and irregularly branched. Roots are not branched.

Dispersal mechanism

Reproduces rapidly by fragmentation, forming dense mats across nutrient-rich still waters. Produces spores which may be spread by waterfowl.

Biosecurity risk

First naturalised record 1969 (Whangarei). Widespread free-floating weed smothering sheltered still water bodies.

Eichhornia crassipes (Mart.) Solms-Laub.

Water hyacinth

Flowers and leaves of water hyacinth.

A dense stand of water hyacinth in a farm pond.

Known distribution

Northern North Island. Almost eradicated.

ID features

Free floating perennial herb. Plants are stoloniferous with daughter plants often attached. Leaves are bright green, often with a spongy inflated petiole. Roots are long and finely divided, and are bright purple when young before becoming black. Flowers are large (7 cm in diameter) in a spike of up to 10 flowers. They are blue-purple with a central yellow eye surrounded by a dark ring on the uppermost petal.

Similar species

None.

Dispersal mechanism

Older stolons between individual plants decay to release young plants. Also spreads by seed.

Biosecurity risk

First naturalised record 1950 (Waiuku). Notifiable organism. Subject to nationally funded eradication programme since 1950s. A major weed in many warm temperate and tropical countries.

Field key for identifying the main alien sprawling emergent weeds in New Zealand freshwater

1.	Leaves divided	2.
	Leaves not divided	3.
2.	Leaves in whorls	***Myriophyllum aquaticum*** (page 76)
	Leaves trifoliate	***Menyanthes trifoliata*** (page 77)
3.	Leaves linear	4.
	Leaves not linear	6.
4.	Leaves in whorls	***Myriophyllum variifolium*** (page 78)
	Leaves not in whorls	5.
5.	Leaf sheaths with cross-veins	***Glyceria maxima*** (page 79)
	Leaf sheaths without cross-veins	***Paspalum distichum*** (page 80)
6.	Leaves opposite	7.
	Leaves alternate	***Ludwigia peploides*** (page 81)
7.	Stem 6–8 angled, leaves toothed	***Gymnocoronis spilanthoides*** (page 82)
	Stem round, leaves not toothed	***Alternanthera philoxeroides*** (page 83)

Myriophyllum aquaticum (Vell. Conc.) Verdc.

Parrot's feather

Upper stem of parrot's feather.

A dense mat of parrots feather.

Known distribution

Spreading rapidly through the North Island (most common in Auckland, Waikato, Wairarapa, and southern Manawatu) and the northern part of the South Island and Westland.

ID features

Sprawling emergent perennial herb. Emergent leaves are a light bluish-green, up to 3.5 cm long, and deeply divided (pinnate), giving them a feathery appearance. They are arranged in whorls of 4–6. The stem can be up to 2 m long, but with only up to the top 10 cm emerging above water. Flowers are white, tiny (up to 1.5 mm across), with no petals, and attached at the leaf-stem axil.

Similar species

Other *Myriophyllum* spp. and hornwort. Of the *Myriophyllum* species in New Zealand, the rare *M. robustum* is the most similar to parrots feather. The easiest way to tell the difference is by looking at the shape of each leaf. *Myriophyllum robustum* is pointed at the end, whereas parrots feather has a rounded leaf tip. Hornwort has forked leaves compared with the pinnate leaves of parrot's feather (as shown by the diagram on the hornwort infosheet on page 44).

Dispersal mechanism

Propagation and spread is by stem fragmentation and lateral stem growth. It does not produce viable seed in New Zealand, with only female flowers known to exist here.

Biosecurity risk

First naturalised record 1929 (Palmerston North). Unwanted organism. Currently a major sprawling emergent weed, affecting a wide range of habitats. A weed in many warm temperate countries

Menyanthes trifoliata Tournef.

Bogbean

Leaves of bogbean are shown on the left. On the right are the flowers, clearly showing the white hairs on the surface of the petals.

Known distribution

Recorded at Racecourse Hill near Darfield in Canterbury and in a pond in Queenstown. Has been eradicated from both sites. Currently not known to exist in the wild.

ID features

Sprawling emergent perennial herb. Leaves appear in threes at the end of stems (like the leaves of broad bean). Leaflets are elliptical to obovate, 3–10 cm long, 1–5 cm wide, entire or sometimes coarsely toothed. Leaves are all basal, with the petiole bases arranged alternately on the creeping stem. Flowers have five petals, pinkish-white in colour, with long white hairs on the top surface. Flowers are about 2.5 cm across.

Similar species

None.

Dispersal mechanism

Spreads by seeds, stem extension, and fragmentation. Can establish rapidly from stem fragments. Seeds have not been seen in the field in New Zealand.

Biosecurity risk

First naturalised record 1976 (Darfield). Unwanted organism. A potential sprawling emergent weed, eradicated.

Myriophyllum variifolium Hook f.

The emergent leaves of Myriophyllum variifolium.

Known distribution

A few scattered sites in the North and South Islands (e.g., Auckland, Waikato, Marlborough, and Nelson).

ID features

The emergent leaves are in whorls of 5–6 and have entire leaf margins, although the lower ones may have a few teeth. The submerged leaves have up to 19 elongated and widely spaced leaflets.

Similar species

Myriophyllum propinquum. Myriophyllum propinquum has reddish stems and leaves are arranged in whorls of 3–4, whereas *M. variifolium* has whorls of 5–6. Emergent stems of *M. propinquum* have male (yellow stamens) and female flowers on the same stem (male above female).

Dispersal mechanism

Propagation and spread is by stem fragmentation and lateral stem growth. It does not produce viable seed in New Zealand, with only female flowers known from field sites.

Biosecurity risk

First record 1990 (Hunua), possibly natural spread from Australia. Spreading at this site and also in the Opawa River, Blenheim. A potential sprawling emergent weed.

Glyceria maxima (Hartman) Holmb.

Reed sweetgrass

Dense stand of reed sweetgrass.

Floating mats of reed sweetgrass.

Known distribution

Scattered throughout the country, but locally common in Waikato, Hauraki Plains, and parts of Otago.

ID features

Has stout erect leaves (30–60 cm long and up to 20 mm wide), with creeping rhizomes that form large patches excluding all other plants. The tip of the leaf is boat-shaped. The panicles are branched, rather dense, and have numerous spikelets. The sheath has obvious cross veins. Reed sweetgrass can grow to 0.5–2 m tall and is bright green.

Similar species

Glyceria declinata and *G. fluitans.* Both of the other *Glyceria* species present in New Zealand are much smaller (up to 50 cm tall) and form low clumps as opposed to the tall erect clumps formed by reed sweetgrass.

Dispersal mechanism

Spread by seed and rhizomes.

Biosecurity risk

Problem sprawling emergent weed, affecting drains and slow flowing waterways. Can be toxic to cattle.

Paspalum distichum L.

Mercer grass

On the left are the stems and leaves of Mercer grass and on the right are the flower heads.

Known distribution

Common in the North Island. As far south as Lincoln in the South Island.

ID features

Leaves are distantly alternate, the lamina is 4–10 cm long and 2–6 mm wide. The flower heads are usually paired as shown above and up to 5 cm long. The stems sprawl along the ground and then grow to 60 cm tall. Ligule membranous, up to 4 mm long.

Similar species

Kikuyu grass (*Pennisetum clandestinum*). Differs from Mercer grass in that Kikuyu grass lacks a membranous ligule and has a short flowering head that is almost enclosed within the leaves. In contrast, Mercer grass has a very distinctive forked flowering head.

Dispersal mechanism

Spreads by seed and stem fragmentation.

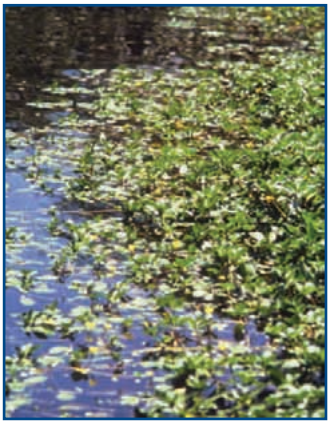
Biosecurity risk

First naturalised record 1887 (Mercer). Widespread sprawling emergent weed, common in flooded pasture.

Ludwigia peploides (Kunth) Raven

Primrose willow

A flowering stem apex.



Primrose willow spreading on the lower Waikato River.

Known distribution

Northland to Waikato and a few sites in Manawatu.

ID features

Sprawling emergent perennial herb. Primrose willow has branched stems with roots at the nodes, either attached to soil or hanging in the water. The leaves are alternate and obtuse, and up to 6 cm long. Their upper surfaces are glossy and they taper into petioles that are up to 2.8 cm long, with two dark green, swollen, rounded stipules at the base. The flowers are up to 2 cm, bright yellow, and arise on stalks from the leaf axils.

Similar species

Ludwigia palustris and alligator weed. *Ludwigia palustris* has reddish, opposite, entire leaves. Alligator weed also has opposite leaves.

Dispersal mechanism

Stem fragments and seed.

Biosecurity risk

First naturalised record 1933 (Waikato). Unwanted organism. Currently a major sprawling emergent weed where it occurs, poor dispersal capacity has limited spread.

Gymnocoronis spilanthoides (D. Don) DC.

Senegal tea

Senegal tea flower (left) and vegetative mat of Senegal tea (right).

Known distribution

Northern North Island.

ID features

Sprawling emergent perennial herb. Leaves are dark green, opposite, and ovate to lanceolate in shape. They vary in size from 5 to 20 cm long, 2.5 to 5 cm wide, and are on shortish stalks. Leaf margins are serrate and slightly wavy. Flowers are whitish, numerous, and grouped into terminal heads that are 1.5 to 2 cm in diameter. Stems are pale green and prostrate, becoming erect when flowering. Flowers are highly scented.

Similar species

Similar to alligator weed when in its sprawling phase. Can be differentiated from alligator weed by its serrated leaf margins.

Dispersal mechanism

Spreads by stem fragments and seed.

Biosecurity risk

First naturalised record 1990 (Papakura Stream). Unwanted organism. A potential sprawling emergent weed, with eradication programmes at all known sites.

Alternanthera philoxeroides (Mart.) Griseb.

Alligator weed

Stems of alligator weed are shown on the left and on the right is the clover-like flower head.

Known distribution

Its current distribution is widespread in Northland and Auckland, with scattered sites in Waikato, Bay of Plenty, Manawatu-Wanganui, Westland, and Canterbury.

ID features

Sprawling emergent perennial herb. Leaves are bright green, waxy, and elliptical. They are between 5–10 cm long, up to 2 cm wide, and arranged in opposite pairs on the stem. The white flower looks like a small clover flower and is at the end of a longish stalk. Stems are thick, soft, and hollow, often with a reddish tinge.

Similar species

The native nahui, *Alternanthera sessilis,* Senegal tea, and primrose willow. Nahui is much smaller, with the flowers located in the axis between the stem and leaves. Senegal tea has serrated and wavy leaf margins. Primrose willow has alternate leaves.

Dispersal mechanism

Reproduction is vegetative by the extension of prostrate stems or stem fragmentation. The floating fringe of marginal mats is also readily fragmented and dispersed. Seed set is unknown in New Zealand.

Biosecurity risk

First naturalised record 1906 (Dargaville). Unwanted organism. Currently our worst sprawling emergent weed, affecting arable and pastoral land in addition to aquatic habitats. A major weed in many temperate countries.

Glossary

acute: sharply pointed.

adipose fin: a small fleshy lobe with no spines or rays on the back of fish between the dorsal fin and caudal fin.

alternate: arranged singly along the stem (opposite of opposite).

anal fin: the unpaired or single fin on the ventral (underside) of a fish just behind its vent; the base of the anal fin is where it joins the body.

anal gill: thin respiratory structure positioned at posterior of invertebrate.

apex: tip of an organ (e.g., tip of a stem, root).

axil: upper angle between dissimilar parts such as leaf and stem (see diagram).

barbel: soft, whisker-like appendage protruding from around the mouth of fish.

basal: attached near the base, as with leaves on a stem.

bladder: swollen body with hair triggers (carnivorous plants) (see diagram).

budding: offspring grows out of the body of the parent.

bract: a modified, usually much reduced, leaf (scale-like).

capsule: dry fruit containing many seeds. Spontaneously opens to release seeds.

caudal fin: tail fin of fish.

cauline: leaves arranged along the length of the stem (opposite of basal).

cleft: deep incision.

comb scales: small comb-like scales present on lateral margins of last abdominal segment of mosquito larvae.

compound: having several similar parts (often used to describe a leaf that is composed of distinct or separate leaflets).

crenate-sinuate: shallow toothed with wavy margins.

cross-veins: veins that run perpendicular to the leaf across longitudinal veins.

culm: aerial stem bearing inflorescence and leaves (often used to describe stems in grasses and sedges).

deflexed: bend sharply downwards.

dorsal fin: an unpaired fin on the back of fish; there may be up to 3 dorsal fins and some may be joined.

echinostomes: intestinal flukes (flatworms) of the Family Echinostomatidae which consists of many species. They occur in man and other vertebrates. The intermediate hosts are frequently snails.

elliptical: rounded at both ends, widest in the middle.

entire: not toothed or lobed, smooth (see diagram).

filiform: thread-like.

filament: stalk of a stamen.

fin rays: soft rods that give support to fins. Rays are usually branched into two halves (side by side), are often segmented, and are usually flexible.

fin spine: a stiff, bony rod supporting a fin. Some spines are sharp. Not divided into two halves.

flabellate: fan-shaped.

forked: refers to the posterior margin of the caudal fin; a forked fin is deeply indented.

gill opening: the exterior opening of the gills — located just behind the head. Gill openings may be covered by a bony plate (the operculum) or soft flaps of skin.

glabrous: hairless.

globose: nearly spherical.

gonopodium: a specialised part of the anal fin in male gambusia and other poeciliids (live bearing fish) that is used to transfer sperm to female fish.

hastate: arrow-shaped, with backward pointing basal lobes.

inflorescence: collection of flowers and their supporting branchlets which arise from a common point.

lamina: an expanded flattened portion of an organ (usually the blade of a leaf).

lanceolate: lance-shaped (see diagram).

ligule: outgrowth at the inner junction of the leaf sheath and blade.

linear: narrow with parallel margins (see diagram).

liver fluke: flatworm parasitic in liver and bile ducts of domestic animals and humans.

lobed: divided into (usually rounded) segments.

membranous: thin and flexible.

node: the region of a stem from which one or more leaves or branches arise (see diagram).

oblique: having a slanting direction.

oblong: with parallel sides and rounded ends.

obovate: egg-shaped, attached at the narrow end.

obtuse: blunt (see diagram of blunt leaf tip).

operculum: a hardened plate used to seal a snail shell.

orbicular: almost circular.

ovate: egg-shaped, attached at the broad end.

ovoid: of a solid body with ovate outline.

panicle: an indeterminate (continuing to grow at the apex) inflorescence which is branched several times. Especially common in grasses.

pecten teeth: scale or comb-like teeth on respiratory siphon of mosquito larva.

pectoral fins: paired fins (one on either side of the body) located just behind or below the gill openings.

peltate: petiole attached near the middle of the underside of leaf**,** not on the leaf margin.

pelvic fins: paired fins (one on either side of the body) located on the ventral side of the fish between the head and the vent. Pelvic fins are not always present, e.g., mudfish.

perennial: living for several or many years.

petiole: stalk of a leaf.

pinnate: compound, with parts arranged on either side of an axis (see diagram).

rhizome: stem growing underground, usually horizontally.

rounded: refers to the posterior edge of the caudal fin; edge is shaped like a convex curve.

scales: thin, overlapping plates of a hard substance that protect the skin of fish. The easiest way to tell if a fish has scales is to run your finger along the side of the fish from back to front. If the fish feels smooth and slippery, it has no scales or the scales are small and deeply embedded within the skin; if it feels rough and your finger catches, then it has external scales.

scabrid: with minute harsh projections, rough to touch.

serrated: notched like a saw blade.

sheath: enclosing tubular structure, usually around the base of a stem or leaf.

sinus: a recess or indentation between adjacent lobes or teeth (usually on the margin of a leaf) (see diagram).

siphon: breathing tube of mosquito larva.

spathulate: spoon-shaped (see diagram).

spike: inflorescence with an unbranched axis and unstalked flowers.

spikelet: small spike.

spire: the pointed end of a snail shell.

stipule: a leaflet-like appendage at the base of a leaf stalk.

stolon: stems growing horizontally at or above ground level and giving rise to upright stems at nodes (runners).

summer-green: green in summer, above-ground parts dying down before winter.

terminal: borne at the end of a stem and limiting its growth.

trematodes: flukes.

trifoliate: with three leaflets.

tuber: swollen portion of a stem or root, usually underground.

turion: a winter bud that is produced by certain aquatic plants. Turions become detached and remain dormant on the pond or lake bottom during the winter before developing into new plants the following season.

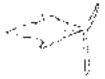
undulate: wavy, in a plane at right angles to the surface (like corrugated iron).

vent: the posterior, external opening of the gut (akin to the anus)

ventral: the lower surface of the body or leaf.

whorl: three or more parts arranged on one level (see diagram).

Leaves strap-like, linear



Leaves toothed

Leaves entire

Bladders present

Rosette leaf

Pinnate leaf

Leaf with basal sinus

Leaves lanceolate

Leaves spathulate

Leaves ovate

Leaves rounded at tip

Leaf tip blunt

Leaves orbicular

Leaf tip acute

Stem 4-angled

Plant with long stolons

Rootstock tuberous

Leaves conspicuously toothed

Leaves pinnate, filiform

Leaves alternate

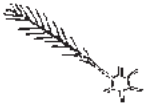
Leaves in whorls of 3

Leaves in whorls of 4

Leaves opposite

Leaf with distinct sheath

Plants with rhizome



Leaves petiolate

Leaves sessile

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Index - common names

Index - scientific names


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