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In Essence

- Ruppia beds are essential to Waituna Lagoon for regulating water quality and providing habitat for aquatic organisms.
- The continued viability of Ruppia, under the current conditions in Waituna Lagoon, is at risk.
- Waituna Lagoon has shifted from pristine towards more eutrophic conditions.
- Restoration of Waituna Lagoon towards a pristine condition is essential if the high ecological status of the lagoon is to be maintained.
- Limiting nutrient inputs into the lagoon is critical to the survival of the Ruppia beds.

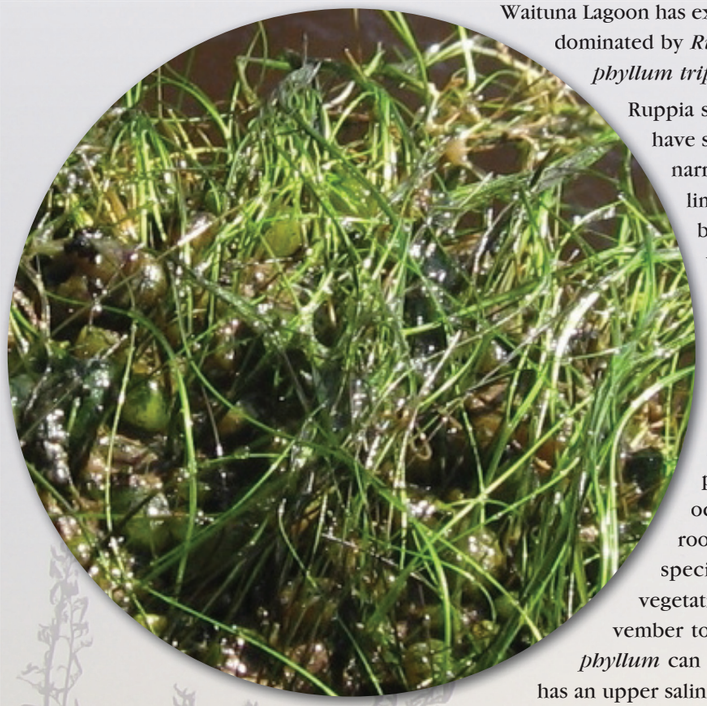
Arawai Kākāriki
wetland restoration programme

Awarua/Waituna

Published by
Department of Conservation
Southland Conservancy
PO Box 743
Invercargill
June 2010

Waituna Lagoon Macrophyte Community

Macrophytes are aquatic plants that grow in or near water. In lakes macrophytes provide cover for fish and habitat for aquatic invertebrates, produce oxygen, and act as food for some fish and wildlife.



Ruppia or Horse's mane dominates Waituna Lagoon's Macrophyte community. When conditions are favourable Ruppia forms extensive underwater meadows. Photo: Department of Conservation

Waituna Lagoon has extensive meadows of macrophytes which are dominated by *Ruppia megacarpa, R. polycarpa* and *Myriophyllum triphyllum* (water milfoil).

Ruppia species grow in relatively shallow water and have slender creeping stems and thread-like, long, narrow leaves. *R. megacarpa* is widespread but limited to saline coastal habitats, growing in brackish water or saline ponds and lagoons, whilst *R. polycarpa* has a wider habitat, growing in estuarine water as well as freshwater lakes and streams. Both can form dense, grassy beds in shallow water but seldom grow higher than 40cm, although *R. megacarpa* can grow up to 2 m long.

Myriophyllum triphyllum (water milfoil) plants grow to 3m tall in deep water. They occur in both standing and flowing water and root most commonly in sandy sediments. These species form dense and conspicuous stands of vegetation in shallow water, while flowering (November to March). Unlike the Ruppia species, *M. triphyllum* can survive short term receding water levels. It has an upper salinity tolerance level of 4 ppt.

WHY IS RUPPIA IMPORTANT?

The Ruppia dominated macrophyte beds play a key role in the lagoon ecosystem by stabilizing the bottom sediments, reducing sediment re-suspension and limiting shoreline erosion. They also provide food and/or habitat for macroinvertebrates, fish and birds.

Ruppia also plays an important part in regulation of the lagoon's water quality, taking up nutrients from the water column and thereby reducing the potential for high nutrient levels to result in nuisance algal blooms.

New Zealand Government

Department of Conservation
Te Papa Atawhai

WHY IS RUPPIA AT RISK?

Snapshot 2007

- Ruppia beds covered 66% of the lagoon.
- *Ruppia polycarpa* and *Ruppia megacarpa* both present.
- Areas of greatest density spread throughout the lagoon.
- Primarily in areas sheltered from wind and wave disturbance.
- Low presence of Myriophyllum.

The ecological value of Ruppia is compromised by changes occurring within the lagoon system. The main risks come from; changing light levels (water clarity), increased nutrient loads (nitrogen and phosphorus) and saline incursion during critical growing periods.

WHAT WILL HAPPEN IF THE RUPPIA BEDS ARE NOT MAINTAINED?

If the Waituna Lagoon Ruppia beds are not maintained the lagoon ecosystem will shift from its current macrophyte dominated state to one dominated by phytoplankton. This would be catastrophic for the native fish and water fowl that the lagoon supports. Current research suggests that once this shift is made it may not be easily reversed. The most classic example of this is Te Waihora/Lake Ellesmere where Ruppia was lost many years ago. Despite translocation attempts the Ruppia beds have not regenerated. Te Waihora/Lake Ellesmere is now in a modified state subject to periods of poor water quality, including algal blooms, which threaten the biodiversity, fishing and recreation values.

MACROPHYTE (RUPPIA) MONITORING

At present, monitoring evidence suggests that the lagoon is moving further towards the point to which a switch to an algal dominated system is likely.

Macrophyte surveys were carried out in 2007 and 2009. Each survey was undertaken while the lagoon was closed and during what is believed to be optimal growth conditions. The first survey mapped the distribution and abundance of macrophytes based on aerial photograph interpretation and randomised survey sites. In 2009 a more rigorous methodology was developed comprising 48 sample sites on 10 transects across the lagoon. Measurements included macrophyte abundance, species composition, water depth, water clarity, and temperature and salinity.

Results of the 2009 survey indicated that there is a shift towards more eutrophic conditions with an increase in nuisance macroalgae (*Bachelotia*), poorer water and sediment quality, and decline in condition of Ruppia beds evident by a decline in abundance since 2007.

This knowledge is increasing the information we have to identify the optimal growing conditions for Ruppia. Ideally, an ecosystem model of Waituna Lagoon will be developed that can be used to predict the future distribution of Ruppia; and determine the management actions that will help maintain Ruppia beds and the health of the lagoon.

Right: Waituna Lagoon – typical bottom sample showing brown slimy macroalgal layer (*Bachelotia antillarum*) and Ruppia. Photo: Department of Conservation

Snapshot 2009

- Ruppia beds cover reduced within the lagoon.
- *Ruppia polycarpa* dominated.
- *Ruppia megacarpa* present only at a few sites.
- Widespread presence of nuisance macroalgal growths.
- Lagoon has shifted towards a more eutrophic state.
- Substantial risk of losing Ruppia from the lagoon.
- Increased presence of Myriophyllum.

MANAGEMENT OPTIONS

Maintaining healthy and functioning macrophyte beds including both *Ruppia megacarpa* and *R. polycarpa* is essential to ensuring the ecological features and important values of the lagoon are preserved.

The key management options for the lagoon are:

- Limit nutrient and sediment inputs;
- Managing the lagoon water regime to limit periods of poor water quality - taking into account the ecosystem water requirements and surrounding landholders.

HOW DOES LIMITING NUTRIENTS BENEFIT THE LAGOON?

By limiting the concentration of the nutrient in shortest supply, the growth of nuisance algae can be reduced. Ratios of total nitrogen (TN) to total phosphorus (TP) suggest phosphorus is often the limiting nutrient in the lagoon system.

Ways you can reduce phosphorus entering the lagoon system include:

- Nutrient budgeting
- Fencing and planting riparian areas
- Applying effluent appropriately

HOW WILL INCREASING OR DECREASING THE PERIOD OF CLOSURE AFFECT THE LAGOON?

Another approach to restoring the lagoon is to increase flushing and dilution by increasing the period when the lagoon is open. If the lagoon was opened in June and remained open till August this would limit the available N for nuisance plant growth. However, this approach is likely to risk damage to the Ruppia beds through increased saline intrusion and exposure of some of the beds to drying out. Various studies indicate that the optimum salinity range for Ruppia seed germination, establishment and growth are exceeded with extended periods of lagoon opening.

In contrast, increasing the length of time the lagoon is closed is likely to result in the build up of nutrients and sediment; the increased water depths may also limit Ruppia growth through reduced light availability to the macrophytes.

What is clear is that management of nutrients, sediment and the lagoon opening regime is critical, and partnerships between relevant stakeholders is needed to protect Waituna Lagoon, and the vulnerable RUPPIA beds it contains.