# 6. Management of Didymo in Otago

It has been long apparent that eradication is not a Didymo management option since there is no single management tool that will safely accomplish this. What is required within Otago and New Zealand is a sufficient understanding of factors that influence Didymo growth and, where practicable, methods that can be moulded into an integrated management system.

## 6.1 Impacts of Didymo on the recreational use of rivers

The sight of masses of Didymo completely covering entire sections of river can severely degrade the recreational enjoyment of New Zealand's waterways. Recreational fishing is affected by the reduction in the quality of experience in rivers visually affected by Didymo. Observations from Otago suggest that this may not be a significant issue in unregulated rivers that have sufficient flow variability to keep Didymo biomass from reaching nuisance levels.

Results from the Fraser River monitoring study indicate that in regulated rivers where large Didymo blooms occur, well timed flushing flows may be able to reduce biomass production to a level that does not so severely reduce the recreational enjoyment of Otago's rivers.

## 6.2 Didymo and irrigation

Didymo is already having a substantial impact on irrigation equipment taking from infected waterways. The tough fibrous nature of Didymo and its high biomass have caused significant clogging of pump and race screens as well as sprinkler nozzles (T Lepper, pers. comm.). Its large cell size has also led to severe clogging of filters used in drip irrigation.

Following concerns raised by irrigators in the Fraser River catchment, a public meeting was organised between Earnscleugh Irrigation Company, ORC and Central Otago irrigators. The ORC presented a summary of the current knowledge of Didymo and its effect on river ecology and irrigation systems. Current research and monitoring of Didymo by ORC was outlined as well as the work being undertaken by other organisations such as NIWA and Biosecurity New Zealand.

The feedback received from this meeting was very positive and a follow-up meeting towards the end of the irrigation season was requested by those present. The aim of this meeting will be to share new research and monitoring results as well as any Didymo management strategies employed by irrigators throughout Otago.

It was initially thought that Didymo would not attain high biomass in irrigation races due to the small substrate (clay or silt) found in most races. Anecdotal evidence from the Earnscleugh irrigation scheme has indicated that Didymo is able to attain very high biomass in predominantly sand/gravel bottomed races (Figure 6.1) as long as there is a small amount of gravel to which it can attach.

**Figure 6.1 Thick cover of Didymo in Earnscleugh irrigation race**

## 6.3 Irrigation system management suggestions

The management methods for Didymo in irrigation schemes will vary depending on the setup of each individual scheme. There is no silver bullet, but it is believed that with a combination of management tools and developments in screening any filtering equipment, the effects of Didymo on irrigation can be effectively mitigated.

### 6.3.1 Settling ponds

Anecdotal evidence from Lake Dunstan indicates that Didymo will settle out of the water column at low velocities (G. Martin, M. Trotter, pers. comm.). Based on this evidence, it is likely that positioning of settling ponds within irrigation systems may be able to reduce the volume of Didymo moving through races and clogging equipment.

### 6.3.2 Drying infected systems

New Zealand studies have shown that Didymo is very susceptible to desiccation and does not survive long once removed from the water. There is potential for irrigation races to be temporarily dewatered to kill most Didymo colonies in the system. The ideal timing of this control method would be before a full blown bloom occurs to prevent biomass from reaching nuisance levels. However, the clay bottomed nature of many irrigation races may require an extended period of drying which may lead to cracking and subsequent water loss once races are re-wetted.

### 6.3.3 Flushing flows

Results from the Fraser River monitoring study and photographic monitoring studies have indicated that Didymo is sensitive to velocity changes, and flushing flows may be an effective method of removing large buildups of Didymo biomass. The effectiveness of this management tool depends largely on substrate composition and channel morphology. The low gradient of many irrigation races may also make effective flushing flows difficult.

It is likely that all takes from the affected waterway would need to be temporarily ceased to prevent equipment being clogged by the pulse of Didymo associated with the flushing event.

### 6.3.4 Chemical control of Didymo

Research has been undertaken by NIWA in an attempt to find a chemical control for Didymo. Efforts have been focused on finding a treatment that will effectively control Didymo, as well as minimising negative impacts in other instream biota.

The results from the past year's work at the Monawai research station are very promising, with field trials due to be completed by July 2007. The control methods being currently developed are designed for use in small waterways to manage infestations or possibly eliminate new incursions in the north island.

If field trials are successful there is potential for chemical control to be an effective addition to managed flushing flows in regulated rivers and irrigation races. There is also the potential for a chemical treatment to be applied to an unregulated river where a fresh has not occurred for a substantial period of time.

# 7. Conclusions

This report has gathered together all of the available information on Didymo in Otago from both field and desk top investigations.

The results from the Fraser River monitoring study, as well as the monitoring photos of the Clutha River/Mata-Au, Hawea and Fraser Rivers, have shown that Didymo is susceptible to rapid changes in velocities and may not be as adept at recovering from these events as other native algae. This raises the possibility of using flushing flows to raise velocities at strategic times of the year to reduce Didymo biomass in irrigation schemes and regulated rivers.

It has also been shown by the Fraser River study, photographic monitoring, and a large body of anecdotal evidence that blooms can occur at any time of year during stable flows. Observations from Lake Dunstan indicate that there is potential to lessen the effects of Didymo on irrigation systems by using settling ponds, though this remains to be tested.

An integrated management approach will be required to manage Didymo in Otago's regulated rivers and irrigation systems.

# 8. References

Cleve, P.T. 1894-1896. Synopsis of the naviculoid diatoms. Kongliga Sevenska Vetenskaps-Akademiens Handlingar. Stockholm. Reprinted 1965, A. Asher & Co., Amsterdam

Cox, E.J. 1996. Identification of freshwater diatoms from live material. Chapman & Hall.

Department of Conservation, *New Zealand non-migratory galaxiids fishes recovery plan,* 2004

Hayes. J W., Stark. J. D., & Shearer. K. A. 2000. Development and Test of a Whole-Lifetime Foraging and Bioenergectics Growth Model for Drift-Feeding Brown Trout, *Transactions of the American Fisheries Society 129*: 315-332

Hustedt, F. 1930. Die Susswasser-Flora Mitteleuropas. Heft. 10. Bacillariophyta (Diatomeae). Gustav Fischer. (Reprinted 1976, Otto Koeltz Science Publishers)

Kawecka, B.; Sanecki, J. 2003. Didymosphenia geminate in running waters of southern Poland – symptoms of change in water quality? *Hydrobiologia* 495: 193-201.

Kilroy. C. 2004, A new alien diatom, Didymosphenia geminata (Lyngbye) Schmidt: its biology, distribution, effects and potential risks for New Zealand fresh waters, *NIWA Client Report CHC2004-128*

Kilroy. C., Biggs. B., Blair. N., Lambert. P., Jarvie. B., Dey. K., Robinson. K., & Smale. D. 2005a. Ecological Studies of *Didymosphenia geminate, NIWA Client Report CHC2005-123*

Kilroy, C.; Lambert, P.; Robinson, K; Blair, N. 2005b. Periphyton and invertebrate monitoring programme, lower Waiau River. Results of the 2005 survey and a commentary on the ecological effects of Didymosphenia geminata. NIWA *Consultancy Report 2005-032*.

Krammer, K; Lange-Bertalot, H. 1997. Susswasserflora von Mitteleuropa. 2/1. Bacilllariophyceae. 1. *Naviculaceae. Jena*, Fischer.

Mundie, J.H.; Crabtree, D.G. (1997). Effects on sediments and biota of cleaning a salmonid spawning channel. *Fisheries Management and Ecology 4: 111-126.*

Patrick, R.; Reimer, C.W. 1975. The diatoms of the United States, exclusive of Alaska and Hawaii. Vol. 2, part 1. Monographs of the Academy of Natural Sciences of Philadelphia. 13. Acad. Nat. Sci. Phila.

Sherbot, D.M.J.; Bothwell, M.L. 1993. Didymosphenia geminata (Gomphonemaceae). A review of the ecology of D. geminate and the physicochemical characteristics of endemic catchments on Vancouver Island. NHRI Contribution No. 93005. National Hydrology Research Institute, Environment Canada, Saskatoon, Saskatchewan.

Wolman, M.G., 1954, A method of sampling coarse river-bed material: Transactions of the American Geophysical Union (EOS), v. 35, p. 951-956.