Native Fish

Native fish communities in larger rivers

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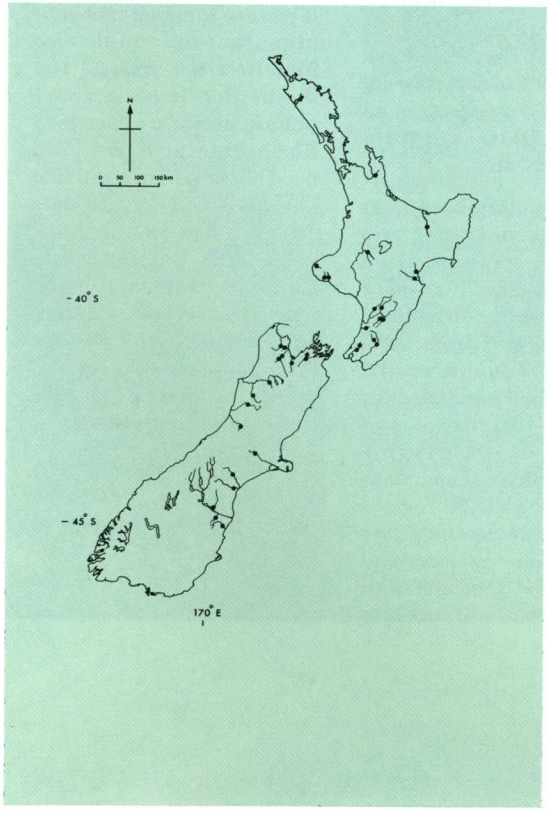
In Water & Atmosphere 2*(1), Gordon Glova presented preliminary results from a native fish study which concentrated on a single, small catchment – Pigeon Bay Stream on Banks Peninsula, near Christchurch. This article presents initial results from a complementary study which focused on the distribution and density of native fish in larger rivers throughout New Zealand.*

THERE is relatively little quantitative information on the native fish species present in our larger rivers. One reason for this is that New Zealand's native fish are small, cryptic, benthic and do not have a high public profile. As a result, water management issues have tended to focus on introduced salmonids, with little attention given to the native fish in larger rivers. Our study goes some way toward redressing this deficiency, by seeking to provide water managers with the information needed to make ecologically sound decisions about acceptable flows for the maintenance of native fish habitat.

Methods

Our sampling sites were located in rivers selected from the "100 rivers"[1] database to give a range of rivers on the east and west coasts of both islands (see map). Sites were downstream of major dams and waterfalls, so that passage for migratory species was unrestricted, at least by major obstacles. Hydrological, water quality, catchment and in-stream habitat data were available for all sites.

Locations of native fish sampling sites on larger New Zealand rivers.



In each river, depth stratified lanes in two runs and two riffles were sampled by downstream electroshocking. Lanes with relatively uniform hydraulic characteristics for each habitat type were marked by weighted ropes placed at depths of about 0.125, 0.25 and 0.5 m. Depths greater than 0.5 m were sampled in runs but not in riffles because of the practical difficulty of electroshocking in deep, swift water. The lane length was 15 m. The width of each lane was measured at three points to calculate the area fished.

The number, total weight and the size range of each species of fish caught were recorded; these data were converted to density per square metre to allow comparisons between lanes, habitat types and rivers. Water depths and velocities were measured at 12 points within each sampling lane and the mean values calculated. Substrate composition was assessed in each habitat type by measuring at least 50 randomly selected stones.

Preliminary results

In all, 16 native and 3 introduced species were found at the sampling sites. Eight native species: longfin eel, shortfin eel, torrentfish, upland bully, redfin bully, bluegill bully, common river galaxias and common bully were reasonably common (n>200 for each species), whereas Cran's bully, lamprey, koaro, inanga, shortjaw kokopu, common smelt, dwarf galaxias and black flounder were rarely encountered (n<40). Juvenile brown trout were relatively common (n=175), but the other two salmonid species (rainbow trout and chinook (quinnat salmon) were rare (n<20).

Bluegill bullies were most numerous, followed by upland bullies, longfin eels, common bullies and shortfin eels (Table 1). Collectively, these five species made up over 80% of the total fish numbers and relative biomass. Eels alone accounted for two thirds of the biomass. With the exception of lamprey, which Glova found in large numbers, this is a similar community structure to that found in Pigeon Bay Stream.

The analysis of data by habitat type showed that generally native fish were more abundant in riffles than runs, with 70% of all fish caught in riffles (Table 1). Two species, upland bully and redfin bully, were more numerous in runs than riffles, whereas torrentfish and bluegill bullies were found predominantly in riffles. Again, this is similar to Glova's results.

[1] The "100 rivers" project was a multi-disciplinary study, carried out between 1987 and 1991, by scientific staff currently working within NIWA. Its aim was to characterise New Zealand's rivers for a range of physical and biological variables and to develop predictive relationships between the variables, on a regional basis. The resulting database now forms a valuable resource for continuing studies such as the one described in this article.

Future analysis

These data, together with depth, velocity and substrate information, are now being used to describe habitat preferences for the more common native species. Glova's results suggested that substrate type and habitat quality may play an important role in controlling the distribution of native fish in Pigeon Bay Stream. This appears to be true in larger rivers also. However, the advantage of a wider picture has led us to conclude other factors are also important. For example, preliminary cluster analysis of the rivers showed three major groupings based on the fish species present and their abundance. These could be characterised by the location of the sampling site within the catchment as lower, middle or upper reaches. Lower reach communities were dominated by bluegill bullies, common bullies, torrentfish and shortfin eels. Upper reach communities were primarily upland bullies, common river galaxias (in the South Island only) and longfin eels. Middle reaches were intermediate. This suggests the diadromous life-cycle of many native species may exclude them from areas of suitable habitat, even when no major physical obstacles exist.

A comprehensive analysis of how the "100 rivers" database of hydraulic, water quality and catchment factors influence native fish density and distribution remains to be completed. Nevertheless, the results from this study are already being used to recommend minimum flows for maintaining native fish habitat in larger rivers. The similarity between the community composition and the habitat used by fish in larger rivers and Pigeon Bay Stream is indicative that habitat preference information and models that predict the distribution of native fish will have application in many types of waterway. ■

Table 1. Numbers, relative biomass and habitat types of fish species sampled in larger rivers.

Species	Total number	Relative biomass %	Percent in riffles	Percent in runs
Longfin eel	966	61	76	24
Shortfin eel	686	5	78	22
Torrentfish	550	8	94	6
Upland bully	1397	8	44	56
Redfin bully	248	3	45	55
Bluegill bully	1850	5	88	12
Common river galaxias	408	3	59	41
Common bully	721	2	63	37
Other species	285	5	-	-

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Online database big hit with DOC staff

NIWA established a computer-based freshwater fish database in 1977. The database is a comprehensive collection of site-specific fish records covering the whole of New Zealand, including Chatham and Stewart Islands. Data stored include the species found and their abundance, as well as a variety of other information such as the percentage of each habitat type (pool, run, riffle, etc.), riparian vegetation, site altitude and the fishing method. (See *Water & Atmosphere 1*(4):14-15 for more details.) The database has grown considerably over the past 4 years and now contains over 11,000 records.

In 1991, the Department of Conservation (DOC) enquired about having some fields of data from the database transferred to their computers for ease of access. Although anyone engaged in legitimate research in New Zealand may access the database through NIWA, there were often delays in getting the information into the hands of DOC staff. NIWA canvassed contributors to the database to see if there were any objections to DOC's proposal, agreed on a set of appropriate data fields, drew up a formal agreement with DOC and proceeded with the first transfer of data in July 1992. Since then, three further upgrades have occurred at six-monthly intervals.

Having the database online allows DOC to incorporate more complete and timely fisheries data into their reports. DOC use the data, in some cases on a daily basis, to fulfil their responsibilities relating to the Resource Management Act (resource consent applications, fish pass requirements) and for their Conservation Management Strategy Plans which are essentially regionally-based, 10-year management plans. The data are also used to focus further sampling effort by identifying gaps in the national coverage or out-of-date records, particularly for species of concern to DOC (mudfish, rarer galaxiids, etc.).

The online database has received a positive and enthusiastic response from DOC who describe it as quick and reliable, with good national coverage. Support from DOC was a critical factor in the decision by the Foundation for Research, Science and Technology in 1993, to proclaim the database as nationally important. Most DOC regions are now actively assessing their freshwater fish resources and ensuring new data are both recorded and stored properly by filling in database forms and sending them to NIWA for processing. This will benefit all database users.

If you are thinking that your organisation could also benefit from having the freshwater fish database online, please contact Jody Richardson at NIWA. You need not be part of a national network like DOC, as data can be issued on a regional basis. All you need is a computer with some database management software and a desire to use the information to protect and enhance New Zealand's freshwater fish resource.

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