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NEW ZEALAND FRESHWATER FISHERIES MISCELLANEOUS REPORT NO. 23

FURTHER CONSIDERATIONS OF THE
IMPORTATION OF CHANNEL CATFISH
INTO NEW ZEALAND

by

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Report to: Northland Support, Kerikeri

Confidential to client

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MAF Fisheries

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CHRISTCHURCH

Servicing freshwater fisheries and aquaculture

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NEW ZEALAND FRESHWATER FISHERIES MISCELLANEOUS REPORTS

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PURPOSE - This report was prepared under contract for Northland Support, Kerikeri, as per the conditions specified by the client in the letter attached.

It is intended as a supplement to the EIA prepared by C J Hardy (July 1988) on the importation of channel catfish into New Zealand. Specifically, it pertains to the potential impacts of this species on trout and native fish stocks in New Zealand. It is based on information from various researchers in the west and north central United States, who were contacted either in person or by telephone on my return last August from an international fisheries conference in Scotland.

People that were contacted included Drs Bob Stickney (Director), Tom Quinn (fisheries scientist), Bob Naiman (fisheries scientist), Fisheries Research Institute, University of Washington, Seattle; Mr Paul Barrett (biologist), University of Arizona, Tucson; Dr Andrew Mitchell (biologist), US Fish and Wildlife Service, Arkansas; and Dr Christopher Kohler (Fisheries scientist), Southern Illinois University, Carbondale.

Channel catfish experts in the southern states were considered, but not contacted, as the environmental conditions in those areas are not representative of freshwater environments in New Zealand.

To each of the six people approached on the subject, our intentions and concerns regarding the importation of channel catfish into New Zealand were explained. A number of questions was asked pertaining to the biology and ecology of the species, with particular emphasis placed on knowing if

- 1) there is any evidence that channel catfish has had an impact on wild stocks of rainbow trout in the United States,
- 2) there is serious predation/competition between channel catfish and wild populations of cottids, a group of bottom-dwelling fishes similar in niche requirement to that of bullies in New Zealand, and

- 3) channel catfish require a minimum water temperature of 21°C for a period of time in which to spawn?

The information gathered is briefly presented, followed by a consideration of potential impacts of channel catfish in New Zealand in light of the new information.

SOME GENERAL NOTES - The species is widespread in the continental United States and occurs in all but a few of the northeast and extreme northwest states. It is regularly stocked in at least 35 states, with stocking ranging from fry to adults, although most states stock fingerlings 10-18 cm long. Stocking is usually in reservoirs that are part of major river systems, with some liberations in farm and stock water ponds. Growth is best at temperatures of 26-30°C for at least six months of the year; at lower temperatures they eat little and grow slowly. The species is popular as a sports and farmed fish. It has not done well in the tropics; it seems to need the winter period to thrive and reproduce.

Wild stocks of channel catfish in the United States are not a concern for fisheries managers. Their population densities are usually relatively low in comparison to some of other species present. They are not an aggressive fish. Typically, they prefer the deep, turbid waters of large, muddy rivers (e.g. Mississippi drainage), have an average fecundity of 30 000 - 40 000 eggs per female, and spawn in the spring-summer period in water temperatures normally about 18-21°C. Survival of the hatch is generally very low (about 2%), probably because of excessive predation by large mouth bass and other predatory species.

The channel catfish is an opportunistic omnivore/scavenger that feeds largely on the bottom on a variety of foods, including tadpoles and crayfish. Large invertebrate prey, such as crayfish, while it is reasonably common in the guts of larger fish when available, is not their preferred prey. It is not

normally heavily piscivorous, although occasionally fish are common in the guts of larger fish. Plant material of various sorts is common in the gut of fish, but is believed to be primarily incidental to the species' benthic feeding habit.

There is no evidence that the species is cannibalistic in nature. However, in cultured conditions some cannibalism does occur under crowded conditions. However, this is generally not a problem, and often fingerling fish are added to ponds containing adults following harvesting of the larger fish.

IMPACT ON TROUT STOCKS - None of the six people that I spoke to could think of any evidence to suggest that channel catfish have had, or are having an adverse effect on wild rainbow trout stocks in the United States. They all maintained that the two species generally occupy quite different rivers, and so seldom interact in nature. The preferred habitat of channel catfish is muddy rivers, they rarely occupy the small, clear water, streams favoured by trout, and in the few instances in which they do (some streams in the northern states), there is no evidence of incompatibility between the two species. Similarly, in captivity the two species are known to get along well together, an example of long-standing co-existence of the two species being the "Crystal Springs" pool in Ohio. Predation by channel catfish on wild trout eggs in redds is not known to be a problem, if it does occur. Moreover, there is no evidence to suggest that the species bottom-foraging activities would significantly increase invertebrate drift rates or decrease water clarity for fly fishing.

IMPACT ON COTTID STOCKS - Unfortunately, there is little information on the impacts of channel catfish on cottid populations in the United States as these fishes seldom co-occur in nature. Cottids tend to occur in the clear water, gravelly/bouldery streams frequented by trout, and these rarely

contain significant catfish populations. In the few places in which they do/might co-occur, the opinion by all six people was that channel catfish would not be a major predator on cottids, but would be a significant competitor for resources (e.g. food, space) because of the similar life styles of both fishes. It was suggested that impact to the small bottom-dwelling fishes in New Zealand would be along similar lines.

TEMPERATURE FOR SPAWNING - In the EIA prepared by C J Hardy, no clear indication could be given of the minimum water temperature requirements for spawning of channel catfish. The literature indicates that channel catfish spawn in water temperatures ranging from 15.5 to 29°C. However, there is conflicting evidence as to whether a threshold temperature of 21°C is necessary for a given minimum period to initiate the spawning cycle and for successful spawning to occur at water temperatures below that.

Five of the six people that I spoke to in the United States about this issue said there was no conclusive evidence for the necessity of the 21°C threshold concept. In addition to various laboratory tests that had failed to provide conclusive evidence on this issue, they pointed to the number of self-sustaining populations of channel catfish in the northern states in which water temperatures seldom, if ever, reach 21°C for any length of time. In some northern lakes there are populations that survive the winter under the ice, although the summer temperatures of these lakes are quite warm.

However, Dr C Kohler, who is actively researching this phenomenon, says that water temperatures greater than 21°C are needed for at least a few weeks for spawning to occur in the stocks that he is working with. Moreover, he has found that the fish can be induced to spawn out of season by providing them with the appropriate temperature and photoperiod regimes in the laboratory. His findings suggest that the temperature phenomenon

may be stock related, and may be more akin to stocks that have evolved in the more southerly states. This possibility has important implications for the importation of the species into New Zealand, as it may be that choosing the appropriate stock is an effective means of limiting its geographical range in the wild, should it escape.

POTENTIAL IMPACTS IN NEW ZEALAND - On the basis of my findings about channel catfish in the wild in the United States, it seems reasonable to draw the following conclusions regarding potential impact of the species in New Zealand.

- 1) It is unlikely to result in any significant impact to wild rainbow trout stocks.
- 2) The bottom-foraging activity of the species is unlikely to significantly increase invertebrate drift rates or decrease water clarity for fly fishing in trout streams.
- 3) The abundance of koura (crayfish) stocks may be significantly lessened in some water sheds, as this is a prey type commonly eaten by channel catfish in the United States in areas in which it is available.
- 4) Native fish stocks, such as bullies and other bottom-dwelling types, are likely to be more adversely affected than trout because of possible competition for bottom foods and possibly some predation.
- 5) Assuming the 21°C threshold for spawning is stock related, the risk of impact to the wild may be lessened by selecting a stock for aquacultural purposes that requires a minimum water temperature of 21°C in order to spawn.

These conclusions must, however, be tempered by the fact that there is always the possibility that the species may respond

quite differently in New Zealand from that in the United States. In any one watershed, New Zealand's freshwater fish fauna is comprised of relatively few species compared to that in the United States. The low species diversity and lack of ecological complexity among fish communities here, may allow the channel catfish opportunities that do not exist in the United States. It may exploit suitable vacant niches or compress the niches of existing fish species. Nonetheless, it is doubtful that its impact would, in the long term, be greater than that of its close relative, the brown bullhead, a species that is already established in the wild in New Zealand. To the best of my knowledge, there is no evidence, as yet, to indicate that the brown bullhead is having a significant effect on either the introduced or native fish stocks in the country.

In the EIA prepared by C J Hardy, the channel catfish was ranked on an ecological scale between that of brown trout and the longfinned eel. In the light of its feeding habits and non-aggressive nature, it is doubtful that the channel catfish would be as predacious and dominant in fish communities as either of these species.