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PRELIMINARY REPORT ON TROUT STOCKING

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This report was prepared during the course of the project identified on the title page. The conclusions and recommendations given in the report are those considered appropriate at the time of its preparation. They may be modified in the light of further knowledge gained at subsequent stages of the project.

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1. INTRODUCTION

As part of phase one activities undertaken under the Sepik River Fish Stock Enhancement Project an analysis of trout stocking practices in PNG was made. Work undertaken by the project with regard to trout has been restricted for reasons outlined below. This report is, therefore, preliminary in nature and may be modified as more field data become available.

Trout is an exotic species in PNG and has been, and still is, stocked by various PNG authorities. Experiences relating to trout are, therefore, highly relevant to the Sepik River Fish Stock Enhancement Project.

2. HISTORICAL BACKGROUND

Brown trout, Salmo trutta, were first introduced to P.N.G. in 1949 when 20,000 fingerlings from Oberon, N.S.W. (Australia) were imported and released in streams in the Nondugl area and a pond at the Hallstrom Fauna Trust (West and Glucksman 1976). Apparently, these did not survive (Schuster 1951). Rainbow trout, S. gairdneri, were next imported as eyed eggs in 1952 and successfully hatched by the Bulolo Gold Dredging Co. Ltd in a raceway in the Upper Buane Creek, a tributary of the Bulolo River. The company continued hatching eggs and distributing fry in the Bulolo River and its tributaries for several years, and the fish apparently survived until about 1964 (West and Glucksman 1976). Private introductions continued until 1959.

The Division of Fisheries began importing rainbow trout eggs and introducing fingerlings in 1964 into the Baiyer River, a tributary of the Sepik, and Gumanch Rivers near Mount Hagen. According to West and Glucksman (1976) these rivers were more suitable and released fish survived and reproduced. In 1971, a small government operated hatchery was set up at Mendi, in Purari River drainage, and by 1973 approximately 180,000 rainbow trout had been distributed throughout the highlands but mainly in the catchment of rivers draining to the south (not the Sepik or Ramu Rivers). In 1976, growth rates experienced had been very encouraging and stocks were heavily fished by highlands people (West and Glucksman 1976). During the severe famine of 1972, caused by drought and frost, considerable quantities of trout were caught in some of the worst affected areas and served as a very welcome addition to the people's diet (Blichfeldt 1974 quoted by West and Glucksman 1976).

There has been little objection to trout introductions because of the perceived sparsity of native fishes in the

highlands and trout being a far more attractive food item. In addition, it has been argued that trout can only survive in cold water and offer no threat to fish stocks in the lowlands (West and Glucksman 1976).

Commercial trout farming began in 1973 based on rainbow trout. Aquaculture using trout was reviewed by Coates (1989). However, in addition to farming aspects of this species, it is noted that trout farms are placed along natural waterways and escapes from farms into river systems are probably inevitable and have frequently occurred.

In 1974, the Mendi hatchery received a trial shipment of 50,000 eyed ova of the brook trout, Salvelinus fontinalis, from New South Wales. Hatching was not very successful and only 4,000 fry were released. There is no information on their survival.

3. PRESENT ACTIVITIES

There remains considerable interest amongst highlands Provincial Governments in trout farming and stocking. Importations and releases have continued since the mid-1970's on an irregular basis. Mendi trout hatchery still operates, as does the trout farm at Goroka (renamed Gana Trout farm - see Coates 1989). The last stockings undertaken from Mendi were in 1981 although trout eggs were imported to this site in 1982, 1984 and 1986 but all of these were unsuccessful due to delays in transit. A proposal to upgrade the Mendi hatchery was made in 1987 with a budget of Kina 175,000 (approximately US\$190,000); funds have not yet been allocated for this. A second hatchery for the purposes of producing trout fingerlings for stocking rivers was established at Keglsugl on Mount Wilhelm, Purari River catchment, in about 1984 and was abandoned in 1987. Plans have recently been made to move this and re-establish it at Gembogl on the same river.

In addition to the above, unrecorded importations and distributions of trout have occurred both by provincial governments and by the private sector.

4. TROUT IN THE SEPIK/RAMU BASIN

As part of the research undertaken by the Sepik River Fish Stock Enhancement Project a survey of trout in highlands streams was planned. Unfortunately, it was found difficult to obtain accurate records of trout introductions and field work for this specific purpose could not be effectively undertaken. It was decided, during the course of the project, to note the occurrence of trout during other

studies undertaken in regions where trout might be expected. Several other sub-projects have been undertaking sampling in Sepik and Ramu highlands. In view of time and staffing constraints this was thought the best way to proceed. The following is a summary of conclusions:

(i) project scientists have never caught a trout in the Sepik/Ramu drainage despite extensive sampling at higher altitudes. Trout are known to have been introduced into at least the Baiyer River area and the Jimi River area. The Baiyer River has not recently been sampled but Allen (personal communication) did not note trout in this region during sampling in the early 1980's. Van Zwieten has sampled the Jimi River extensively without catching a trout; and,

(ii) Mys (personal communication) whilst undertaking surveys of villages near Telefomin, noted that, according to local people, trout populations exist at Feramin in the headwaters of the Sepik River, and in Lake Louise, which has an outlet to a sidestream of the Sepik, both introductions occurring in 1979 by helicopter. Gravid females were reported from Lake Louise in January, 1989.

5. FACTORS RELEVANT TO TROUT STOCKING

5. 1 Establishment of trout populations in PNG

It is not clear whether or not rainbow trout establish self-reproducing populations in PNG. Previous experiences would suggest that in many cases introductions have failed to establish populations. However, in other regions, reports suggest that introduced trout are at least breeding. One problem is that it is not known if such breeding has been successful. Trout populations are known to occur in a limited number of areas from initial stockings undertaken at least nine years ago. These could, however, still be remnants of a previously introduced stock or stocks presently in decline.

Based on existing evidence it appears that in certain environments introduced trout have established. Clearly, a thorough research survey of trout populations in PNG is required. Unfortunately, many of the known populations are not in the Sepik or Ramu catchment. Those known to occur in the Sepik/Ramu have only just been reported to the project.

Despite considerable attention to trout stocking it is, however, clear that trout in general have not established well under PNG conditions. Surveys of the high altitude environments in the Sepik and Ramu which did not reveal any trout populations, suggest that in these regions at

least the impact of trout stocking must be considered minimal.

It is likely that, if trout have established, they have done so only at high altitudes. Coates and Mys (1989) note that within the Sepik/Ramu catchment no people live above 2500 m above sea level. The use of trout stocks from Tasmania (see later) suggests that such stocks may be particularly cold-water adapted. Under PNG conditions, trout may only establish in areas where few people live and are visited infrequently by the local population.

5. 2 Utilisation and benefits of trout in rivers

Experiences with trout stocking in PNG clearly indicate a demand of fish caught from rivers in highlands regions. This activity is one of the few fisheries related benefits perceived by Highlands Provincial Governments. The national Department of Fisheries and Marine Resources is, therefore, often under considerable pressure from these sources to continue and enlarge trout stocking programmes. In addition, where trout have been previously stocked, it appears that the resource is quickly utilised by local people. Only in remote areas do significant trout stocks still exist where, because of local conditions, the resource is not fully exploited.

5. 3 Quarantine and stocking aspects

Trout are obviously an exotic fish species and their stocking is relevant to the Sepik River Fish Stock Enhancement Project. However, little attention has been given to any recommended procedures regarding this activity. Trout stocking is, essentially, a continuation of activities initiated in 1949.

Trout eggs or fingerlings have also never been subject to strict quarantine requirements once in PNG. However, since independence in 1975, PNG has generally assumed that trout originating from Australia were relatively "disease free". On this basis, authorities responsible for quarantine have restricted imports to those from Australia. This assumption may not, however, be correct. A number of fish diseases may occur in Australia and not in PNG. This may be the situation with other, unknown, or unrecorded diseases. Following disease outbreaks in freshwater fish populations in New South Wales in the late 1970's, PNG has tended to restrict trout importations to those only from Tasmania. They are, however, still not subject to quarantine after arriving in PNG.

At least one outbreak of disease in freshwater fishes in PNG has been linked, although circumstantially, to the importation of trout eggs from Australia (Coates et al. 1989).

5. 4 Environmental effects of trout in PNG

Trout are one of the few species of fish with well documented adverse effects on native fish species following their introduction. Effects of trout on PNG's native fish stocks are, however, unknown. Within the Sepik and Ramu catchment, very limited stocks of native fish exist above 800 m elevation and practically non at all, except eels, above 1000 to 1200 m (Van Zwieten 1989). This altitude is below that to which trout might be expected to descend. The impacts of introduced trout on Sepik/Ramu native fish stocks are, therefore, expected to be minimal. However, rare endemic species of Sepik/Ramu native fishes have been recorded above 1200 m and living in streams having potential for trout stocks, although such fishes are too small and rare to be of any significance for local fisheries. In addition, only a small part of the Sepik/Ramu catchment has been sampled and other, presently unknown, rare native species might occur. Following experiences in other countries, trout stocking could be expected to possibly have an impact on such species. The situation in the upper catchments of the rivers in southern PNG is not known. However, such regions may contain more native fish species than in the Sepik/Ramu, although their altitudinal distributions are poorly understood (Allen and Coates 1989).

Although the effects of trout stocking in the Sepik/Ramu on native Sepik/Ramu fishes might be considered minimal the effects on longer-term fisheries management in this area are, perhaps, of more concern. Trout stocking in the Sepik/Ramu might be expected to affect future plans to stock the region with alternative and, perhaps, better species, more suited to PNG conditions.

5.5 Economic costs versus benefits of trout stocking

The economic aspects of trout stocking in PNG have received practically no attention. Projects have invariably been established either by local companies and groups with their own objectives or by government operated hatcheries where there have been no field studies on the extent of utilisation of trout once stocked. This is obviously one aspect of trout stocking where further evaluation is desirable.

Population statistics (Coates and Mys 1989) and details of existing fish stocks (Van Zwieten 1989) clearly indicate the great value of stocking fish into Sepik/Ramu highlands regions. It is, however, necessary to develop fish stocks in the correct altitudinal ranges within the highlands in order to benefit a significant number of people. This factor will be discussed further in other project reports.

A further point is, however, that over forty years of experiences with trout stocking have still resulted in PNG only continuing to import eggs from Australia, hatch and rear fingerlings and to stock rivers on this cost intensive basis. Procedures for the maintenance of broodstock, or obtaining broodstock from rivers, have not been established. It is not known if this has been for economic reasons, for environmental reasons, for example, perhaps broodstock cannot be maintained under PNG conditions, or simply due to a lack of hatchery management experience. If such problems have not been addressed in forty years, then the question emerges as to whether trout are the correct species to use from a hatchery operation point of view under PNG conditions.

Perhaps the more important question is, after forty years of stocking over a wide area, why do trout continue to need to be stocked? If the objectives are to promote fishery resources in highlands rivers for subsistence purposes then, perhaps, trout again is the wrong species to use. Attention might be given to the use of alternative species which would disperse more effectively and produce self-maintaining populations over a wider area. Such species might, in theory, reduce long-term government expenditure on perennial stocking programmes.

6. CONCLUSIONS

In relation to the objectives of the Sepik River Fish Stock Enhancement Project the following points emerge as relevant:

(i) trout are probably used for stocking highland rivers because they are perceived as satisfying a demand for fish in these regions (notwithstanding the need for studies on the economic and biological factors involved as outlined above);

(ii) trout are used because of historical reasons and they are still presently the easiest species to obtain, import, hatch, rear and stock. There are few alternative species in use for stocking cold-water rivers that are presently available to PNG;

(iii) it would be relatively easy, on environmental grounds, to justify that trout stocking be stopped since the fish are predatory in nature and have known adverse effects on native fishes in other countries. However, within the Sepik/Ramu systems the situation is somewhat complicated by the existing, natural, absence or low abundance of native fish species in waters with potential for trout stocking. At present, it would also be difficult for the Department of Fisheries and Marine Resources to be negative about trout stocking in PNG without having the ability to offer highlands regions a better and more sensible alternative;

(iv) even assuming trout have established in some regions, trout have shown a great reluctance to move from one river sub-catchment to another and disperse widely. In short, in PNG they probably stay where they are put. This is probably because of their temperature tolerance. Preferring cold waters, trout would be reluctant to descend PNG highland streams into regions with higher temperatures and ascend adjacent rivers in order to populate neighboring sub-catchments. Thus they do not disperse. It is possible that one factor contributing to this problem is the importation of trout only from Australian stocks which may be particularly cold-water adapted and require marked seasons for reproductive purposes. It might be possible to obtain a stock of trout from another region which is better adapted for PNG conditions, particularly in terms of their temperature and breeding requirements. Should this be done, however, the environmental aspects of trout introductions would need to be assessed more fully because they might be expected to enter lower altitudes where stocks of native species may already exist;

(v) notwithstanding any possible effects on native fish stocks, trout stocking might be expected to jeopardise future stocking programmes of alternative species. There seems little point in stocking a predator with known detrimental impacts and questionable benefits (in PNG) and later to begin stocking alternative, more environmentally acceptable species better suited to PNG's requirements, only to be subsequently consumed and/or displaced by trout; and,

(vi) alternative species to trout for stocking highlands regions are urgently required. Irrespective of whether trout stocking continues, further species should be sought that have less detrimental effects and are more appropriate for PNG conditions. Such species should also have the ability to establish self-maintaining populations and disperse widely, negating the need for continual stocking programmes as far as practicable.

The above outlines the approach to stocking of trout in PNG. Further discussion on the use of alternative stocks of trout and alternative species to trout will be presented in other project reports.

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