TROUT IN THE KLIPPLAAT?

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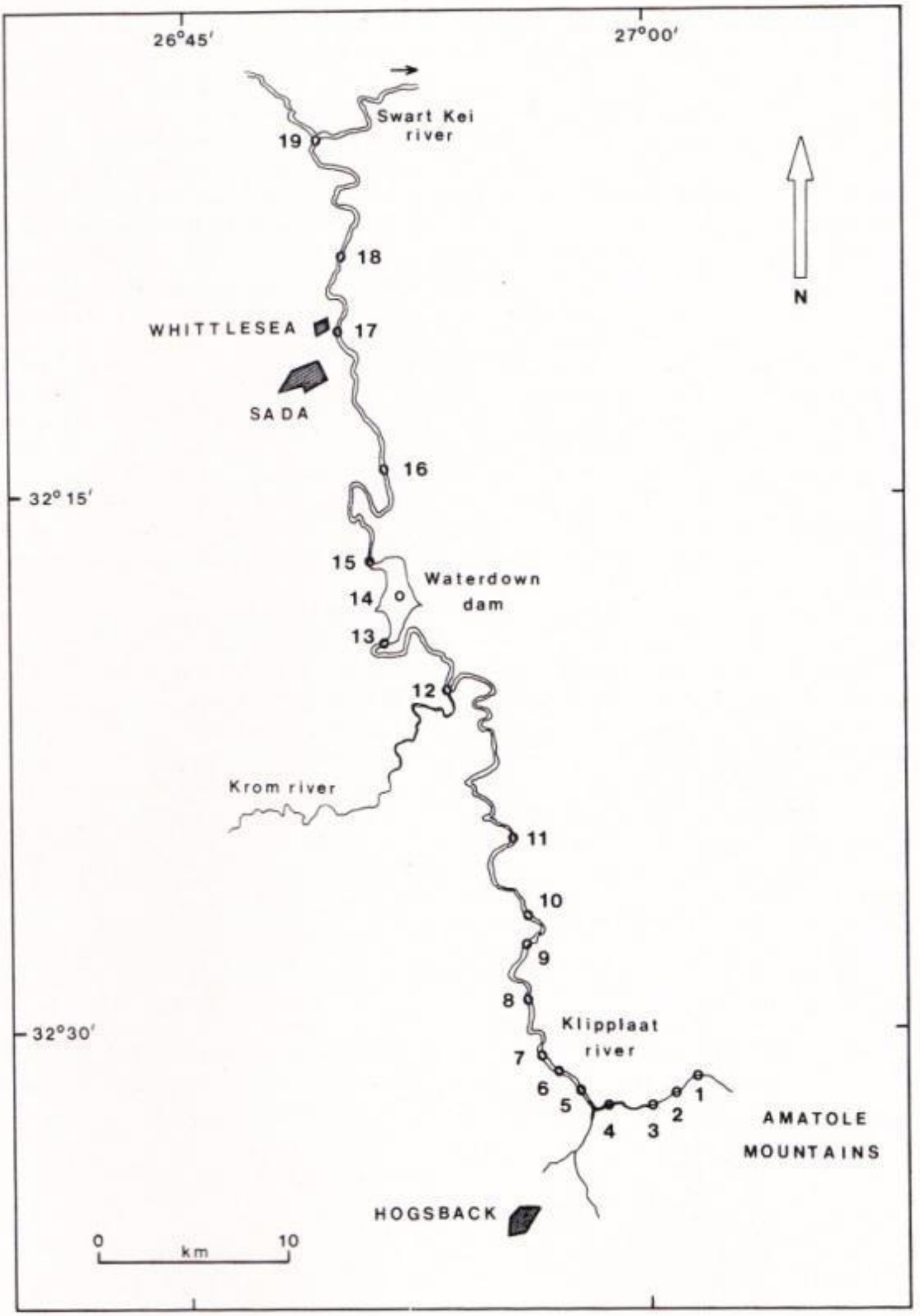
In the past, the Klipplaat river in the eastern Cape was a productive trout water, but in recent years its productivity has deteriorated to a point where the future of fly-fishing in this river is in question.

The Klipplaat has its source at an altitude of over 1 500 m. near Hogsback in the Amatole mountains, and flows roughly northwards for some 150 km. through Whittlesea in northern Ciskei to join the Swart Kei — part of the Kei river system —at an altitude of 1 000 m. near Queenstown. The river rises in comparatively well conserved farmland in an area where mean annual temperature is only 11°C. and annual (mainly summer) rainfall averages 1 200 mm. Good snowfalls can be expected during winter, and snow has been known in all months other than January and February. The average gradient of the Klipplaat is slight, and the river is therefore characterized by long pools, some of which are several hectares in surface area and 2 m. or more deep in places.

For the upper half of its length, from tiny upland streams near Hogsback to the major impoundment of the Waterdown dam (altitude 1 150 m.) near Whittlesea, the Klipplaat and its tributaries are controlled by the Hogsback Trout Angling Club (HTAC). The river was first stocked with trout many years ago at private initiative, and the HTAC was formed in the early 1970's. With the co-operation of its dozen or so riparian owners, the club has more than 70 km. of river fishing as well as access to several farm dams.

Breeding conditions are less than ideal in the Klipplaat, but regular stocking — 39 500 rainbow and 1 000 brown trout, mainly yearlings, during the period 1972—1980 — ensured good fishing until the close of the 1979—1980 season. The river regularly yielded trout of a kilogram or two, and occasionally of around 3 kg.; fish of up to 5 kg. were reported from the Waterdown dam.

Subsequently, the story has been one of continuing disaster. Severe drought during the winter of 1980 practically eliminated trout from the Klipplaat; only one fish was taken during the entire 1980—1981 season. The river was modestly restocked (2 000 yearling rainbows) in August 1981, and by the close of the 1981—1982 season a number of fish of up to 35 cm. (300—400 g.) had been taken — testimony to the good food supply in the Klipplaat noted by Crass (1986). A small number of larger fish — survivors of the 1980 drought — were also taken during 1981—1982. A further 5 000 yearling rainbows were put into the river in 1982, but prolonged drought prevailed (1982—1984) and most of the fish disappeared. Simultaneously, the Pirie hatchery — traditional source of trout stocks in the eastern Cape — temporarily ceased production. The HTAC likewise went into abeyance. No further stocking was attempted until February 1985 when 13 000 14 cm. rainbow fingerlings and 18 000 rainbow fry from Jonkershoek were put into the river. These little fish initially did well, but the winter was again very dry,



Map of the Klipplaat River indicating the sites at which samplings were made.

Figure 1: per Ken Willan

there was repeated flooding in the spring, and by late 1985 the fish seemed to have disappeared once more.

Against this background and in consultation with John McCrostie, President of the HTAC, a brief survey was undertaken of the fish fauna of the Klipplaat river, from the headwaters to the confluence with the Swart Kei, during the first half of 1986. We set out to investigate the following: 1. the distribution and abundance of fishes, particularly trout, in an attempt to objectively assess the future of fly-fishing in the Klipplaat; 2. the effect of trout on indigenous fish species, in the context of the debate on deproclamation of trout waters in the Cape Province; and 3. whether two small 'Red Data' fish species, the eastern Cape rocky (*Sandelia bainsii*) and the Border barb (*Barbus trevelyani*) occur in the Kei river system, from which they were reportedly absent (*inter alia* Skelton 1980).

The survey

The survey took 12 days and was spread — due to pressure of other commitments — over the period February–June 1986 (3–7 February, 5–6 March, 12–13 May and 17–19 June). We started at the Waterdown dam on 3 February, and worked upstream. The first trout — four little fish averaging less than 100 g. — were not located until five days and 300 man-hours later; at a point just a few kilometers from the source of the Klipplaat. Thereafter (March and May) we worked mainly on the upper reaches — the Happy Valley section — of the river, attempting to locate the cut-off point for trout by sampling successively further downstream. The section below the Waterdown dam was sampled in June.

Nineteen sites (Figure 1) and a variety of habitat types as defined by Allen (1951) — stickles, shallow and deep runs, pools and the Waterdown dam — were sampled. Depending on the habitat, standard gill netting, seining and electro-shocking were employed. As many of these methods as possible were tried at each locality. Due to site differences and the limited time available, sampling effort could not be standardized at the various localities. The results therefore provide a qualitative rather than quantitative assessment of the fish fauna of the Klipplaat, although an indication of relative abundance was obtained (Table 1). All trout caught were taken to the laboratory where they were measured (fork length), weighed and sexed. Scales and otoliths were removed for age determination, and the fish were dissected for examination of the digestive and reproductive systems.

Four fish species were encountered (Table 1): rainbow trout (*Salmo gairdneri*), chubbyhead barbs (*Barbus anoplus*), smallmouth yellowfish (*Barbus holubi*) and carp (*Cyprinus carpio*). None of the 1 000 yearling brown trout (*Salmo trutta*) introduced in 1980 were recovered.

Table 1. Fish species recorded at various sites in the Klipplaat. Species: rainbow trout (*Salmo gairdneri*); chubbyhead barb (*Barbus anoplus*); smallmouth yellowfish (*Barbus holubi*); carp (*Cyprinus carpio*). Relative abundance: XXX = high; XX = moderate; X = low.

Site	*Locality / Beat*	*Trout*	*Barb*	*Yellow*	*Carp*
1	Mountain Top		XX		
2	Oakdene	XX	XX		
3	Highlands	XX	XX		
4	Fenfield	X	XX		
5	Clifton	XX	XX		
6	Dunskye (upper)	X	XXX		
7	Dunskye (lower)			X	
8	Rockford Park		XXX		
9	Aquadale			X	
10	Rooken		XX		
11	Lindisfarne			XX	

12	Lower Chilton	XX	X	
13	Waterdown (upper)	X	XXX	X
14	Waterdown (lower)		XXX	
15-19	Below dam	XX	XX	X

A total of 17 rainbow trout were collected, all of which were found in pools or deeper runs (approximately 0,7 m.). The fish fell into three discrete size/age classes. Twelve fish were around the 20 cm. (100 g.) mark, three were of the order of 30 cm. (300 g.), and two were really big by river standards: a cock fish of 47 cm. (1 819 g.) and a magnificent fat hen of 50,5 cm. (3 054 g.). (As indicated by the unrealistically high condition factors calculated for the two largest fish — K=175 for the male and K=237 for the female — their recorded weights were no doubt inflated as a result of water absorption before they were processed in the laboratory.) All females dissected were sexually mature and contained developing ova.

Scales could not be used for age determination as the circuli patterns were irregular, but microscopic examination of the otoliths suggested that the first two classes (100 g. and 300 g.) were some of the fish put into the river in February 1985, respectively as fry and fingerlings. The larger fish were estimated to be five years old, and were apparently survivors from the 1981 and/or 1982 stockings.

The stomach contents of the trout were revealing: the most common prey items were Odonata and Notonectidae nymphs and small crabs (*Potomon sidneyi*). The stomach of the largest fish contained 14 nymphs and five crabs. Barbs were not included in the stomach contents.

Trout were apparently restricted to the Happy Valley section of the river at the time of the main survey (February and March). Late in the 1985—1986 season (May) a few fish were taken by fly in the Rooken (site 10) and Lindisfarne (site 11) areas. In September/October 1986 there were fish at Rooken and presumably up and downstream from there, but their numbers appeared to be low. Extremes in the level of the Klipplaat over the period winter 1985 to autumn 1986 may have accounted for these migrations. (see Floods, below).

Barbs were comparatively abundant along the entire river, occurring in stickles, shallow runs and small pools. (Electro-shocking, by means of which these fish were collected, was impossible in large pools, and barbs may have occurred in those as well.) They are also numerous in the Waterdown dam, according to the Water Bailiff, but were not represented in our (gill net) samples.

Yellowfish were not found in the upper reaches, but occurred in pools from Dunskye (site 7) down to the confluence with the Swart Kei. Their numbers increased greatly downstream of a 1,5 m. weir at Lindisfarne (site 11), and this species was particularly abundant in the Waterdown dam where a graded series of seven gill nets set overnight yielded approximately 1 000 yellowfish.

Carp were rare. Only three were collected, two in the Waterdown dam and the other in a pool just below. Two forms were present, the Israeli Dor 70 and the Bavarian Aischgrund varieties.

What the data tell us

In spite of the brevity and other limitations of the survey, several preliminary conclusions in respect of the fish fauna of the Klipplaat are supported by the available data, as follows.

Only one indigenous East Cape species was represented in our samples, namely the shubbyhead barb. Neither the eastern Cape rocky nor the Border barb were found in the Klipplaat, although Mayekiso (1986) found these species in the nearby Tyume and

Keiskamma rivers which flow south from the Amatole mountains. The smallmouth yellowfish, a native of the Orange/Vaal system, was introduced into the Kei river system many years ago, and presumably made its way upstream to the Waterdown dam area before completion of the dam wall in 1957. The source of the carp is a mystery.

The trout population was small and was restricted mainly to the upper reaches of the river. Ripe females were present in our samples, but the population is probably not self-sustaining due to a shortage of adequate gravel beds in the Klipplaat — the river bed is generally rocky or muddy, although gravels suitable for breeding reputedly exist in the Krom river, a tributary joining the Klipplaat at Lower Chilton (site 12). It is noteworthy that 80% (12 out of 15) of the 1985-stocked trout that we recovered were put into the river as fry (assuming that none were progeny of free-living fish), suggesting a significantly higher and more economical survival of fry than of fingerlings. (The HTAC has noted this difference, and 10 000 fry from Pirie were put into the upper reaches of the Klipplaat in October 1986.)

The results of the survey provided no evidence that trout have depleted the barb population, although major impact by trout on indigenous fish populations (especially on localized endemics) may occur mainly under conditions of continuously heavy stocking (Skelton 1986). This has clearly not been the case in the Klipplaat of late, but it is possible that in past years — when trout numbers were higher — the barb population may have been reduced, increasing again as trout numbers declined, as is known elsewhere (Jackson 1982). Fair numbers of trout of a size adequate to prey on barbs were present in the Klipplaat as recently as 1982, however, while the 13 000 14 cm. fish put into the river in 1985 were large enough to feed on juvenile barbs. Moreover, we collected trout and barbs in near proximity to one another on several occasions, and more than once from the same pool. It is reasonable to suppose, therefore, that the effect of trout on barbs is slight in the Klipplaat. This conclusion is reinforced by the fact that barbs were comparatively numerous in areas of shallow, rapid water where only smaller trout, if any, would occur. Such habitats, which constitute a major portion of the Klipplaat (despite the high proportion of pools), would therefore provide refuge for breeding nuclei of barbs, from which recolonization would take place into areas in which numbers were depleted by predation.

Yellowfish were thriving in the Klipplaat at the time of the survey, and in four years had advanced upstream from below the Lindisfarne weir (site 11) to Dunskye (site 7), a distance of some 25 km. In early 1982, one of us (KW) caught three yellows in a pool just below the weir, while trout were taken above. The fact that the HTAC secretary at that time, Jack Lumley, had not previously heard of yellows being taken in the Klipplaat, suggests that their advance upstream from the dam was possibly very rapid.

The decline of trout in the Klipplaat

Several explanations for the decline of trout in the Klipplaat over the past few years are possible, as follows.

Floods

Referring specifically to trout introduced in February 1985, a popular theory among fly-fishers is that the floods of spring 1985 washed the fish downstream to the Waterdown dam. This idea is not supported by the facts: it is well known that trout tend to migrate upstream during periods of stronger than normal water flow and downstream as water volume declines; we found no trout in the dam or lower reaches of the river; and if the trout had been washed away, the same would presumably have happened to the barbs and yellowfish, which was clearly not the case.

Drought

With the exception of 1981, the period 1980—1985 was generally unfavourable for trout in the Klipplaat, as it was elsewhere in the summer rainfall region of southern Africa. Although a few trout were taken in the Klipplaat (at Dunskye; site 7) in October 1985, the possibility exists that the majority of the fish put into the river earlier that year (February) were eliminated during the winter. Circumstantial evidence exists for this in that Mr. B. Currie, a particularly interested HTAC riparian owner (Lindisfarne; site 11), reported to us that he regularly observed small trout during the earlier part of 1985, but that they disappeared in winter.

Environmental deterioration

Without detailed knowledge of river and catchment conditions in previous years it is impossible to assess the extent to which environmental deterioration may have been responsible for the decline of trout in the Klipplaat. It is likely, though, that in recent years there has been some reduction of vegetative cover in the catchment, associated with drought. If this is so, the river would have deteriorated in two ways: by an increase in the silt load following rain, and by reduced water flow during the winter months (due to decreased seepage).

Compounding the naturally dry conditions of the past few years is a recent tendency toward increased irrigation of croplands in the Klipplaat valley. This has occurred mainly as a result of the local farming community obtaining ESCOM power only a few years ago — electric irrigation pumps are convenient and economical to run, resulting in a further depletion of water flow, particularly during critically dry periods.

There is hearsay evidence that pollutants (various poisons and farm wastes) may from time to time enter the river, which could have extremely serious effects on trout and other aquatic organisms. It might be argued that the abundance of barbs and yellowfish indicates that pollution cannot have been responsible for the decline of trout, but the Klipplaat is marginal habitat for this species, and it is reasonable to expect that trout would be more susceptible to poisoning (at given concentrations of toxins) than hardier and better adapted forms such as barbs and yellowfish.

That the Klipplaat has deteriorated as a trout habitat cannot reasonably be doubted. Strong evidence for this is provided by the colonization of the middle reaches of the river by yellowfish, which thrive in comparatively warm, turbid waters with a low oxygen content (such as those of the Orange and Vaal rivers). Moreover, according to Professor Tom Hecht of the Department of Ichthyology and Fisheries Science at Rhodes University, trout occurred in the Klipplaat river in the Whittlesea area (site 17) 20 or 30 years ago, and at the time of the survey had thus retreated the best part of 100 km. upstream!

Competition with yellowfish

Under conditions of high population densities of yellowfish, as in the Waterdown Dam (sites 13 and 14) and upstream to Lindisfarne (site 11), it is possible that trout numbers might have declined due to competition for food and other resources. This would not explain the scarcity or absence of trout at localities further upstream, however, where yellowfish were either few in number or entirely absent.

Conclusions

The available information suggests that the decline of trout in the Klipplaat may be mainly attributable to the direct and indirect (environmental deterioration) effects of drought. But reduced water quality should not be ignored as a factor potentially limiting the viability of trout in the Klipplaat. This possibility should be investigated in future studies.

The future of trout in the Klipplaat

There is reason to believe that conditions for trout — and fly-fishing — will improve over the next few years. The recent drought was scientifically predicted (Tyson & Dyer 1978) as part of an 18-year cycle comprising nine years each of above- and below-average rainfall. South Africa's rainfall is now increasing, and an above-average period may start as early as 1988 (Lund 1983). With improved rains — and hence more, colder and clearer water — the Klipplaat may return to life, although the eastern Cape is notoriously drought-prone, and even under wetter conditions than in the recent past the river will doubtless still be subject to marked fluctuations in flow rate and therefore in suitability for trout.

The HTAC has given some thought to the possibility of improving the Klipplaat as a trout habitat, and is considering building — or prevailing upon its riparian owners to build — low, inexpensive weirs on the upper reaches of the river. Depending on the height of the weirs, fish ladders might have to be incorporated to permit spawning migrations. Moreover, the weirs would have to be carefully sited so as to minimize silting problems. The most obvious benefit of impounding the river in this way would be to increase the volume of good quality water available, thereby increasing the carrying capacity of the river for trout. The weirs would also raise the surrounding water table, which in turn would tend to increase dry-season seepage and help to maintain a more constant flow rate. (Herein lies a possible inducement to farmers to co-operate in the venture.)

Yet another possibility is to improve spawning conditions for trout, either by creating artificial gravel beds in the upper Klipplaat or by carefully siting weirs on the Krom where naturally-occurring gravels are apparently present. The progeny of hardy river fish — which had themselves perhaps survived earlier droughts — would be more likely to tolerate adverse conditions than would hatchery fry and fingerlings.

Acknowledgements

Our sincere thanks to the following: the riparian owners and the Water Bailiff at Waterdown dam for permitting access to their waters, and for their valuable comments and opinions; the Cape Department of Nature Conservation for permission to undertake the survey; our colleagues J. Jemaar, G. Mfuko, F. Ngcongca and E. Nkoane for ther skilled and willing assistance in the field; and Bob Crass for his valuable comments on the manuscript.

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