Short communication

Notes on a comparison of the catchability and growth of a red and normal variety of the sharptooth catfish *Clarias gariepinus* (Burchell) stocked together in fish production ponds

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Abstract

Juvenile fish of the normal black, mottled strain and a red variety of the sharptooth catfish, *Clarias gariepinus*, were stocked together in equal numbers in two experimental grow-out ponds. Successive seining of the fish revealed a consistently poorer capture success of the red variety than for the black strain. A statistically highly significant lower capture rate of the red variety was found, far exceeding the actual percentage ratio of the two strains as measured by the surviving fish cropped at the end of the investigation. The survival of the black strain was the highest. Predation by fish-eating water birds accounted for much of the loss of the red strain from the ponds.

Introduction

Since the publication by Groenewald (1961) on aspects of the ecology of the sharptooth catfish *Clarias gariepinus*, this fish species is now successfully spawned in captivity under local conditions (Schoonbee *et al.*, 1980; Hecht, 1982) and its larvae reared on artificial and live foods (Hecht, 1981, 1982; Uys and Hecht, 1985; Polling *et al.*, 1988). The first significant production and marketing of this fish in South Africa commenced as early as 1985. Since then at least two commercial catfish farms have been established, one at Kimberley in the Cape and another at Hoedspruit in the Transvaal Lowveld.

In 1987, a comparative production study was done by Prinsloo *et al.* (1989b) in ponds at the Turfloop Fish Breeding and Research Station in Lebowa using juvenile fish of the normal, dark mottled variety and of a red strain of *C. gariepinus*, which had been spawned at the laboratory of the University of the North (Prinsloo *et al.*, 1989a). During successive periodic routine seining of the fish to determine mass increments for the upward adjustment of the feed dosage levels, it was observed that the red variety was constantly caught in much lower numbers in the seine-nets than the black mottled fish. This happened despite the fact that the stocking densities of both varieties were the same, and that the numbers of the black strain were only slightly more at the end of the investigation.

In this paper a statistical evaluation is made of the seine-net capture data for both varieties using Student's T-test to establish whether there are in fact significant differences in the catchability of these two fish varieties when they are in the same pond. A brief comparison is also made of the relative growth performance of the two varieties over the production period of one hundred days.

Materials and methods

Two earthen ponds at the Turfloop Fish Breeding and Experimental Station at Sovenga, approximately 500 m^2 in size, were stocked on 8 October 1987 with equal numbers of both sharptooth catfish varieties, at a total density of approximately 15 000 fish ha^{-1} (Table 1). The mean individual mass of specimens of the red variety at the time of stocking in the two ponds was 81,7 g and 81,4 g respectively, as opposed to 122,4 g and 121,1 g for the normal black strain. Feed used consisted of a mixture of minced tilapia, bakery-floor sweepings and formulated 18% protein pellets (Prinsloo *et al.*, 1989b). Because of variations in feed consistency and overall quality of this feed formula, dosage quantities, calculated as dry mass, were applied daily at 4% of the estimated total fish mass in the ponds and not at lower dosage levels as advocated by Hoogendoorn *et al.* (1983), when using a formulated diet specifically developed for this fish species. Dosage quantities were adjusted fortnightly, based on mass measurements of fish seined.

A statistical evaluation was made on the capture data of both varieties using paired T-tests on each set of the red and normal strains caught in the nets in both ponds during the consecutive routine sampling efforts, as well as on the total numbers of the capture data based on all the results obtained (Table 2).

Results

The results of this experiment are listed in Tables 1 and 2. In both ponds the red variety, although initially smaller in size (Table 1), does not appear to be inhibited in its growth by the larger specimens of the black variety (Table 1). However, the survival of the red strain for both ponds was markedly lower than for the black strain (77,7% to 88,5% compared to 93,1% to 100,0%).

The mean capture percentage ratio of the red strain was 42,7% and 47,8% lower than that of the black strain in the two ponds (Table 2, Fig. 1). This does not reflect the actual numerical ratio in final numbers of the red and black strains which survived in the two ponds at the end of the study, where those for the red strain were 11,5% and 15,4% lower in numbers than those of the black variety. In none of the 18 sets of captured fish (Table 2) were the numbers of the red strain anywhere near or higher than that of the black variety caught in nets. In all the cases highly

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significant smaller numbers ($P<0,001$) of specimens of the red variety were caught during the different seining efforts in both ponds (Table 2).

Discussion

The ability of *C. gariepinus* to avoid seine nets during fish population investigations, has been observed by a number of research workers including Göldner *et al.* (1972) and Koch and Schoonbee (1980). If this tendency is taken into account, it appears that the red variety may be more able to avoid, or escape from seine nets than the black variety. In view of this, it is recommended that where the red strain is to be used in fish production in the future, special care should be taken in removing all specimens from the ponds during cropping. It is advisable that in such cases, fish ponds be drained entirely, or to levels where the movement of all fish can be physically observed during and after harvesting programmes.

The percentage survival of the red strain of *C. gariepinus* which was lower than that of the black strain in the same ponds suggests that, because of its brighter colour, this variety may well be more susceptible to predation by fish-eating birds, such as the white breasted cormorant *Phalacrocorax carbo* and lesser cormorant *Phalacrocorax africanus,* which had frequented the fish ponds during the period of investigation. Some of these birds were shot during the early part of this production study, and an analysis of their gut contents revealed that red catfish made up more than 99% of the fish removed from their stomachs. One other factor, apart from colour, which may have contributed towards the higher predation of the red catfish, was that they were much smaller initially than the black variety at the time of stocking. Particular care must therefore be taken of the red juveniles during the early nursing phase in outside ponds to prevent their undue predation by fish-eating water birds and other predators.

Observations on the mean growth and mass increments of specimens of both strains show that the smaller red variety of *C. gariepinus* appears to have a slightly inferior growth compared

TABLE 1
GROWTH RESULTS OF THE RED AND NORMAL STRAINS OF THE SHARPTOOTH CATFISH STOCKED TOGETHER IN PONDS OVER A PERIOD OF 100 D AT A DENSITY OF 15 000 FISH HA^{-1}

	Pond 1		Pond 2	
	Red variety	Black variety	Red variety	Black variety
Stocking density (fish ha^{-1})	7 511	7 511	7 490	7 490
Final density (fish ha^{-1})	6 646 (88,5%)	7 511 (100,0%)	5 821 (77,7%)	6 976 (93,1%)
Initial mean mass (g)	81,7	122,4	81,4	121,1
Final mean mass (g)	623,4	693,0	641,2	749,9
Percentage mass increment	760	570	790	620

TABLE 2
COMPARISON OF CAPTURE STATISTICS OF RED AND BLACK (MOTTLED) VARIETIES OF THE SHARPTOOTH CATFISH *CLARIAS GARIEPINUS* STOCKED IN EQUAL NUMBERS IN 500 m^2 PONDS WHERE THEY WERE REARED TOGETHER FOR A PERIOD OF 100 D

Periods of initial stocking and successive seining	Capture data for the two varieties of *C. gariepinus* from ponds			
	Pond 1		Pond 2	
	Red variety	Black (mottled) variety	Red variety	Black (mottled) variety
08/10/1987 (stocking)				
20/10/1987	12	85	17	40
03/11/1987	32	98	44	120
17/11/1987	72	173	46	129
01/12/1987	40	80	60	150
14/12/1987	50	120	77	118
29/12/1987	80	140	60	110
12/01/1988	34	120	69	130
25/01/1988	57	100	50	100
09/02/1988	62	113	39	70
TOTAL	439	1 029	462	967
Mean ($\bar{x}$)	48,78	114,33	51,33	107,44
Standard deviation (SD)	21,47	28,89	17,80	33,66
Standard error (SE)	7,16	9,63	5,94	11,22
Coefficient of variability (CV)	44,0	25,3	34,7	31,3
	T-value: -9,90; D.F.: 8; $P<0,001$		T-value: -7,24; D.F.: 8; $P<0,001$	

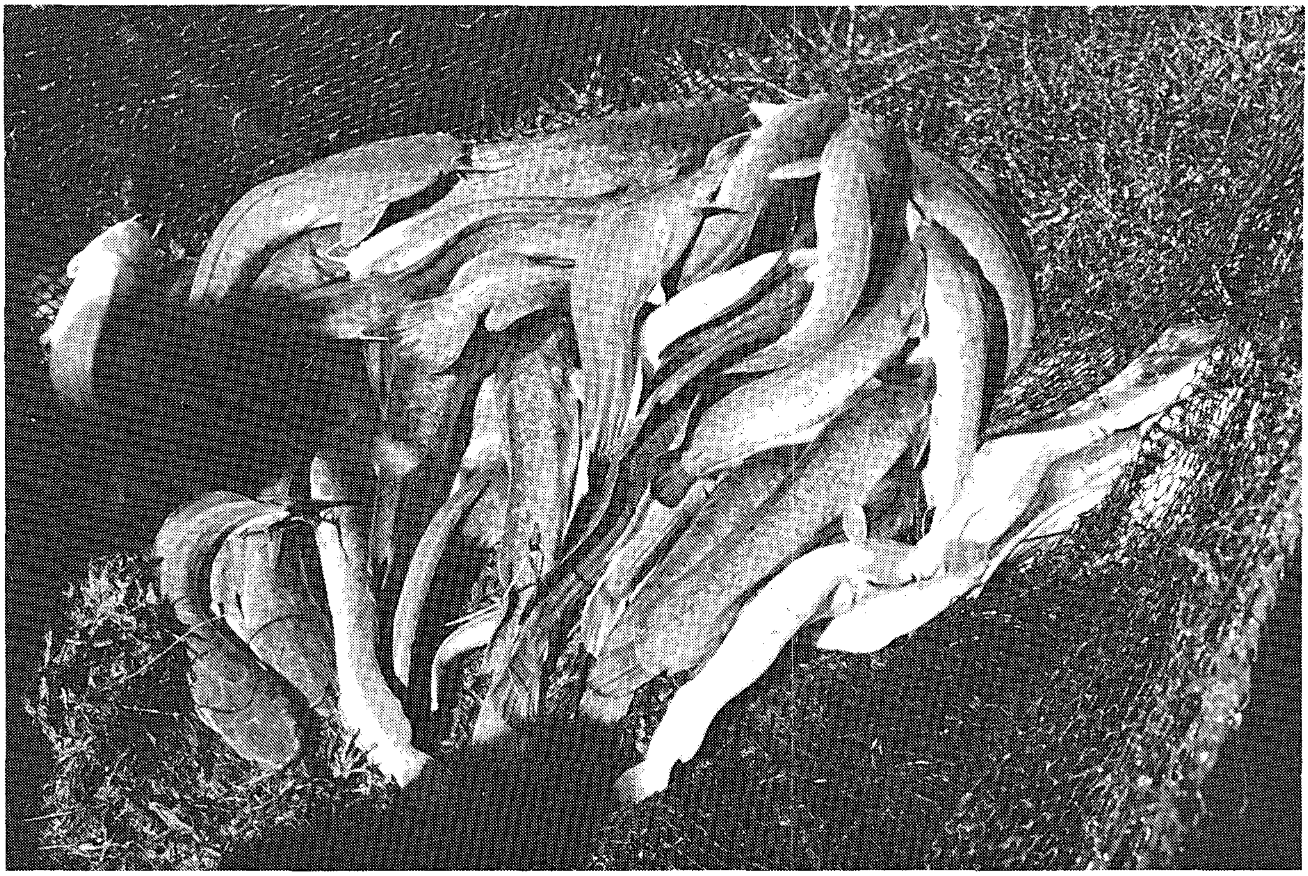

Figure 1
Red and black C. gariepinus *in seine-net from fish production pond showing the smaller numbers of the red variety amongst the collected fish.*

to that of the black variety, where they were reared in the same ponds (Table 1). Whether this is due to the initial mass advantage which the normal black variety had over the red strain or to inherent differences in growth potential between the two strains cannot be substantiated by these results and needs to be investigated in more details.

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