Short communication

Utilisation of chicken offal in the production of the African sharptooth catfish *Clarias gariepinus* in the Transkei

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Abstract

Offal from a chicken broiler farm was macerated and used to grow the catfish *Clarias gariepinus* at a stocking density of 5 875 fish ha^{-1} in ponds over a period of 75 d. Despite a shortage of chicken offal at times and a below normal feeding level of the fish during this period, a yield of more than 2 t ha^{-1} was still obtained. Apart from migration between the experimental ponds no other loss of fish due to mortalities was experienced.

Introduction

Clarias gariepinus (Burchell) is one of the two largest catfish species indigenous to Africa (Bruton, 1976). This fish is known for its omnivorous feeding habits (Groenewald, 1964; Schoonbee, 1969; Van der Waal, 1972; Gaigher, 1977; Willoughby and Tweddle, 1978; Bruton, 1979a). It also has the ability to survive adverse environmental conditions (Bruton, 1979b) and is able to migrate overland from one water body to another.

Induced spawning techniques for this fish have been perfected overseas as well as under local conditions. (Schoonbee *et al.*, 1980; Hecht *et al.*, 1982; de Leeuw *et al.*, 1985; Hecht and Lublinkhof, 1985; Richter *et al.*, 1985), whilst work on the rearing of its larvae has been done by Hecht (1981).

It is a known fact that mortalities due to handling do occur in broiler chicken production units. Such chickens are usually discarded as a loss to the industry. If this material could be utilised to grow fish instead, some of this loss can be recouped in terms of fish produced.

The fact that *C. gariepinus* can adapt to a variety of diets, prompted the present experiment in which chicken offal from a nearby broiler farm was used as the sole source of food.

Materials and methods

Importation of larvae

Five thousand catfish larvae were obtained from the hatchery of the University of the North, Sovenga, through the Department of Agriculture of Transkei who imported the material. The larvae were transferred on arrival to specially prepared earthen ponds rich in zooplankton and benthic macro-invertebrate fauna. Chicken mash was applied daily as supplementary food. The fish were kept for a period of ten months before they were used in the present experiment. Only 235 fish survived, possibly as a result of juvenile cannibalism in this species. Fish used in the feeding experiment averaged 406,5 g in individual mass.

Stocking density of fish

Two 200 m^2 earthen ponds at the Umtata Dam Research Centre with an average depth of 1 m, filled with piped water from the Umhlahlane River, were used in the present experiment. Each pond was stocked at a density of 5 875 fish ha^{-1} with a mean initial standing crop of 2 388,2 kg ha^{-1}.

Source and application of food

Chicken offal and young chickens which died in the process of routine handling on a nearby broiler farm, and which would have been destroyed otherwise, were utilised as food in the feeding experiment. Fresh chicken material, including feathers and bones, was collected daily and macerated in an industrial macerator model B Rise, class F carcass disposer. Determined by availability the macerated material applied daily was at a wet mass varying between 2,7% and 3,8% of the estimated standing crop of the catfish in the ponds. Based on dry mass calculations of the material, these values varied between 1,4% and 1,9% of the daily feed rations applied, which was well below the normal feeding levels required for the production of pond fish. The feeding experiment lasted for 75 d, between the period 7 November 1985 and 20 January 1986.

Water chemistry of ponds

Fortnightly analyses of certain physical and chemical parameters of pond water were made according to standard methods for the examination of water and waste water (APHA, 1980).

Results and discussion

Pond water chemistry

An analysis of pond water as summarized in Table 1, did not, apart from dissolved oxygen, reveal any serious accumulation of concentrations of nitrate, ammonia or phosphates, which could have adversely affected the pond water conditions. pH mainly remained alkaline, fluctuating between 6,5 and 8,1.

Fish production

Even though the daily dosage quantities of chicken offal which

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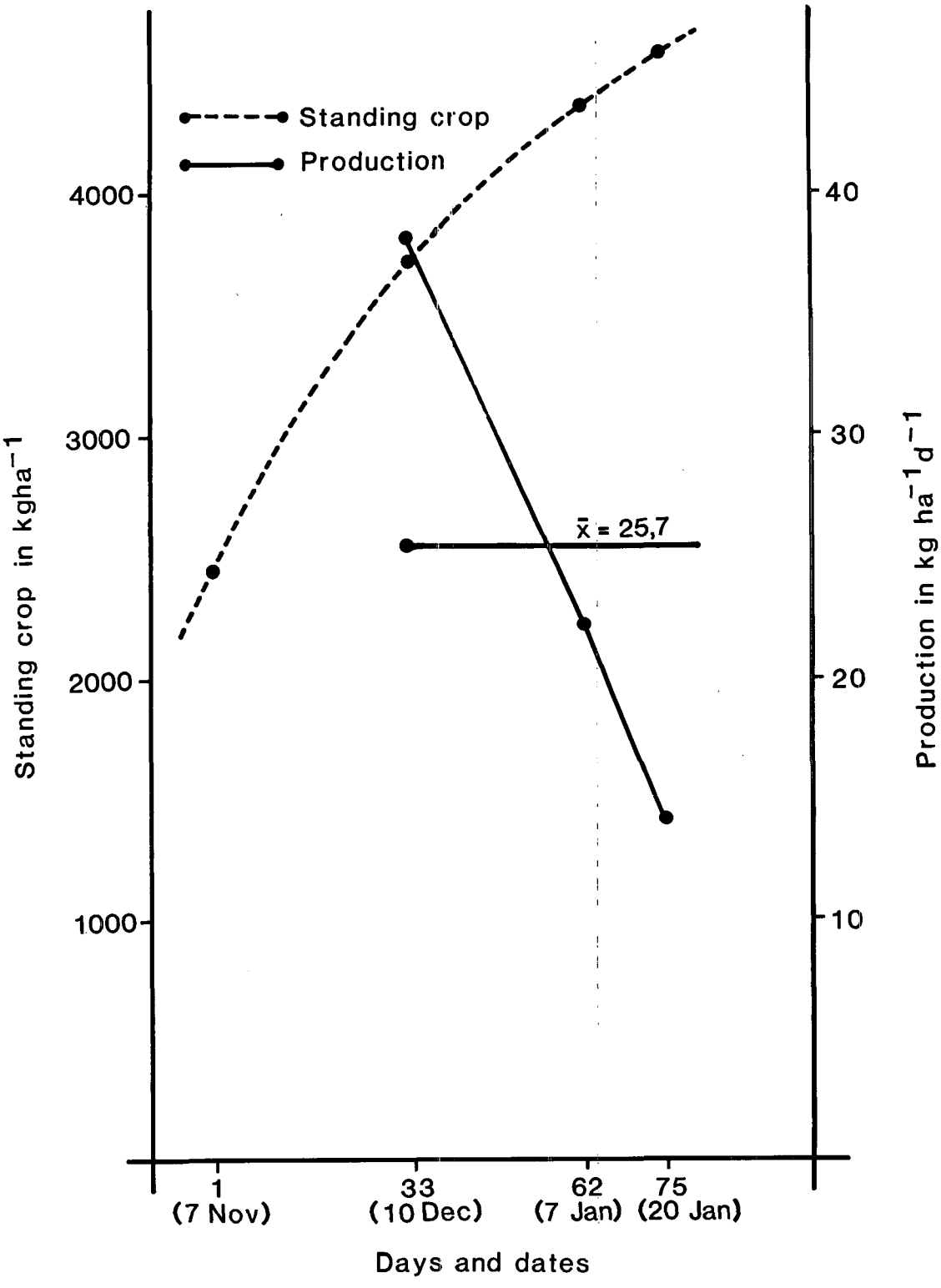

Figure 1
Standing crop and production figures obtained for the African catfish Clarias gariepinus *fed on chicken offal over a period of 75 days.*

included feathers and bones were as indicated, below the normal 4 to 5% (dry mass) of the estimated fish mass in the ponds, which is a generally accepted feed dosage level at fish farms (Hepher and Pruginin, 1981), fish yields obtained over the 75 d period can be regarded under the circumstances as satisfactory, exceeding 2 t ha^{-1} for the period (Table 2; Figure 1).

Likewise, a feed conversion of 4,6 (wet mass) or 2,3 (dry mass) obtained over the entire period, would have been even better if meat material alone was used. A very important factor is, however, the fact that the fish were grown on material which is normally not utilised and despite the insufficient quantities of feed provided, an extremely efficient feed conversion could still

TABLE 1
SUMMARY OF PHYSICAL AND CHEMICAL CONDITIONS IN FISH PONDS RECEIVING MINCED CHICKEN OFFAL

Analyses	N	$\bar{x}$	Min	Max	Sx	CV
Dissolved oxygen mg ℓ^{-1}	8	3,21	1,80	5,8	1,32	2,42
pH	8		6,57	8,10	0,45	15,78
Conductivity μS m^{-1}	6	103	92	111	6,46	15,96
Alkalinity as $CaCO_3$, mg ℓ^{-1}	8	18,5	10,00	24,00	4,66	3,96
Total hardness as $CaCO_3$, mg ℓ^{-1}	8	28,5	18,00	50,00	10,66	2,67
Nitrate (NO_3), mg ℓ^{-1}	8	0,129	0,031	0,167	0,039	3,28
Ammonia (NH_4), mg ℓ^{-1}	8	0,198	0,094	0,348	0,089	2,23
Orthophosphate (PO_4), mg ℓ^{-1}	8	0,047	0,009	0,195	0,061	0,765

Sx = Standard deviation
CV = Coefficient of variability

TABLE 2
RESULTS OBTAINED ON THE COMBINED MEAN GROWTH AND PRODUCTION OF THE SHARPTOOTH CATFISH *CLARIAS GARIEPINUS* IN PONDS RECEIVING MINCED CHICKEN OFFAL DURING THE PERIOD NOVEMBER 1985 TO JANUARY 1986 (75 DAYS)

Period	Days	Date	Mean and extreme pond water temperature for period (°C)	Stocking (s) and final (f) densities (fish ha^{-1})	Standing crop (kg ha^{-1})	Yield increment (kg ha^{-1})	Production in kg $ha^{-1}.d^{-1}$	Chicken offal quantities in kg ha^{-1}		FCR (Feed Conversion Ratio)	
								Wet mass	Calculated dry mass	Wet mass	Calculated dry mass
1	1	7.11.85		5 875 (s)	2 462,2						
2	33		20,6 15,6-23,4	5 450*	3 725,1	1 262,9	38,3	3 292,4	1 655,4	2,6	1,3
3	61		22,2 21,2-23,5	5 450*	4 350,7	625,6	22,3	4 678,6	2 352,4	7,5	3,8
4	75	20.1.86	22,1 20,7-23,5	5 450 (f)	4 581,8	231,1	16,5	1 824,1	917,1	7,9	4,0
TOTAL						2 119,6		9 795,1	4 924,9	$\bar{x}$ = 4,6	$\bar{x}$ = 2,3

*Estimates based on final counts.
$\bar{x}$: Mean feed conversion ratios over entire period

be realised.

However, the comparatively good feed conversion recorded suggests that natural food which developed in the ponds might have been exploited by the catfish.

The results obtained show that if the broiler chicken industry in Transkei should expand, the catfish *C. gariepinus* can be used beneficially to utilise chicken wastes as food. Under high fish density conditions and over a prolonged feeding programme, the offal material might have a detrimental cumulative effect on pond water conditions. In such a case, it would be advisable, apart from aeration, to replace pond water regularly.

All fish inspected during the period of investigation were healthy and did not show any sign of diseases. Although no mortalities were observed, some fish did migrate from the experimental ponds to nearby fish ponds and had to be collected there and returned on occasions during the experimental period.

From the results recorded, it is clear that this fish species adapts well to local conditions in Transkei and indications are that it can be incorporated in local aquaculture ventures. Although *C. gariepinus* does not commonly occur in Transkei waters, indications are that a sufficient local demand exists for this species to merit investigations into its commercial exploitation. The danger does exist, however, that this fish may invade river systems in which it does not naturally occur and where it will probably spawn and survive.

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