# Aspects of the length, mass, fecundity, feeding habits and some parasites of the shortfin minnow, *Barbus brevipinnis* (Cyprinidae) from the Marite River, Mpumalanga Province, South Africa

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## Abstract

The ecology of the shortfin minnow *Barbus brevipinnis* from the Marite River, Incomati River system, Mpumalanga, was investigated. Aspects considered include length, mass, feeding biology, fecundity and the occurrence of ecto- and endoparasites. Factors which may affect the incidence and eventual survival of the shortfin minnow in the Incomati River system are briefly discussed.

## Introduction

There are a number of factors which seriously affect the ecology of streams and lakes in South Africa. Pollution from mines and industries has already caused major, sometimes irreversible changes and deterioration in the water quality and biology of such waters (Förstner and Prosi, 1979; Van der Merwe et al., 1990; De Wet et al., 1994; Van Eeden and Schoonbee, 1996). Habitat destruction due to the erection of weirs and the afforestation of otherwise clean and unpolluted headwaters of streams may further threaten the survival of ecologically sensitive fish species due to the obstruction and siltation of their breeding and feeding grounds (Crass, 1969; Chutter, 1969; Gaigher et al., 1980; Allanson and Rabie, 1983; Cambray, 1985). The medium- to long-term effects of afforestation, particularly in headstreams of rivers, are also reflected in the reduction of streamflow and the resultant stagnation of streams. This may in turn directly threaten the very existence of particular fish species with confined natural distribution and occurrence in such areas. Such is the shortfin minnow, *Barbus brevipinnis* (Jubb, 1966), which has its natural distribution in the headwaters of the Sabie, Incomati and Steelpoort Limpopo River systems (Skelton, 1993).

*Barbus brevipinnis* was first described in 1966 by Jubb from a locality in the Marite River, in the catchment of the Sabie and Sand River tributaries of the Incomati River system where it occurs along the escarpment of the Mpumalanga Province (Fig. 1). It was also recorded from the Mogol, Lephalala (Kleynhans, 1983), Marico, Matlabas, Mogalakwena and Levuvhu Rivers (Kleynhans, 1992). Recent protein starch-gel electrophoretic studies by Engelbrecht and Van der Bank (1994) suggest that the shortfin minnow may be confined to the Sabie-Sand River tributaries (Fig. 1) as well as the Manzaan River of the Pongolo River system (Engelbrecht and Van der Bank, 1996). The fish species which was provisionally identified as *Barbus brevipinnis* in the Levuvhu River has, however, not been confirmed electrophoretically. Until such time, the actual distribution of *B. brevipinnis* in the Levuvhu River must therefore be considered as tentative.

In addition to the large-scale afforestation and construction of dams in the catchment areas of rivers where *B. brevipinnis* naturally occurs, the introduction of the rainbow trout *Oncorhynchus mykiss* (Walbaum, 1792), may further endanger the survival of this barb in the affected waters. Largely due to its clearly restricted recorded distribution, its ecology was investigated, looking at aspects such as length and mass relationship, fecundity, food habits and ecto- and endoparasites, where it occurs in the Incomati River system. This investigation stretched over a period of four successive seasons between April 1990 and January 1991.

## Materials and methods

Limited physical and chemical analyses were made according to standard international procedures (*Standard Methods*, 1989) on water samples collected at the various sites during the different seasons of the investigation.

Fish were caught seasonally at randomly selected sampling sites during autumn (March to May), winter (June to August), spring (September to November) and summer (December to February) using a modified Moore-type electric fish shocking apparatus (Moore, 1968) as well as scoop nets. Associated fish species were also collected at the same time. All fish captured were immediately preserved in labelled bottles containing 10% formalin for later analysis. At the laboratory each specimen was surface-dried with filter paper. The total (TL), standard (SL), and fork length (FL) as well as the mass of each fish were accurately determined to the nearest mm and nearest mg, respectively. The gonads were carefully removed, surface-dried and weighed to the nearest mg. Subsamples of the gonads were taken and individually weighed. Eggs from each subsample were then sorted into different size classes and counted, using a dissection microscope with a calibrated eye piece. The number of eggs for each ovary in the different size classes were calculated. This procedure was followed for all females collected during each season. In the case of mature females collected during the various seasons, the mean

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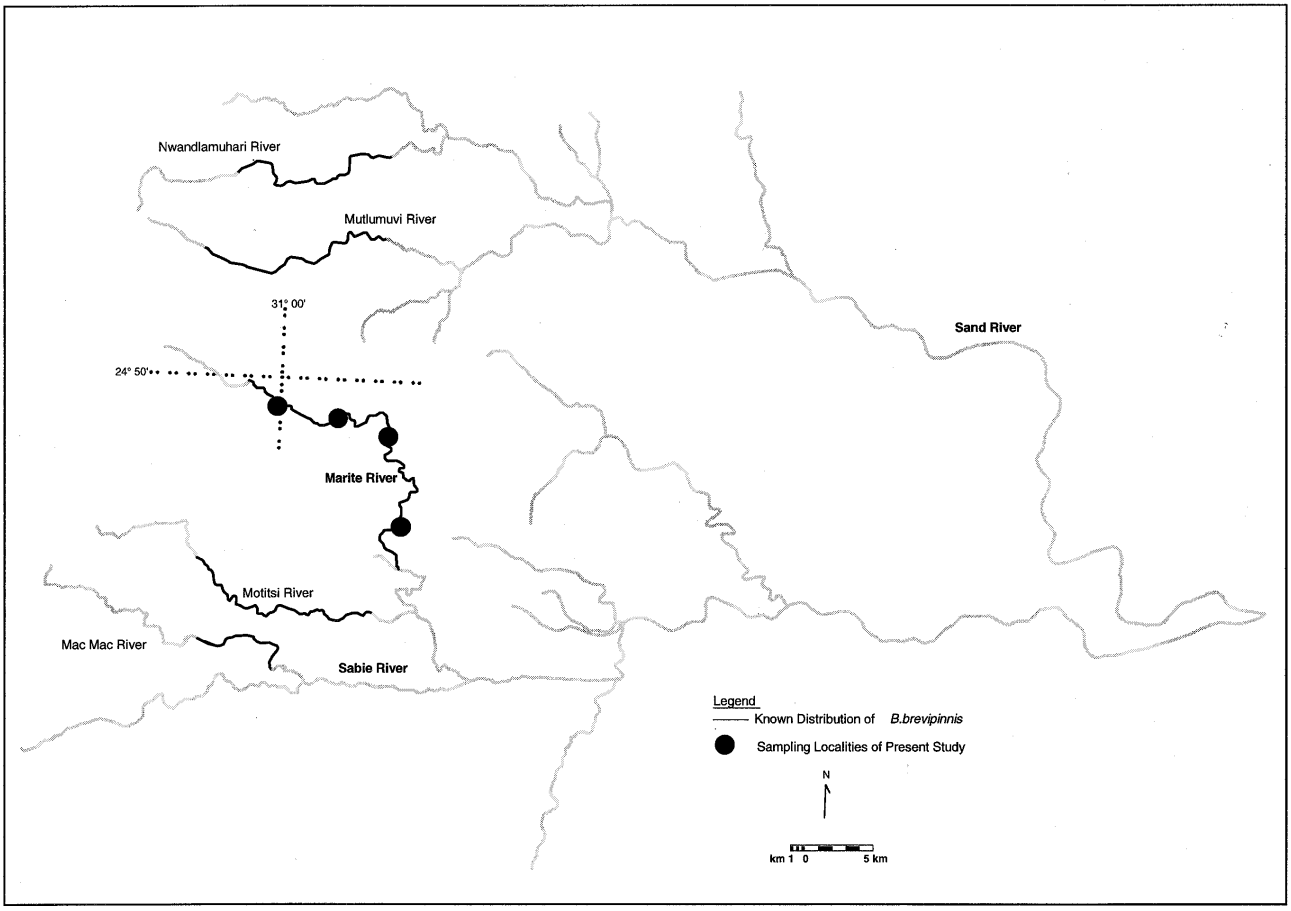


***Figure 1***

*The Sabie, Marite and Sand Rivers from the Incomati River system, Mpumalanga Province where* B. brevipinnis *occur*

**TABLE 1**
**SOME PHYSICAL AND CHEMICAL CONDITIONS AT THE VARIOUS SITES WHERE *BARBUS BREVIPINNIS* WAS COLLECTED DURING THE SURVEY**

| Parameter | n | Mean | Range |
|---|---|---|---|
| Water flow rate (m/s) | 15 | 0.27 | 0.13 - 0.40 |
| Temperature (°C) | 8 | 16.80 | 13 - 24 |
| pH | 8 | - | 7.40 - 7.90 |
| Conductivity (µS/cm) | 8 | 29 | 24 - 32 |
| Oxygen concentration (mg/ℓ) | 2 | 7.50 | 7 - 7.90 |
| Total hardness (mg/ℓ $CaCO_3$) | 5 | 26 | 10 - 40 |
| Alkalinity (mg/ℓ $CaCO_3$) | 5 | 20 | 10 - 30 |
| Nitrate (mg/ℓ $NO_3$) | 4 | 3.60 | 1.20 - 6.60 |

number of eggs in the different size classes were also determined.

Following the removal of the gut, total gut and foregut lengths were measured. The fullness of the fore- and hindgut were estimated after which the various items in the food contents were identified as far as possible. Due to the digested nature of the gut contents at times, it was only possible to express the content of the various items in terms of their frequency of occurrence.

The gonadosomatic index (GSI) for both sexually mature male and female fish was determined using the formula gonad mass (g)/fish mass (g) as described by Fry (1949).

All fish were examined for the presence and incidence of external and internal parasites according to Smith and Roberts (1989).

## Results

### Physical and chemical conditions

Results showed that the streams where *B. brevipinnis* occurs were generally low in dissolved solids. Conductivity values fluctuated between 24 and 32 µS/cm (Table 1). Despite these conditions, the pH of the water at the various localities generally remained alkaline with a lowest pH value of 7.4 recorded. This corresponds with values obtained for total hardness of 10 to 40 mg/ℓ and alkalinity of 10 to 30 mg/ℓ. The streams where *B. brevipinnis* was collected were well oxygenated with dissolved oxygen values fluctuating between 7 and 7.9 mg/ℓ. Nitrate concentrations of 1.2 to 6.6 mg/ℓ suggest some mild eutrophication of the water of the streams. Prevailing water temperatures fluctuated between 13°C in winter and 24°C during summer. Width and depth of the streams where this species was collected varied between 3 to 16 m and 10 to 150 cm, respectively. Current speeds measured at the sites, varied between 0.13 and 0.40 m/s. The substrate of the streams varied between sandy and gravelly conditions.

Records of the distribution of *B. brevipinnis* showed this fish to occur at altitudes of 609 to 1082 m a.s.l.

### Associated fish species

Fish species caught at the same sampling localities as *B. brevipinnis* included the rosefin barb *Barbus argenteus* Günther, 1868; longbeard barb *Barbus unitaeniatus* Günther, 1866; largescale yellowfish *Barbus marequensis* Smith, 1841; smallscale yellowfish *Barbus polylepis* Boulenger, 1907; redeye labeo *Labeo cylindricus* Peters, 1852; pennant-tailed suckermouth *Chiloglanis anoterus* Crass, 1960; Natal mountain catfish *Amphilius natalensis* Boulenger, 1917; Incomati chiselmouth *Varicorhinus nelspruitensis* Gilchrist & Thompson, 1911 and the banded tilapia *Tilapia sparrmanii* Smith, 1840. The rosefin barb *B. argenteus* was in many cases found in the same reaches as *B. brevipinnis* with *B. argenteus* preferring open stream conditions, in contrast to *B. brevipinnis* which as a rule frequents the sheltered marginal vegetation area overhanging into the water.

### Length and mass in sexually mature *B. brevipinnis*

The mean mass as well as the TL, FL and SL of sexually mature males and females of *B. brevipinnis* collected during the different seasons of the survey are summarised in Table 2. Results indicate that the mean lengths of both sexes were generally similar. Females were, however, 5.2% heavier than the males. In the case where the seasonal data for the males and females were grouped together, the fish collected during autumn were shown to be on average heaviest, with a decline in both mass and length towards spring. The data also show that the coefficient of variability for length was the largest during spring. This applies to TL, FL as well as SL. Correlation coefficients calculated for both lengths and mass compared extremely well for all three length measurements, indicating that any of the three length parameters can reliably be used for the calculation of length or mass in the formula $M = cL^n$ as used by Rounsefell and Everhart (1953) and Lagler (1956), respectively.

**TABLE 2**
**MEAN MASS, TOTAL (TL), FORK (FL) AND STANDARD (SL) LENGTHS OF SEXUALLY MATURE MALES AND FEMALES OF *BARBUS BREVIPINNIS* COLLECTED DURING THE SURVEY**

| All seasons | Lengths | | |
|---|---|---|---|
| | TL | FL | SL |
| **Male fish (n=43)** | | | |
| Mean length (mm) | 44.1 | 40.4 | 35.7 |
| Mean mass (g) | 1.076 | 1.076 | 1.076 |
| Standard deviation for length | 0.489 | 0.438 | 0.423 |
| Coefficient of variation (%) for length | 11.09 | 10.84 | 11.82 |
| **Female fish (n=55)** | | | |
| Mean length (mm) | 43.9 | 40.4 | 36.2 |
| Mean mass (g) | 1.135 | 1.135 | 1.135 |
| Standard deviation for length | 0.753 | 0.709 | 0.646 |
| Coefficient of variation (%) for length | 17.12 | 17.52 | 17.84 |

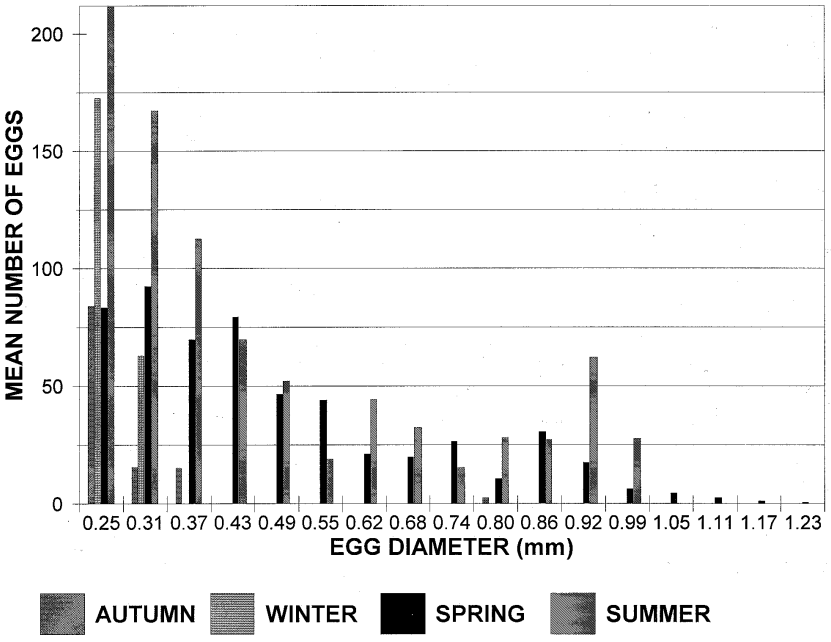


***Figure 2***
*Mean number of eggs in different size classes present in the ovaries of* B. brevipinnis *collected during autumn (n=8), winter (n=8), spring (n=7) and summer (n=7).*

### Fecundity, number of eggs and gonadosomatic index (GSI)

The smallest female found to be sexually mature was 28 mm SL. Figure 2 shows the mean number of eggs for mature females recorded during each season. During autumn, ovaries were still found to contain eggs in the 0.25 to 0.37 and in the 0.8 mm egg size classes. The absence of eggs in size classes 0.43 mm to 0. 74 mm during this season suggests that the breeding season for *B. brevipinnis* has practically ended in autumn. However, investigations during winter still showed eggs present in egg size classes 0.25 mm to 0.31 mm in diameter. Eggs were present in all the size classes of 0.25 to 1.23 mm diameter during spring. Eggs in the larger size classes of 0.25 mm to 0.99 mm diameter, occurred in the gonads during summer. Spring and summer therefore were clearly the main spawning seasons for *B. brevipinnis* in the Marite River.

**TABLE 3**
**FREQUENCY OF OCCURRENCE OF THE DIFFERENT FOOD ITEMS IN THE GUT OF *BARBUS BREVIPINNIS* DURING AUTUMN (N=39), WINTER (N=21), SPRING (28) AND SUMMER (28) WITH AN INDICATION OF THE PERCENTAGE NUMBER OF GUTS (%) WHICH CONTAINED SPECIFIC FOOD ITEMS**

| Food items | Comments | Season | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Autumn frequency | % | Winter frequency | % | Spring frequency | % | Summer frequency | % |
| **Algae and plants** | | | | | | | | | |
| Filamantous algae | | 1 | 2.6 | 4 | 19 | 4 | 14.3 | 17 | 60.7 |
| Phytoplankton | | | | | | | | 1 | 3.6 |
| Higher plant material | | 1 | 2.6 | | | 3 | 10.7 | | |
| **Nematoda** | | | | | | | | | |
| *Cryptonchus* sp. | Freshwater | | | | | 2 | 7.1 | | |
| *Xiphinema* sp. | Plant parasite | | | | | 2 | 7.1 | | |
| *Mesodorylimus* sp. | Omnivore | | | | | 1 | 3.6 | | |
| *Discolimus* sp. | Predator | | | | | | | 1 | 3.6 |
| **Oligochaeta** | | | | | | | | | |
| Lumbricidae | | | | | | 1 | 3.6 | 1 | 3.6 |
| **Crustacea** | | | | | | | | | |
| *Caridina nilotica* | | 1 | 2.6 | | | | | | |
| Cladocera | Unidentified | 1 | 2.6 | 3 | 14.3 | 7 | 25 | | |
| *Alona* sp. | | 5 | 12.8 | 12 | 57.1 | 13 | 46.4 | 1 | 3.6 |
| *Chydorus* sp. | | 2 | 5.1 | | | 2 | 7.1 | | |
| **Hydracarina** | Unidentified | | | | | 1 | 3.6 | | |
| **Insecta** | | | | | | | | | |
| Terrestrial | | | | | | 2 | 7.1 | | |
| Unidentified | | 13 | 33.3 | 5 | 22.8 | 11 | 39.3 | 10 | 35.7 |
| Eggs | | | | | | 3 | 10.7 | | |
| **Diptera** | | | | | | | | | |
| Muscidae | Larvae | | | 1 | 4.8 | | | | |
| Simuliidae | Larvae | | | 1 | 4.8 | | | 3 | 10.7 |
| | Pupae | 1 | 2.6 | 1 | 4.8 | | | | |
| | Adult | 2 | 5.1 | 8 | 38.1 | 6 | 21.4 | 3 | 10.7 |
| Chironomidae | Larvae | 11 | 28.8 | 11 | 52.4 | 16 | 57.1 | 6 | 21.4 |
| | Pupae | | | 1 | 4.8 | | | | |
| | Adults | | | 5 | 23.8 | 4 | 14.3 | 3 | 10.7 |
| *Pentaneura* sp. | Larvae | 3 | 7.7 | 1 | 4.8 | 1 | 3.6 | | |
| Ceratopogonidae | Larvae | 2 | 5.1 | | | 1 | 3.6 | | |
| *Chaoborus* sp. | Pupae | | | | | 1 | 3.6 | | |
| **Coleoptera** | | | | | | | | | |
| Elmidae | Larvae | 2 | 5.1 | 1 | 4.8 | | | | |
| Dytiscidae | Larvae | 2 | 5.1 | | | | | | |
| | Adult | | | | | 2 | 7.1 | | |
| **Ephemeroptera** | Unidentified | 1 | 2.6 | | | | | | |
| Baetidae | Nymphs | 1 | 2.6 | | | | | | |
| *Caenis* sp. | Nymphs | 2 | 5.1 | 2 | 9.5 | | | | |
| **Hymenoptera** | Unidentified | | | | | 1 | 3.6 | | |
| | Wasp | 1 | 2.6 | | | | | | |
| Formicidae | Ant | | | | | | | 7 | 25 |
| **Trichoptera** | | | | | | | | | |
| *Chematopsyche* sp. | Larvae | 2 | 5.1 | 2 | 9.5 | | | | |
| *Orhotrichia* sp. | Larvae | | | 1 | 4.8 | | | | |
| **Orthoptera** | | | | | | 1 | 3.6 | | |
| **Hemiptera** | | | | | | | | 2 | 7.1 |
| **Gastropoda** | | | | | | | | | |
| *Limnaea* sp. | Shell | | | | | | | 1 | 3.6 |
| **Amphibia** | Tadpole | 1 | 2.6 | | | | | | |
| **Other** | | | | | | | | | |
| Sand | | 2 | 5.1 | 2 | 9.5 | 4 | 14.3 | 1 | 3.6 |
| Detritus | | 29 | 74.4 | 18 | 85.7 | 22 | 78.6 | 26 | 92.9 |

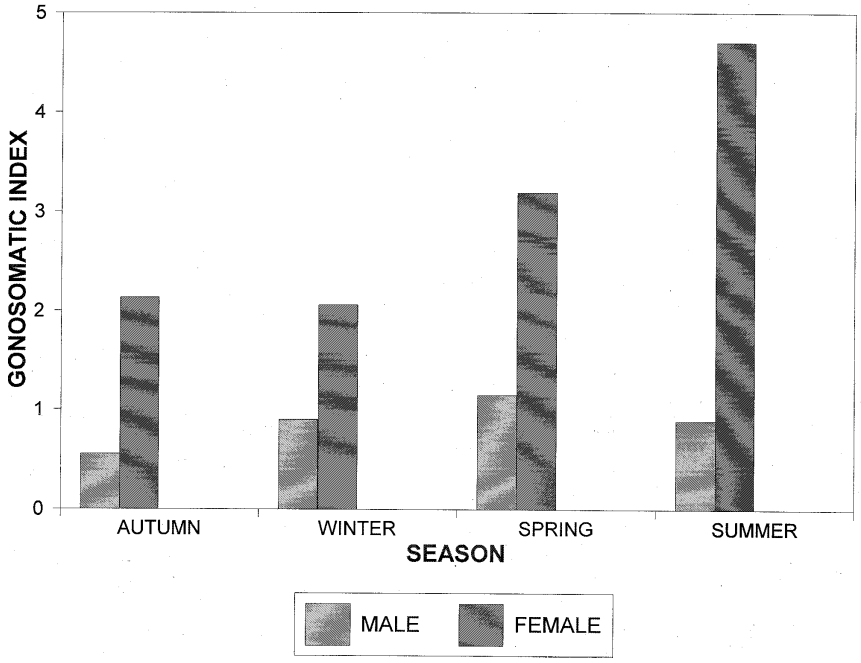


***Figure 3***
*Gonadosomatic indexes of male and female* B. brevipinnis *during the different seasons of the year. Males:autumn (n=8); winter (n=6); spring (n=7); summer (n=15). Females: autumn (n=8); winter (n=8); spring (n=7); summer (n=8).*

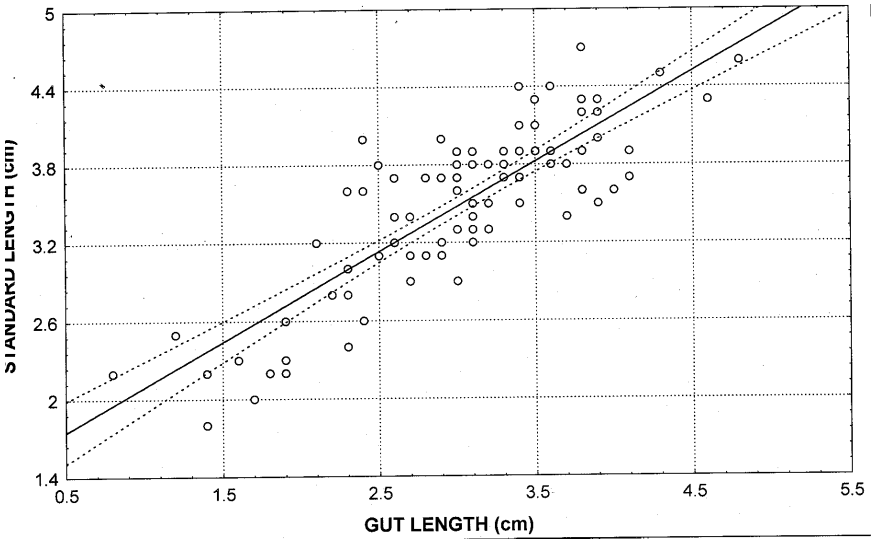


***Figure 4***
*Regression of standard length and gut length of* B. brevipinnis *from the Marite River collected during April 1990 to January 1991. (Correlation coefficient=0.85; n=98; $r^2$ =70.3).*

GSI values for mature females were the highest during summer and the lowest during winter (Fig. 3). This supports the findings on the egg sizes present in the gonads during the different seasons of the year (Fig. 2). Male GSI values peaked during spring and those of the females, during summer.

## Food and feeding

The combined length of the fore and hindgut was found to be shorter than the standard length of the fish (Fig. 4) which suggests that *B.brevipinnis* may largely be a carnivore (Kruger and Mulder, 1973).

There was little difference in the variety of dietary items in the gut contents of the fish for the different seasons of the year (Table 3). Most food items present consisted of bottom-dwelling macro-invertebrate organisms living in or on the substrate of the streams where *B. brevipinnis* was collected. Taking the stomach contents for all seasons into consideration, detritus was found in most stomachs followed by organisms such as Cladocera, Chironomidae and Simuliidae. Filamentous algae also featured prominently in terms of frequency of occurrence during most seasons of the year. Terrestrial insects, in particular the flying stages of Hymenoptera, also featured prominently during summer. Most empty stomachs were encountered during summer (46.4%) and autumn (43.6%). The lowest variety of food items was also recorded during summer. During all seasons detritus was present in more than 74% of the fish sampled. The ingestion of detritus and sand might have been incidental whilst consuming the actual food items. The presence of Cladocera and, to a lesser extent filamentous algae, indicates some feeding activity of *B. brevipinnis* in pool-like and in slow-flowing areas of streams. A decline in feeding activity as reflected by the number of empty stomachs during summer and autumn in particular, may largely coincide with breeding activity of the fish during these seasons.

**TABLE 4**
**PARASITE INFECTIONS OF *BARBUS BREVIPINNIS* FROM THE MARITE RIVER DURING THE FOUR SEASONS OF THE PERIOD OF SURVEY, WITH AN INDICATION OF THE PERCENTAGE OF FISH INFECTED BY A SPECIFIC PARASITE AS WELL AS THE INFECTION INTENSITY**

| Parasite and season | Percentage of infected fish | Infection intensity |
|---|---|---|
| **Autumn (n=39)** | | |
| **Trematoda** | | |
| cysts in liver | 4 | 1 |
| **Cestoda** | | |
| *Bothriocephalus acheilognathi* | present* | |
| **Acanthocephala** | | |
| *Acanthocentris* sp. | 2 | 1.2 |
| **Pelecepoda** | | |
| Glochidium under skin | 0 | 0 |
| **Winter (n=23)** | | |
| **Trematoda** | | |
| cysts in liver | 4 | 4 |
| **Cestoda** | | |
| *Bothriocephalus acheilognathi* | present* | |
| **Acanthocephala** | | |
| *Acanthocentris* sp. | 0 | 0 |
| **Pelecepoda** | | |
| Glochidium under skin | 9 | 1 |
| **Spring (n=32)** | | |
| **Trematoda** | | |
| cysts in liver | 6 | 50.5 |
| **Cestoda** | | |
| *Bothriocephalus acheilognathi* | present* | |
| **Acanthocephala** | | |
| *Acanthocentris* sp. | 6 | 1.5 |
| **Pelecepoda** | | |
| Glochidium under skin | 6 | 1 |
| **Summer (n=31)** | | |
| **Trematoda** | | |
| cysts in liver | 32 | 7.8 |
| **Cestoda** | | |
| *Bothriocephalus acheilognathi* | present* | |
| **Acanthocephala** | | |
| *Acanthocentris* sp. | 16 | 4.2 |
| **Pelecepoda** | | |
| Glochidium under skin | 19 | 1 |

* Low frequency of occurrence.
No counts made of numbers of parasites.

**Parasites**

Table 4 shows that the percentage of fish infected by the acanthocephalan *Acanthocentris* sp. progressively increased from the lowest infection during winter to the highest in summer. The infection intensity of *Acanthocentris* sp. was the highest during spring. It thus appears that the parasite has a possible annual infection cycle. Glochidia, which represent the temporary obligatory larval parasitic stage of pelecypod molluscs, were found to encyst under the skin of *B. brevipinnis* during three of the four seasons of the investigation with the highest infestation occurring during summer. The highest intensity of infection for any one parasite was recorded for trematode cysts in the liver of the fish, with an infection intensity ranging from 1 in autumn to 50.5 in spring. Results showed that the heaviest of all parasitic infections occurred during summer (Table 4). In addition to the parasites shown in Table 4, a small number of fish were also found to be infected by the intestinal fish tapeworm, *Bothriocepalus acheilognathi*.

## Discussion

The prevailing physical and chemical conditions of the Marite River showed the water to be relatively clean and comparatively low in dissolved solids. The streams are well oxygenated but contain concentrations of nitrates which indicate some form of eutrophication to occur there. This may perhaps in part explain the presence of significant quantities of filamentous algae in the diet of *B. brevipinnis*.

The GSI values (Fig. 3) for males which reached a peak before those of the females, compare with findings by Cambray (1982) on *Barbus anoplus.* In the latter investigation GSI values for male *B. anoplus* reached a peak during September while the GSI values for females peaked a month later.

The eggs of *B. brevipinnis* ranged in diameter between 0.25 mm and 1.25 mm. Kleynhans (1984) found that the smallest and largest eggs of *Barbus treurensis* varied between 0.44 mm and 1.89 mm in diameter respectively, and those of *B. anoplus* ranged between 0.25 mm to 1.15 mm (Cambray, 1982). The maximum egg size of *B. brevipinnis* therefore differs noticeably from that of *B. treurensis* in size, but compares well with that of *B. anoplus*.

The maximum number of eggs found in a single *B. brevipinnis* amounted to 1 341, with those of *B. treurensis* being 2 040 (Kleynhans, 1984) and those of *B. anoplus* 3 000 eggs (Cambray, 1982). *B. brevipinnis* thus shows a significant lower fecundity than both *B. anoplus* and *B. treurensis*. The number of eggs of different size classes present in the ovaries (Fig. 2) as well as the gonadosomatic index for females of *B. brevipinnis* (Fig. 3) suggest that its breeding activities may continue throughout spring and summer.

The variety of food items present in the gut of *B. brevipinnis* (Tables 3) indicates that this species may largely be an opportunistic feeder. Food items of non-aquatic origin such as grass seeds and even ants, frequently occur in its diet. Cambray (1982) suggested that the diet of some of the smaller *Barbus* species may mainly consist of both aquatic and terrestrial insects. Polling et al. (1992a) found that *Barbus toppini* and *Barbus bifrenatus* collected from an impoundment in the Letaba River, South Africa, were both benthic feeding fish which prefer algae, detritus and benthic macro-invertebrates as food. Polling et al. (1992b) showed that *Barbus paludinosus* mainly feeds on zooplankton whilst *B. unitaeniatus* largely utilises aquatic benthic dwelling macro-invertebrate organisms in its diet. The feeding habits of

*B. brevipinnis* is therefore similar to that of the small *Barbus* species investigated by Cambray (1982). Feeding habits of *B. brevipinnis*, especially during summer, are comparable to those of *B. toppini* and *B. bifrenatus* which both prefer algae (Polling, 1993), but are also unique in that detritus was ingested by almost all the sampled fish.

*Barbus brevipinnis* is the second barb species in the rivers of South Africa shown to be infected by an acanthocephalan parasite of the genus *Acanthocentris*. *Acanthocentris phillippi* was first described by Mashego (1988) from the Lingwe River (Northern Province, South Africa) where it was found to infect *B. neefi*. Specimens of *Acanthocentris* found in *B. brevipinnis* could not be positively identified to species level as none of them were found with an extended proboscis. Cambray (1982) found that *B. anoplus* from the PK le Roux Dam (Orange River system, South Africa) was infected mainly by two types of parasites, namely parasitic nematodes and the cestode *Ligula* sp. This author also reported no seasonal tendencies in parasitic infections of this fish. During the present study a clear seasonal tendency in infections of some parasites occurred in the case of *B. brevipinnis*. This could probably be associated with the marked seasonal changes in the physical and chemical composition of the streams concerned, compared to the more stable water quality conditions in the PK le Roux Dam. Trematode cyst infections of the liver of *B. brevipinnis* noticeably reduced the size of this organ which may result in reduced liver functions of the fish and possibly also in the life expectancy of this species. The cestode *Bothriocephalus acheilognathi* found in the intestine of *B. brevipinnis* shows a preference for cyprinid fish (Brandt *et al*., 1981) and may well infect other *Barbus* species which occur in the Incomati River system. This parasite which utilises a cyclopoid or calanoid copepod as intermediate host for its larval developmental stages with cyprinid fish as its usual final host, may complete its life cycle within 14 to 21 d (Körting, 1975). The worm inhabits the anterior part of the intestinum of fish where it is embedded with its scolex in the gut wall (Scott and Grizzle, 1979). It may cause mechanical damage to the wall of the intestine with resultant haemorrage and necrosis of the affected tissues. Heavy infestation may cause the blockage of the gut with the occasional perforation of the gut wall (Hoffman, 1980).

Taking into consideration the environmental and other associated conditions under which *B. brevipinnis* occurs in the Marite river, this fish may well be regarded as vulnerable, especially in view of its very restricted distribution in this river system.

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