possibly because the fish were smaller than 200 mm total length.

Combining the available literature on the feeding of these two species (Talbot 1955; Blaber 1974; Lasiak 1982 and this study), it is clear that although there is some variability in the contribution of individual components, the overall prey assemblages of both species are similar. The life-history and hence diet has two distinct phases. Firstly juveniles which are estuarine-dependent feed predominantly on diatoms associated with plant material. However, Wallace & van der Elst (1975) found that *R. holubi* was able to survive hypersaline conditions in Lake St Lucia in the absence of macrophytes. This suggests that the animals were able to change their diet accordingly. Secondly, the adult phase is essentially marine although the fish are present in estuaries in relatively small numbers. In both environments they are shown to be carnivorous, feeding on a variety of epibenthic prey with little or no algae present in the diet.

Intraspecific competition for food is therefore reduced by resource partitioning between adults and juveniles. Interspecific competition is probably reduced by spacial separation, *R. holubi* being dominant along the east coast and *R. globiceps* along the west coast, with an area of overlap between Port Elizabeth and Mossel Bay.

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Observations on the occurrence of the fish louse *Argulus japonicus* Thiele, 1900 in the western Transvaal

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Parasitological surveys of the fish in Bloemhof Dam and Lake Barberspan were carried out during January 1983 (summer). Bloemhof Dam (27°40'S/26°0'E) is situated in the western Transvaal and is the second largest man-made dam in the Transvaal, 23 035 ha in area when full but it was only 30% full in January 1983. Lake Barberspan (26°35'S/25°35'E) is a natural lake with no outlet and is supplied by overflow water from the Harts River, a tributary of the Vaal River. It covers an area of 2 000 ha when full and was 80% full during the time of this survey. Both water bodies are situated in the Vaal River drainage system.

Fish collections were made by using gill-nets with mesh sizes ranging from 30 to 180 mm. The collected fish were examined for the presence of fish lice, *Argulus* (Crustacea: Branchiura) directly after removal from the nets. If infected, the position of attachment to the host fish was recorded, the parasites counted and each examined fish weighed and measured. The fish lice were subsequently removed from host fish and fixed in hot 10% buffered neutral formalin.

The argulid found in both survey localities was identified as *Argulus japonicus* Thiele, 1900 (Figure 1) by using the key of Meehean (1940). The fish examined and the extent of infection is summarized in Table 1. All the fish in the dam as well as the lake, with the exception of the solitary specimen of *Cyprinus carpio* collected in Lake Barberspan, were infected by this parasite. Infection prevalence (Table 1) of all examined fish species from both survey localities was more than 90%, the only exception being *Clarias gariepinus* in Lake Barberspan with an infection prevalence of 78%.

The prevalence, mean intensity of infection, relative parasite density as well as number of parasites per fish in Bloemhof Dam were higher than in the lake.

For the purpose of analysing the data of attachment sites of *A. japonicus* on the host fish of the two localities, the percentage of total number of parasites per body region of each fish species was calculated and presented in Figure 2. The following body regions are distinguished: head; lateral sides of body; ventral surface and the different fins. From the results obtained it appears that *A. japonicus* is not specific to any attachment site on the body or fins of the fish examined from both study localities. It seems, however, that the head region

Table 1 Infection statistics[a] of fish examined in Bloemhof Dam and Lake Barberspan during January 1983

Fish species	Number of fish examined	Prevalence[b] %	Mean intensity of infection[c]	Relative parasite density[d]	Highest number of parasites per infected fish recorded
Bloemhof Dam					
Barbus holubi Steindachner	6	100	20,8	20,8	39
Barbus kimberleyensis Gilchrist & Thompson	3	100	62,5	62,5	250+
Clarias gariepinus (Burchell)	5	100	6,6	6,6	17
Cyprinus carpio L.	12	100	32,4	32,4	180+
Labeo capensis (Smith)	30	100	10,8	10,8	69
Labeo umbratus (Smith)	3	100	18,7	18,7	33
Lake Barberspan					
Barbus holubi	30	93	9,8	9,2	50+
Clarias gariepinus	18	78	5,1	4,0	10
Cyprinus carpio	1	0	–	–	–
Labeo capensis	29	97	22,2	21,4	81+
Labeo umbratus	10	100	4,6	4,6	13
Tilapia sparrmanii (Smith)	2	100	1	1	1

[a]Infection statistics as defined by Margolis, Esch, Holmes, Kuris & Schad (1982).
[b]Prevalence: Number of hosts infected divided by number of hosts examined, expressed as a percentage.
[c]Mean intensity of infection: Mean number of parasites per infected host.
[d]Relative parasite density: Mean number of parasites per host examined.

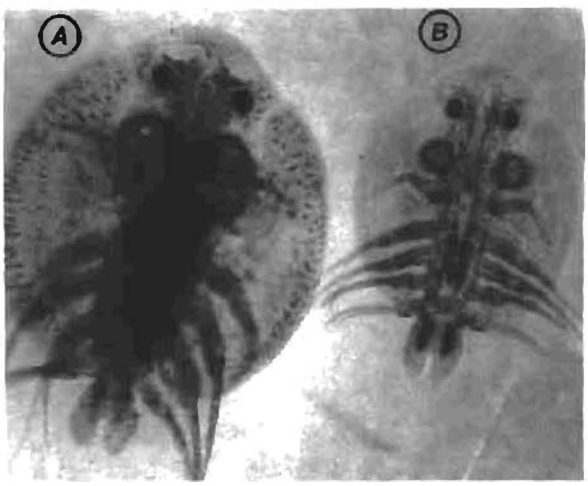

Figure 1 Micrograph of a female (A) and male (B) fish louse *Argulus japonicus* from Lake Barberspan.

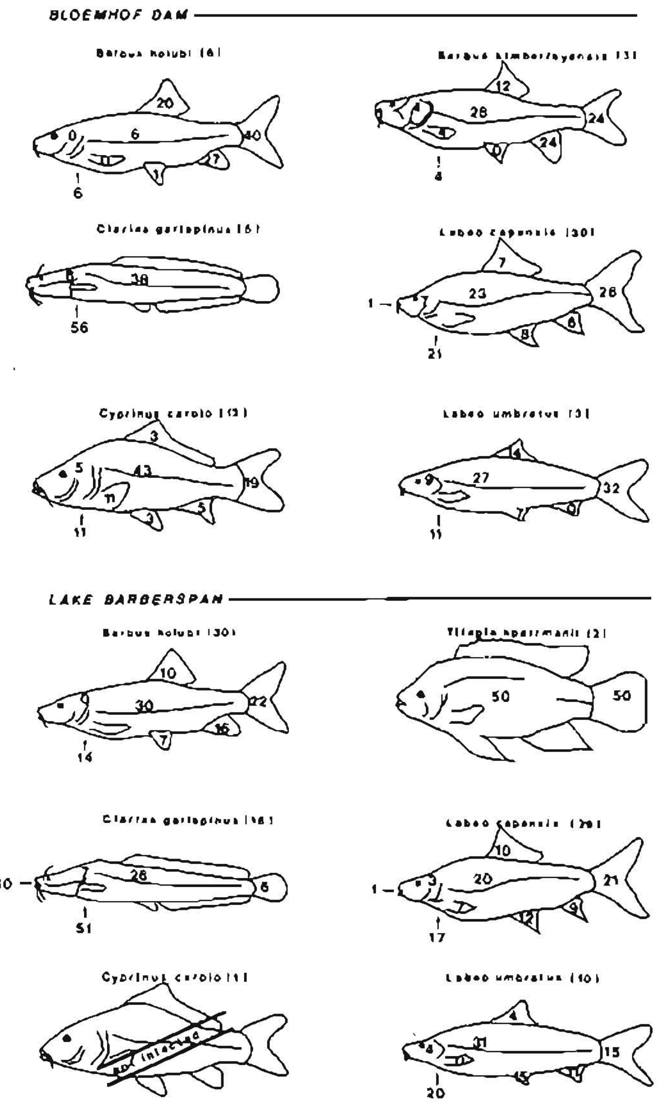

Figure 2 Percentage of total number of *Argulus japonicus* found on different body regions of the host fish in Bloemhof Dam and Lake Barberspan. Numbers of specimens examined are given in parenthesis. Percentages on ventral body surface and mouth cavity are indicated by an arrow.

of all fish carries a relatively low infection. A clear tendency towards preference of the ventral body surface of *Clarias gariepinus* was noted since in both localities more than 50% of the argulids were found here. The only fish species with argulids in their mouth cavity were *Labeo capensis* (both study localities) and *Clarias gariepinus* (Lake Barberspan).

Since the original description of *A. japonicus* this parasite has been reported from a variety of localities and host fish in various parts of the world. Infected fish include *Cyprinus carpio*, Israel (Reich 1949), *Cyprinus carpio* and *Carassius carassius*, Japan (Tokioka 1936; Gopalakrishnan 1968) and *Carassius auratus*, U.S.A. (Meehean 1940). More than 20 species of *Argulus*, including *A. japonicus*, from various fish species have thus been reported from Africa (Fryer 1968). Information on the occurrence of *Argulus* in southern Africa includes the work of Barnard (1955) who described a new species namely *A. capensis* Barnard, 1955 from the Cape kurper, *Sandelia capensis*.

According to Barnard (1955) representatives of the genus

Argulus, although common on freshwater fish in central Africa are very rare in southern Africa. The only other published records of *Argulus* in South Africa are those of du Plessis (1952) noting the presence of *Argulus* on wild *Labeo* sp. in an irrigation dam in Eastern Transvaal and Lombard (1968) on the presence of *Argulus* on *Clarias gariepinus* in the north eastern Transvaal.

No systematic parasitological survey has been carried out thus far on fish in Bloemhof Dam or Lake Barberspan. Schoonbee (1969) carrying out a study of the feeding habits of the fish in Lake Barberspan, handled large numbers of fish but did not record any infections by argulids at that time. The present infections of *A. japonicus* therefore appear to have originated since then.

In a checklist of crustacean parasites of fish in Africa, Fryer (1968) also refers to *A. japonicus* as an introduction to this continent. Owing to the lack of information on the occurrence of *A. japonicus* in southern Africa it seems highly unlikely that it is indigenous to the African sub-continent. The world-wide association of *A. japonicus* with exotic cyprinids such as carp and goldfish suggests that this crustacean parasite owes its ubiquitous distribution to introductions of ornamental goldfish and the common carp *C. carpio* which in the latter case was already introduced into southern Africa as early as 1859 (Maar 1960). Subsequently the Dinkelsbühl Aischgrund variety of the common carp was introduced into the Transvaal in 1952 (Lombard 1961).

The ornamental fish industry is now well established in South Africa with fish being imported from Europe, the Far East and the U.S.A. on a regular basis. The most important area for receiving imported goldfish is the Witwatersrand situated in the Vaal River drainage system. It is therefore possible that the present infections of *A. japonicus* could have originated along this line.

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