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THE HABITAT PREFERENCES OF FISHES FROM THE LIMPOPO RIVER SYSTEM, TRANSVAAL AND MOCAMBIQUE

by

I. G. GAIGHER*

Abstract – The species composition of fishes in the Limpopo River system is described. The frequency of occurrence for each habitat type is expressed as a percentage of the habitats sampled. A check list of species is presented and the species can be grouped into five habitat preferences.

Introduction

The rapid industrial and agricultural development of the Transvaal is not only causing an increase in river pollution, but also necessitates the extraction of large quantities of water from the rivers, erection of weirs and dams and the transfer of water (and possibly fish species) from one river system to another. Any one, or a combination of these factors, could easily lead to the extinction of rare fish species, or of species with a specialised habitat preference.

At the moment water shortage, especially in the lower sections, presents the greatest hazard to fish species in the east-flowing rivers of the Transvaal. The most vulnerable species are those that are dependent on rapids or well-oxygenated water for existence, but all species are affected in some way or another by competition for space and food, and by being more vulnerable to diseases and predators.

It therefore became necessary to determine the status of every fish species in the Transvaal, in order to implement conservation measures if necessary. With this objective in mind, the Department of Nature Conservation, Transvaal, undertook distribution surveys in all the east-flowing rivers of the Transvaal during 1967 and 1968 (Gaigher and Pott, 1972). This paper describes the results of the determination of habitat preferences for fishes collected from the Limpopo River system during these surveys.

Material and Methods

Fish were sampled at 220 different collecting sites distributed over the whole drainage area of the Limpopo River system. At each collecting site notes were made of the river type (annual or perennial), size, bottom

* *Department of Zoology, University of Fort Hare, Alice.*

type, occurrence of aquatic plants, clearness and any other factors which could have an influence on the presence of fish at that particular site. The species of fish collected were recorded separately for each habitat type.

The determination of habitat preference was based merely on the presence or absence of species in each habitat type without considering density. Due to the selectivity of collecting gear used, it was found impractical to use abundance as an indication of habitat preference. Johnson (1967), in the determination of habitat preferences of Malaysian freshwater fishes, came to the same conclusion, and he further found that species which have the highest frequency of occurrence for a certain habitat type, also tend to be the most abundant in that specific habitat type.

The frequency of occurrence for each habitat type, or habitat preference, is expressed as a percentage of the given habitats sampled. For example, if habitat type A is sampled twelve times, and species Z is found in six of these, then the habitat preference of species Z is 50 per cent for habitat A.

The frequency of occurrence of each fish species at five different altitudes, namely 0–305 m, 306–610 m, 611–915 m, 916–1220 m and over 1220 m was determined for each of the following habitat types:

rapid (perennial stream);
pool in perennial stream;
pool in annual stream.

All the streams sampled above an altitude of 1220 m were perennial.

A more extensive classification of habitat types, including factors such as the occurrence of aquatic vegetation, bottom types, etc., was originally used. However, with the exception of a few species, these factors were found to have no marked influence on the distribution during the survey period, which was conducted during the drier months of the year.

In evaluating the results the following limitations of this method must be kept in mind:

1. The survey was done during the dry months. During the flood period fishes obviously occupy habitats that are not frequented or are not available during the dry season, in search of food, breeding sites, or in response to the natural urge to move and occupy newly available waters.
2. A few species prefer specialised habitats which do not fit into this classification. These species are discussed separately in the text.
3. Waterfalls or other barriers may isolate fish species in certain sections of the river system, thus changing its frequency of occurrence for certain altitudes where it might be able to survive. Pollution will have the same influence on the results.

Results and Discussion

A check list of fishes collected from the Limpopo River System

FAMILY LEPIDOSIRENIDAE

Protopterus annectens brieni Poll, 1961.

FAMILY ANGUILLIDAE

Anguilla marmorata Quoy & Gaimard, 1824.
A. nebulosa labiata Peters, 1852.
A. mossambica Peters, 1852.
A. bicolor bicolor McClelland, 1845.

FAMILY MORMYRIDAE

Petrocephalus catostoma (Günther), 1866.
Gnathonemus macrolepidotus (Peters), 1852.

FAMILY CHARACIDAE

Hydrocynus vittatus Castelnau, 1861.
Alestes imberi Peters, 1852.
Micralestes acutidens (Peters), 1852.

FAMILY CYPRINIDAE

Barbus polylepis Boulenger, 1907.
B. mattozi Guimaraes, 1884.
B. paludinosus Peters, 1852.
B. eutaenia Boulenger, 1904.
B. unitaeniatus Günther, 1866.
B. neefi Greenwood, 1962.
B. viviparus, M. Weber, 1897.
B. toppini Boulenger, 1916.
Labeo rubropunctatus Gilchrist & Thompson, 1913.
L. rosae Steindachner, 1894.
L. molybdinus du Plessis, 1963.
L. cylindricus Peters, 1852.
L. ruddi Boulenger, 1907.
B. marequensis A. Smith, 1841.
B. trimaculatus Peters, 1852.
B. afrohamiltoni Crass, 1960.
B. anoplus M. Weber, 1897.
B. lineomaculatus Boulenger, 1903.
B. treurensis Groenewald, 1958.
B. annectens Gilchrist & Thompson, 1917.
Beirabarbus radiatus (Peters), 1853.
Barilius zambezensis (Peters), 1852.
Engraulicypris brevianalis (Boulenger), 1908.

FAMILY SCHILBEIDAE

Eutropius depressirostris (Peters), 1852.

FAMILY AMPHILIIDAE

Amphilius platychir Günther, 1864.

FAMILY CLARIIDAE

Clarias gariepinus (Burchell), 1822. *C. ngamensis* Castelnau, 1861.

FAMILY MOCHOKIDAE

Synodontis zambezensis Peters, 1852. *C. swierstrai* v. d. Horst, 1931.
Chiloglanis paratus Crass, 1960. *C. pretoriae* v. d. Horst, 1931.

FAMILY CYPRINODONTIDAE

Aplocheilichthys johnstonii (Günther), 1893. *A. katangae* (Boulenger), 1912.

FAMILY CICHLIDAE

Tilapia mossambica Peters, 1852. *T. sparrmanii* A. Smith, 1840.
T. melanopleura Dumeril, 1859. *Chetia flaviventris* Trewavas, 1961.
Haplochromis brevis (Jubb), 1968.
Serranochromis meridianus Jubb, 1967.
Hemihaplochromis philander M. Weber, 1897.

FAMILY GOBIIDAE

Platygobius aeneofuscus (Peters), 1852.
Glossogobius giuris (Hamilton-Buchanan), 1822.

Habitat Preference

Based on habitat preference and distribution, the fishes of the Limpopo River system can be divided into five ecological groups, namely:

A. Species with a wide distribution (high- and lowveld) and a wide habitat preference;
B. Species with a wide habitat preference, but which are confined to the warmer middle- and lowveld streams;
C. Pool-loving species confined to the warmer middle- and lowveld streams;
D. Species confined to well-oxygenated middle- and highveld streams;
E. Species with a restricted distribution and/or habitat preference.

Group A: (Fig. 1)

Unspecialised species with a wide distribution. *B. marequensis* is included in this group because it is so widespread and abundant. It differs from the other species, in being dependent on rapids for breeding purposes, and is therefore found mainly in perennial streams. It is absent from the lower section of the Limpopo River in Mocambique which is devoid of rapids. Although widespread, *T. sparrmanii* is specialised to a certain extent in that it prefers habitats with abundant rooted aquatic vegetation.

Group A includes the following species:

Barbus marequensis
B. trimaculatus
B. paludinosus
Clarias gariepinus
Tilapia sparrmanii
Hemihaplochromis philander

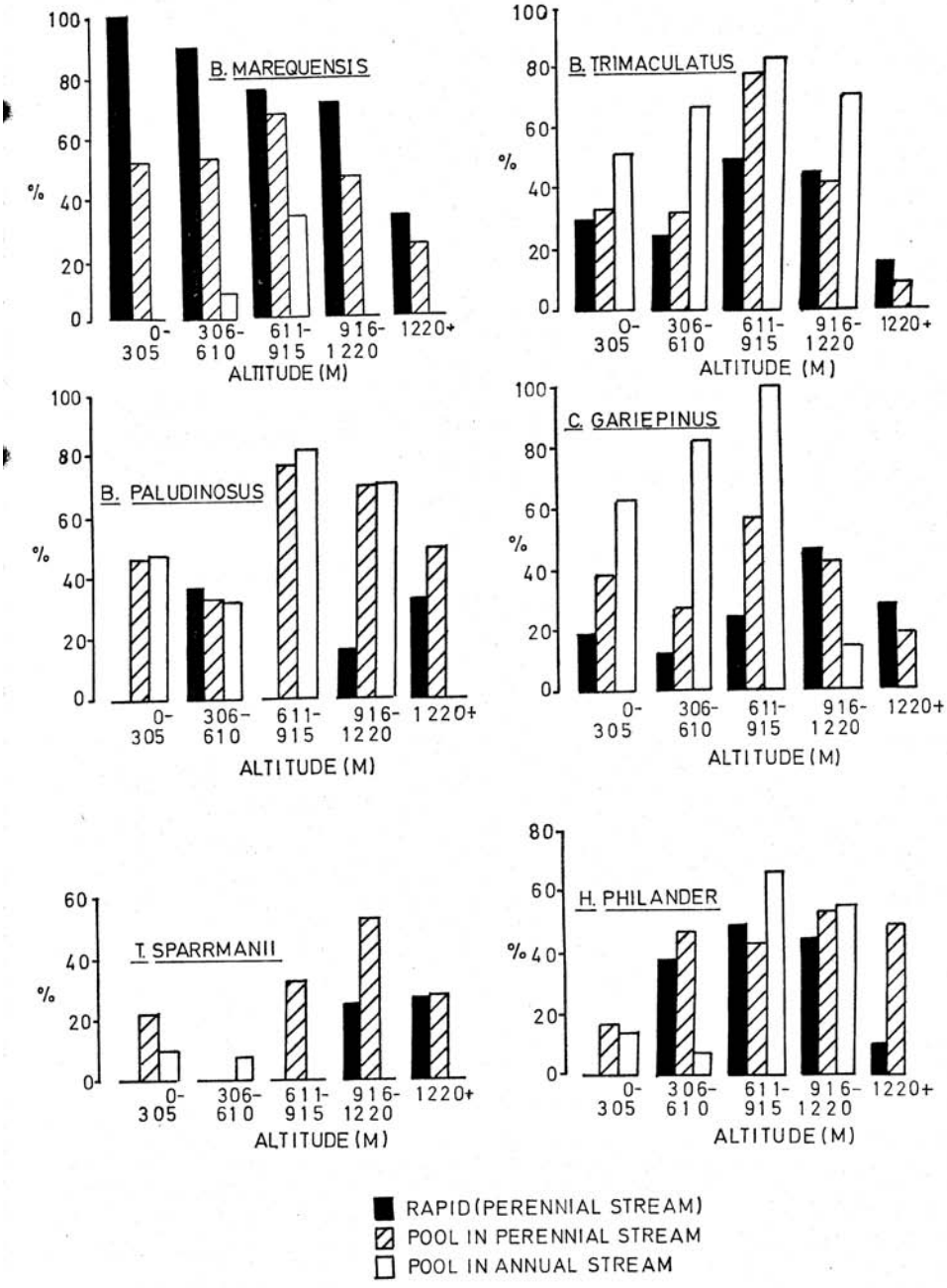


Fig. 1. The percentage frequencies of occurrence at different altitudes of group A fishes in the Limpopo River system, 1968.

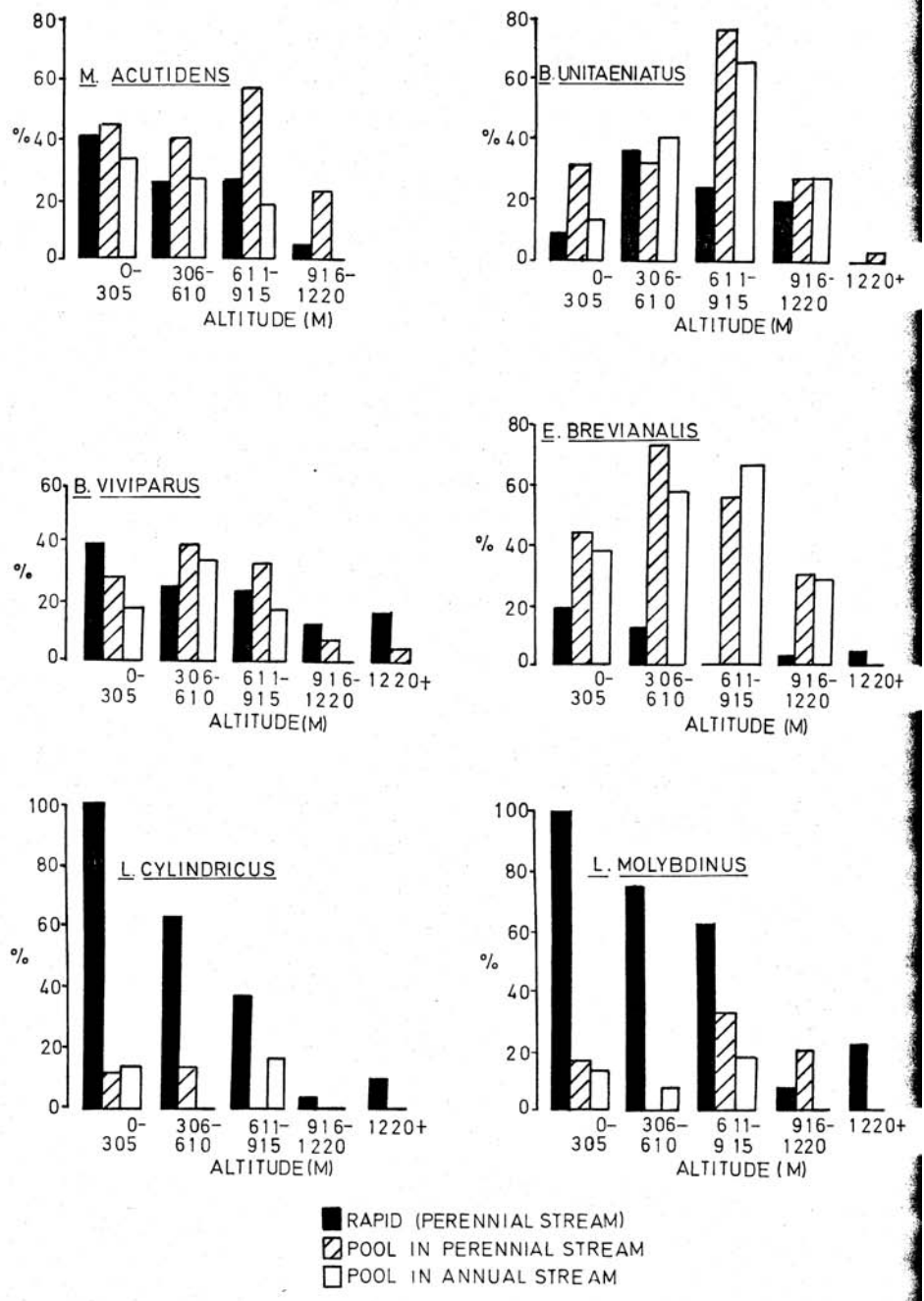


Fig. 2. The percentage frequencies of occurrence at different altitudes of group B fishes in the Limpopo River system, 1968.

Group B: (Fig. 2)

These species are unspecialised and also abundant, but differ from the previous group in being absent from the coldest highveld streams (this difference is not so apparent from the figures, but is clearly shown in the distribution maps).

Labeo cylindricus and *L. molybdinus* were collected mainly from rapids, but both are abundant in pans and river sections in the lowlands of Mocambique, and are therefore not dependent on rapids for existence. The results show that they prefer rapids, most probably for feeding purposes, if these are available.

Group B includes the following species:

Micralestes acutidens
Barbus unitaeniatus
B. viviparus
Engraulicypris brevianalis
Labeo cylindricus
L. molybdinus

Group C: (Fig. 3)

Pool-loving species confined to the warmer middle- and lowveld streams. They are not dependent on rapids for feeding or breeding purposes and all do well in irrigation dams. Although not strictly freshwater fishes, *Glossogobius giuris* and *Platygobius aeneofuscus* can be added to this list as far as distribution and habitat preference in the Limpopo River system is concerned.

Group C includes the following species:

Petrocephalus catostoma
Gnathonemus macrolepidotus
Alestes imberi
Barbus mattozi
B. afrohamiltoni
B. annectens
B. toppini
Beirabarbus radiatus
Labeo rubropunctatus
L. rosae
L. ruddi
Eutropius depressirostris
Synodontis zambezensis
Tilapia mossambica
T. melanopleura

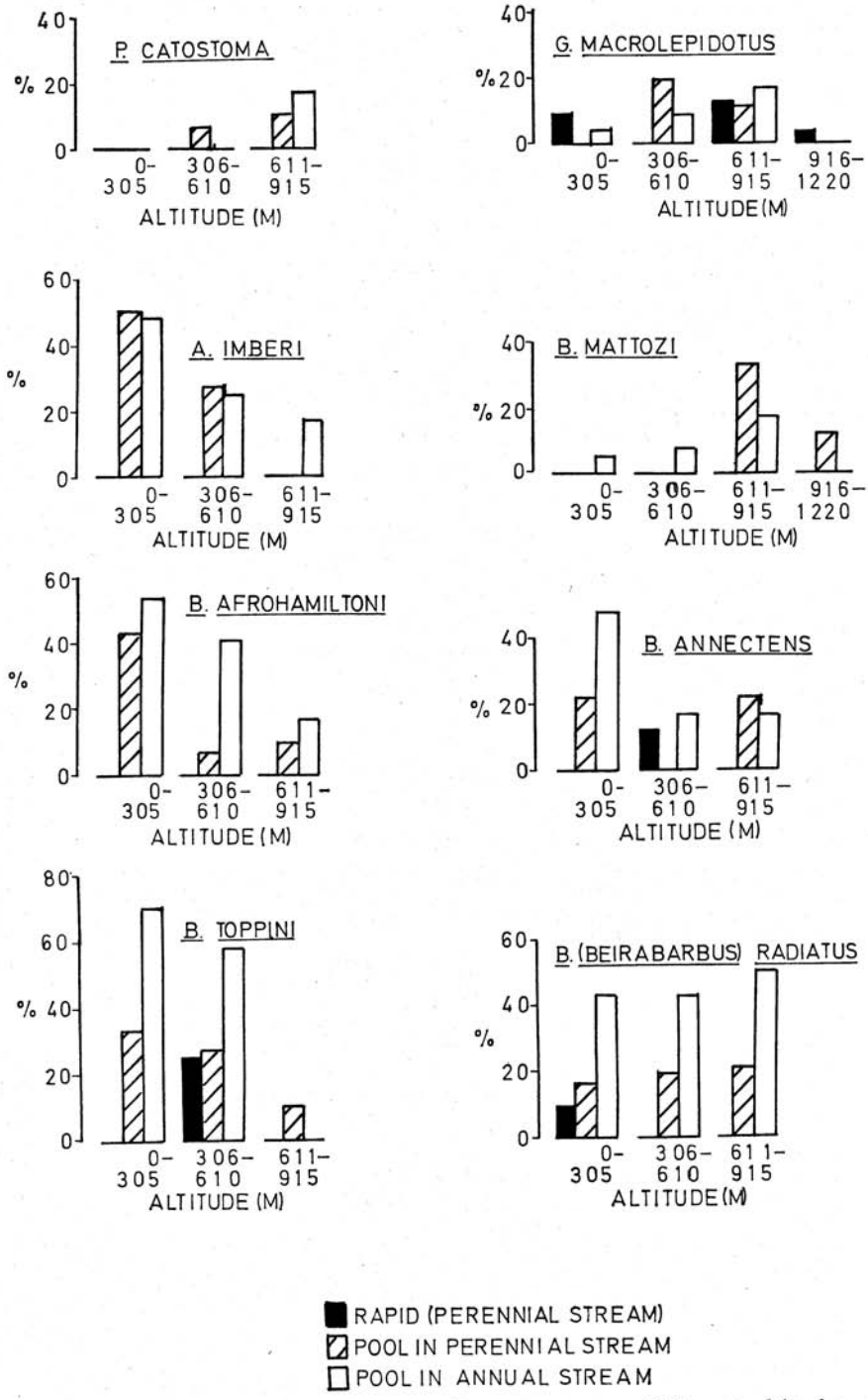
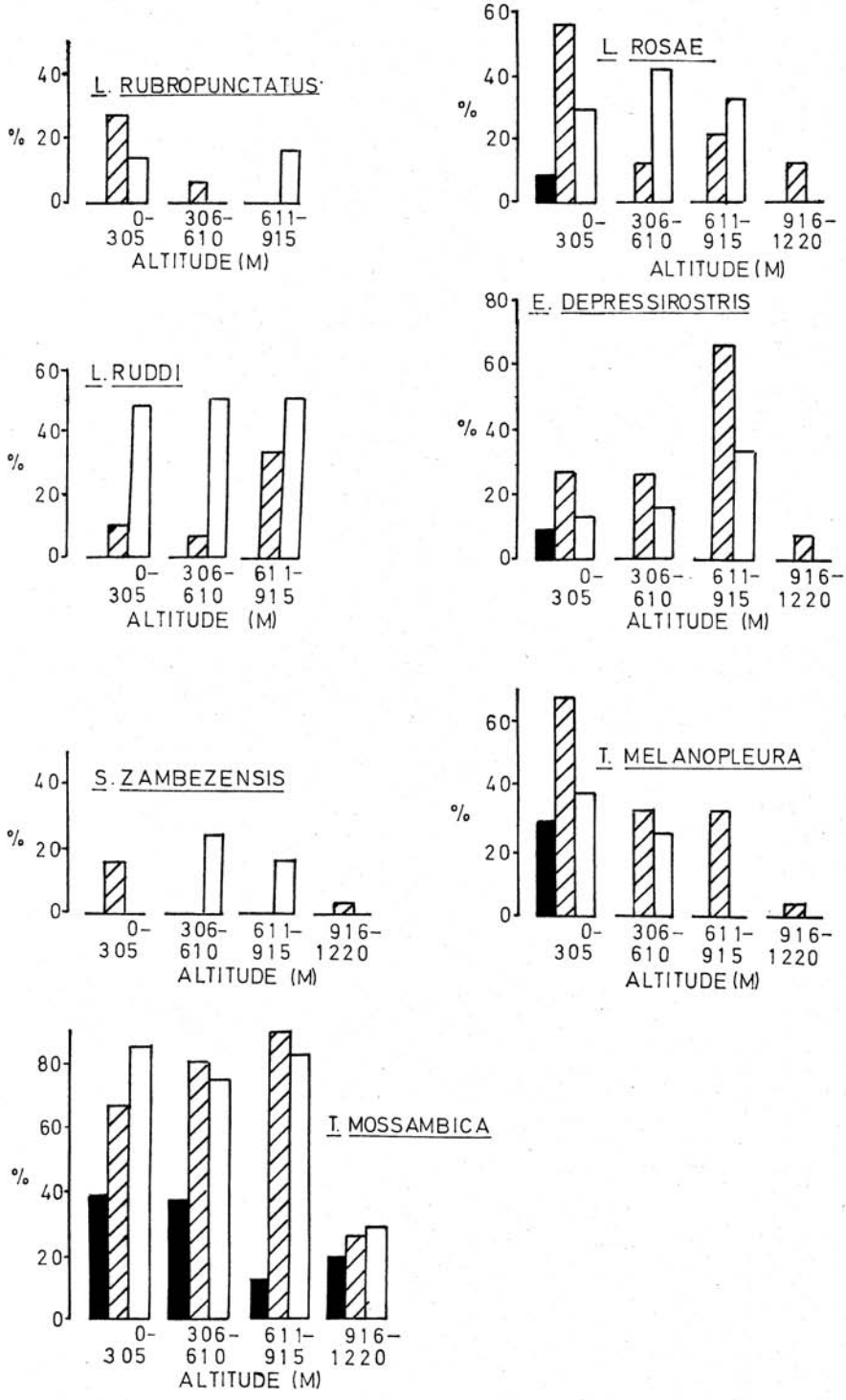


Fig. 3. The percentage frequencies of occurrence at different altitudes of group C fishes in the Limpopo River system, 1968.


L. RUBROPUNCTATUS
L. ROSAE
L. RUDDI
E. DEPRESSIROSTRIS
S. ZAMBEZENSIS
T. MELANOPLEURA
T. MOSSAMBICA
%
ALTITUDE (M)
0-305
306-610
611-915
916-1220
RAPID (PERENNIAL STREAM)
POOL IN PERENNIAL STREAM
POOL IN ANNUAL STREAM

Group D: (Fig. 4)

These species are confined to perennial middle- and highveld streams. They are less abundant than the previous groups, but are not so specialised that they are in any danger of disappearing from the system. Only *Chetia flaviventris* is endemic to the Limpopo River system. Although this species does not have a wide distribution in the system, it is well adapted to conditions in irrigation dams. In certain dams, for example, the Hartebeestpoort Dam near Pretoria and Buffelspoort Dam near Rustenburg, it has become so abundant that it is a nuisance to anglers, and the numbers must be controlled from time to time.

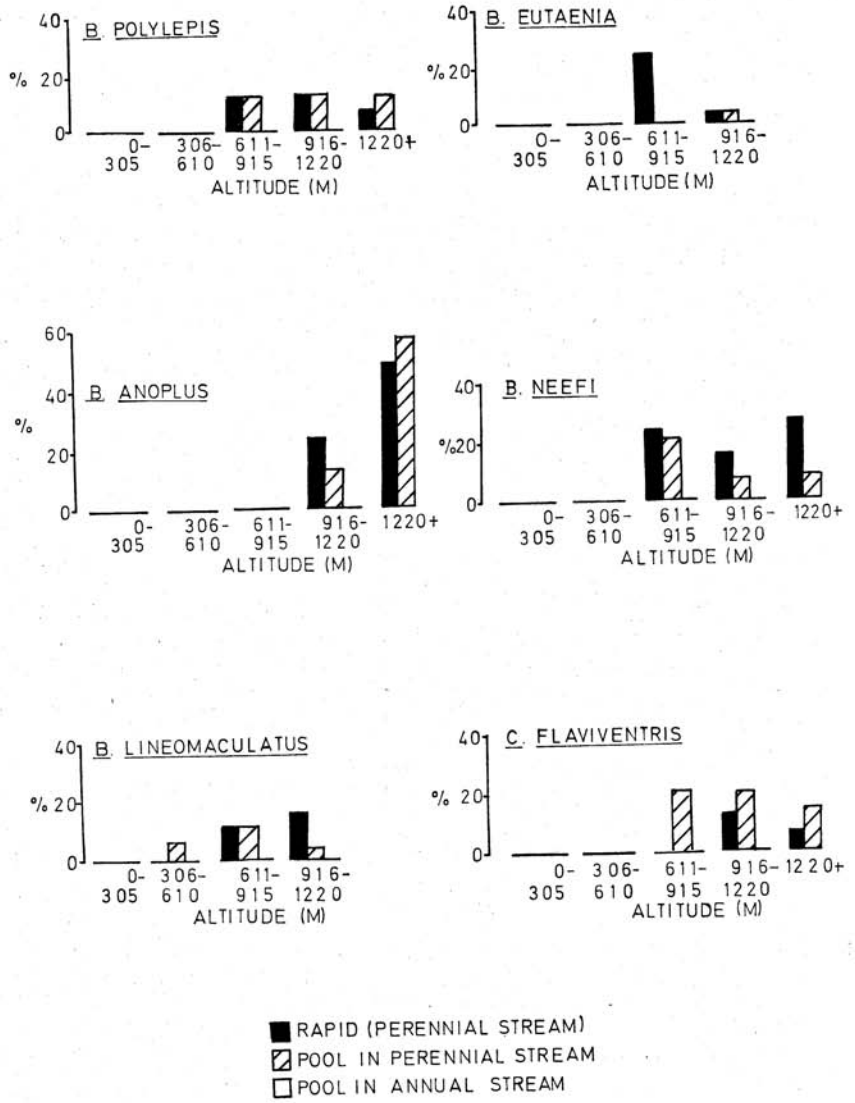


Fig. 4. The percentage frequencies of occurrence at different altitudes of group D fishes in the Limpopo River system, 1968.

Group D includes the following species:

Barbus polylepis
B. eutaenia
B. anoplus
B. neefi
B. lineomaculatus
Chetia flaviventris

Group E: (Figs. 5 and 6)

The following fish species have a restricted distribution and/or specialised habitat preference and will therefore be easily affected by water shortage or other habitat changes.

1. *Protopterus annectens brieni*

This interesting species is confined to floodplains and pans that dry up wholly or partially during the dry months. It is abundant along the lower part of the Limpopo River in Mocambique. The future erection of irrigation dams in the upper reaches that are large enough to prevent inundation of flood plains and pans during the summer months, could possibly lead to the disappearance of the lungfish in this area.

2. *Hydrocynus vittatus*

Tiger fish are abundant in Mocambique, but in the Transvaal they are virtually confined to the Kruger National Park, where they are not available to anglers. Water shortage and the erection of weirs are probably the main reasons for the disappearance of this fine angling fish from higher stretches of the system where it previously occurred.

3. *Barbus treurensis*

This minnow is endemic to the upper reaches of the Blyde River, Eastern Transvaal. For a long time it was only known from one tributary, the Treur River. The introduction of trout and bass to the Treur River has probably caused its disappearance and no specimens could be found during this survey despite an intensive search. Subsequently another population has been found by the Provincial Fisheries Institute, Lydenburg in a tributary upstream of the Treur River where attempts are being made to provide a sanctuary for this rare species (Jubb, 1972).

4. *Barilius zambezensis*

This colourful little fish is confined to clear, fast-flowing perennial middle- and lowveld streams. It was never found in standing water. Several middle- and lowveld stretches of previously perennial streams have become annual during the past few years. If this trend increases, it could possibly lead to the disappearance of *B. zambezensis* from the Limpopo River system.

5. *Amphilius platychir*, *Chiloglanis paratus* and *C. pretoriae*

Although these species have a wide distribution in the Limpopo River system, they have a highly specialised habitat preference in being virtually confined to rapids. They might therefore disappear from sections of the river system where flow ceases, even only for a short period.

6. *Chiloglanis swierstrai*

This species is confined to fast-flowing sections of middle- and lowveld streams with a sandy or pebbly bottom. This type of habitat is rare in the Limpopo River system, especially during the dry months when the water tends to flow through the sand substratum instead of over it.

During this survey *C. swierstrai* was only found in the Steelpoort and Olifants Rivers. During surveys done before 1965 by the Provincial

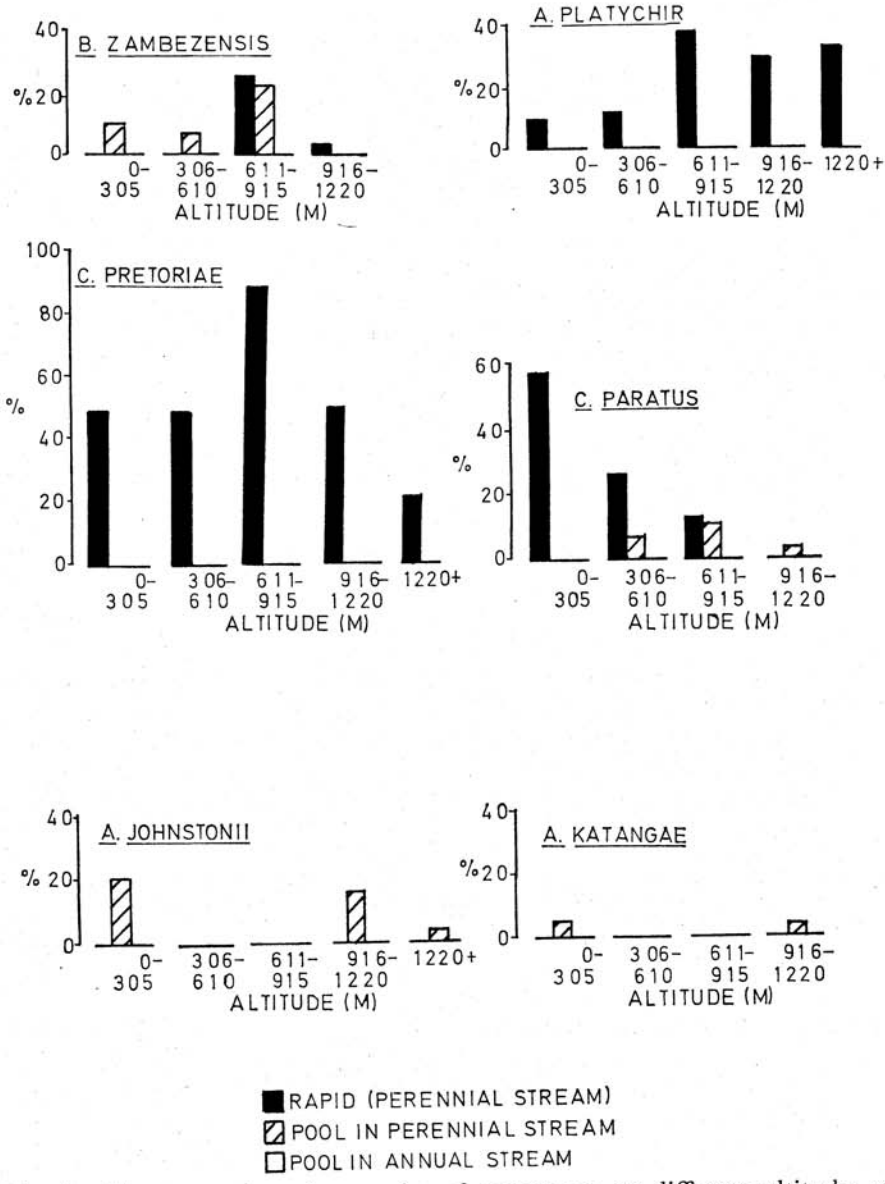


Fig. 5. The percentage frequencies of occurrence at different altitudes of group E fishes in the Limpopo River system, 1968.

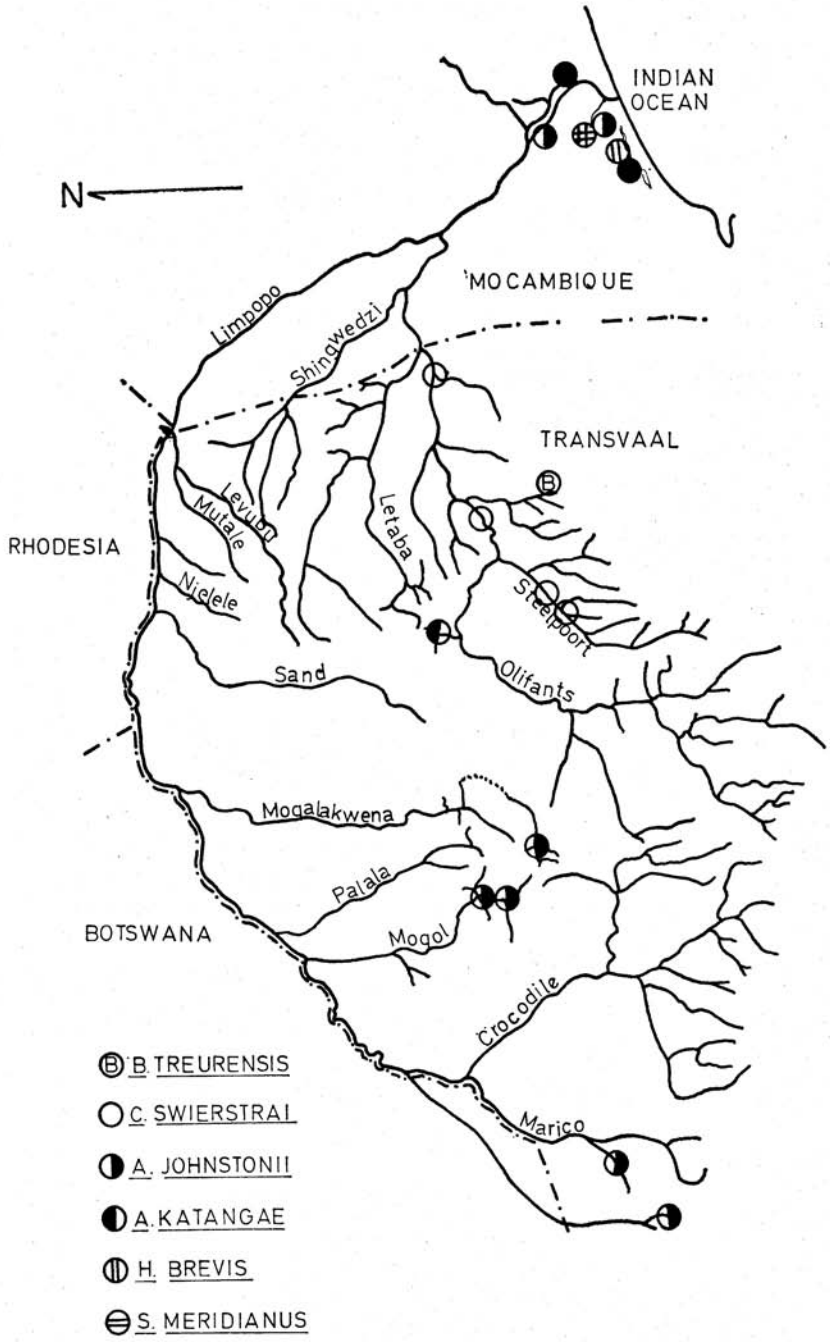


Fig. 6. The recorded distributions of *Barbus treurensis*, *Chiloglanis swierstrai*, *Aplocheilichthys spp.*, *Haplochromis brevis* and *Serranochromis meridianus* in the Limpopo River system, 1968.

Fisheries Institute, it was also found in the Letaba and Limpopo Rivers, and Pienaar (1968) collected it from four different sites in the Letaba River.

7. *Clarias ngamensis* has a limited distribution in the lower parts of the system in Mocambique, where it is abundant. The reasons for its absence from the higher reaches are unknown.

7. *Clarias ngamensis* and *C. gariepinus* have a limited distribution in the lower parts of the system in Mocambique, where they are abundant. The reasons for its absence from the higher reaches are unknown.

8. *Aplocheilichthys* spp.

These two species are eurotherm, but are confined to clear pools and slow-flowing sections of perennial streams with abundant aquatic vegetation. *A. katangae* was only found in the Matlapatzi River, a small tributary of the Olifants River (Fig. 6). This is its only known locality in the Transvaal. *A. johnstonii* is abundant in the lower parts of the system, especially in the floodplains and pans in Mocambique. In the Transvaal it has a scattered distribution in the upper reaches of the Mogalakwena, Mogol and Marico Rivers.

9. *Haplochromis brevis* and *Serranochromis meridianus*

These cichlids are endemic to the Incomati and Limpopo River systems. During this survey they were only found in coastal pans adjacent to the Limpopo River (Fig. 6).

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