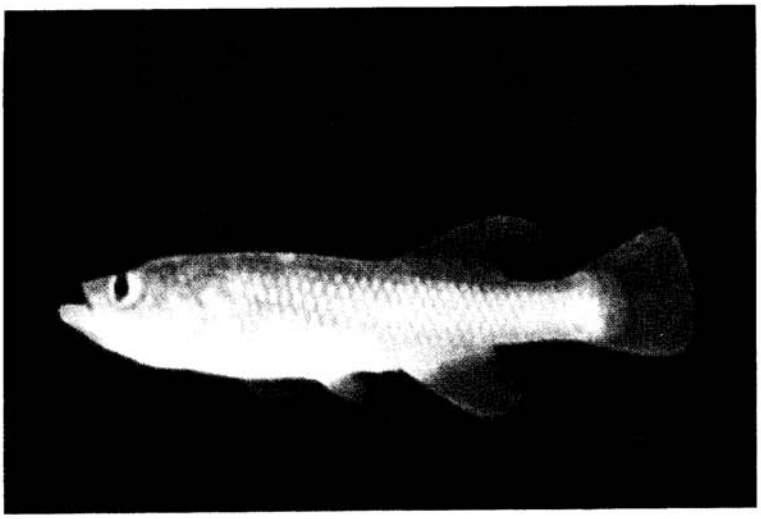


Notobranchius orthonotus (female)

season. Top minnows have been found in both running and still water, but particularly in places where marginal and aquatic vegetation provide sufficient cover for these relatively slow-moving fishes. They are particularly partial to low-lying pans or swampy pools.

An isolated colony of *Notobranchius orthonotus* was discovered in 1960 by the author in a temporary pool in the headwaters of the Mtomene river in the Lebombo mountain range, close to the border between Transvaal and Mocambique. (Latitude 24° 17′, Longitude 31° 57′ east). The fishes were originally found during the rainy season, on 24th February, and were fully-grown adults.

This is the only record of *N. orthonotus* within the borders of the Kruger Park, and of the Transvaal, but they are also known from pans in northern Zululand, and in the lowlands of southern Mozambique they are quite plentiful.

The pools on the eastern boundary of the Park hold water only for a few months during the rainy season and dry up completely. Occasionally they are not filled at all, and they are nowhere deeper than about 3 feet. The depressions usually fill with the first heavy summer rains in November or December. Subsequent visits during February have proved that by that time, the newly hatched fishes have already attained adult proportions — which provides an indication of their remarkably rapid growth.

The pH of the water here is 6.7, thus considerably more acid than the waters in rivers and pools elsewhere in the Park. A water analysis provided the following results: Solids in parts per million — 145 (i.e. 38 parts Sodium, 7 parts Calcium, 6 parts Magnesium, substances causing permanent hardness (as $CaCO_3$) 0.12, substances causing temporary hardness 2.3, chlorides 59, sulphates 2, bicarbonates 4 and fluorides 0.25).

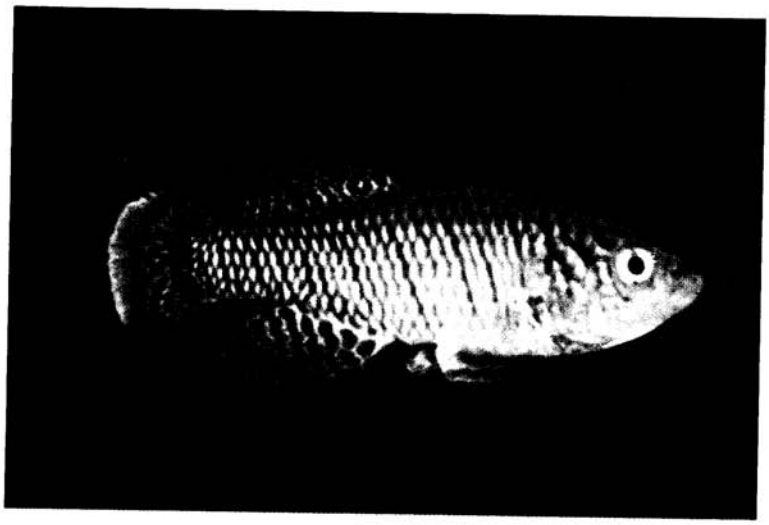
The pools have a muddy substratum of deep black clay, which is derived from rhyolite.

It is considered likely that the pools here were originally colonized by the chance seeding of these waters by means of eggs, encased in mud, and adhering to the legs of wading water birds which have settled here, after frequenting some *Notobranchius* habitat further eastwards in Mozambique.

During the summer seasons of 1963-64 and 1966-67, severe floods inundated the area in which our *Notobranchius* habitat is situated. As a result of the massive run-off of flood waters, considerable erosion of the top soil was evident in this area. The small river itself ran very strongly, and the flood waters eventually reached the larger tributaries of the Nwanetzi river, draining the Lebombo flats in this area. Other fish species, such as barbel *(Clarias gariepinus)* and several small *Barbus* spp. i.e. *B. trimaculatus, B. toppini* and *B. (Beirabarbus) radiatus,* migrated up these tributaries and eventually invaded the *Notobranchius* habitat. Some fear for the survival of this isolated colony was experienced, particularly as no top minnows were found here at all during the critical period. It would appear, however, that these fishes have an ingenious survival mechanism which ensures that the population is not eliminated by natural catastrophes such as those mentioned above. Not all eggs deposited during the particular dry season hatch during the forthcoming rainy season, and some remain dormant in the mud for another year or more, and only hatch when conditions are favourable. It would also appear that eggs do not hatch if the pH and salinity of the water are not within limits which would ensure that the water in the pond does not dry up before the life cycle of the fish is completed. In situations where the pool is not filled to a safe level, or when only the top layers of mud are moistened, the eggs will not hatch. If the temperature of the water is too high, the eggs will not hatch either. That this is probably true, was borne out by the fact that *Notobranchius* was again found in numbers in the Mtomene pools during the summer season of 1964-65.

The diet of these extraordinary fishes consists primarily of mosquito larvae, together with small crustaceans and other tiny aquatic organisms. They are such voracious mosquito larvivores that they have been artificially introduced in swamp lands to aid mosquito control in countries far removed from their natural habitat. Results achieved in this respect look very promising.

Distribution: In the Kruger Park *Notobranchius orthonotus* is only known from a single series of pools in the headwaters of the Mtomene river in Nwanetzi section. (Fig. xxxvi).

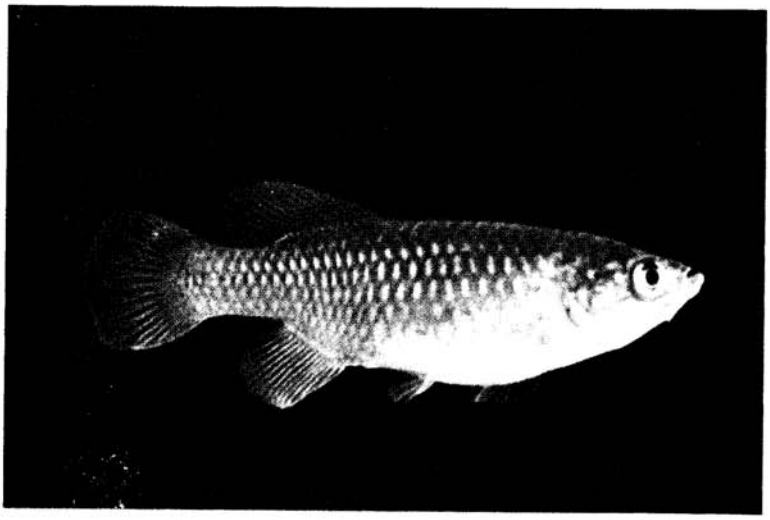


38. *Notobranchius rachovii* Ahl, 1926.
Rachow's top minnow or Seasonal fish.
Rachowse eenjaarvis.

Recently, during the preparation of this manuscript, another *Notobranchius* species was discovered in the Kruger Park very near the original *N. orthonotus* habitat, along the eastern boundary north of Nwanetzi. Several males and females were captured in a series of small pans in the sandveld around Pumbe picket, some 6 miles north of Mtomene, and on the boundary with Mocambique.

These gorgeously-coloured fishes were subsequently identified as *N. rachovii*. This is the southern-most point of distribution of the species and the first record of its occurrence within the Republic of South Africa.

N. rachovii is a smaller species than *orthonotus* and adults rarely exceed $2\frac{1}{4}$ inches in length. The male fishes are particularly brilliantly coloured and display a bluish-green iridescence over the dorsal surface and a shimmering greenish-gold lateral surface. The iris is golden and the throat and chest suffused with crimson. There is usually a series of irregular slanting crimson bars over the lateral surface and the pectoral fins are tipped with white. In breeding males the body becomes very dark blue, almost black. The caudal fin of mature males has a very distinctive subterminal, broad, bright red crescent bordered distally by a marginal deep blue band. The dorsal and anal fins also have blue marginal zones and are spotted with irregular dark blue or indigo blotches.



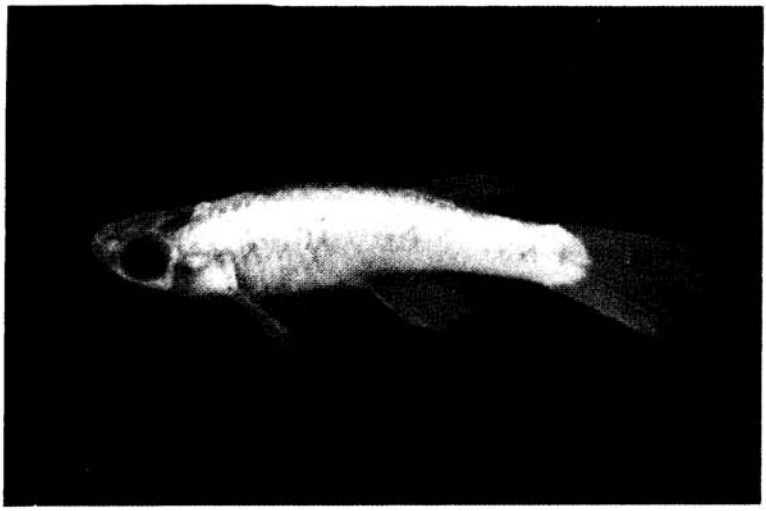
Notobranchius rachovii (female).

Adult females are drab in contrast and a more uniform olive or yellowish-brown with a slight greenish iridescence.

The habitats of *rachovii* in the Park are all rather shallow, natural pans with a sandy or pebbly substratum and almost choked with aquatic vegetation, particularly *Cyperus* spp., the water-loving grass *Echinochloa holubii, Nymphaea* spp. and other aquatic plants.

The fishes appear to take refuge amongst the stems of water grasses etc. and forage for food in the small patches of open water around the edges of the pan. It is probably here in the shallows that spawning activity also takes place and breeding seems to be later than in the case of *orthonotus* i.e. during March and April. *N. rachovii* feeds like *orthonotus,* mainly on tiny aquatic animals such as ostracods and other micro-crustaceans, as well as small insect larvae, particularly those of mosquitoes.

Distribution: The only habitats in the Kruger Park and in the Republic of *N. rachovii* are a series of shallow pans in the sandveld around Pumbe picket, on the boundary with Mocambique. (Fig. xxxvii).



39. *Aplocheilichthys johnstonii* (Gunther), 1893.

Synonym: *A. chobensis* Fowler, 1935.

Johnston's mosquito fish. Johnstonse lampogie.

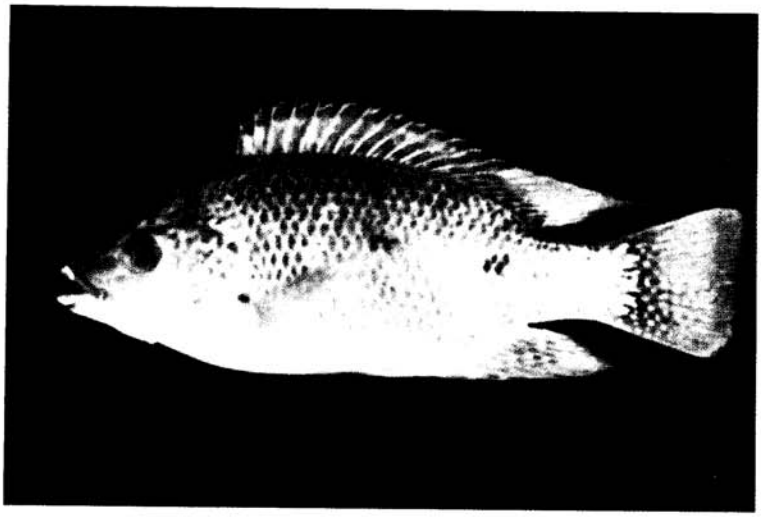
A small species of Cyprinodont which ranges from $1\frac{3}{4}$ - $2\frac{1}{4}$ inches in length. Live fish are iridescent olive-green with lemon coloured fins and belly. A great deal of the general colouration actually depends on the light and angle of illumination. The dorsal and caudal fins are narrowly edged with black.

The common name of these fishes derives from the fact that they live in the upper four inches of any water, deep or shallow, and are great predators on mosquito larvae. Few mosquitoes manage to hatch from water which holds a population of *Aplocheilichthys,* and they should be more widely stocked in town water supplies, swamp land or wherever control of mosquitos is desired. It is an adaptable and hardy species and makes a good aquarium fish. Where they inhabit running water of rivers or streams, they are always associated with grass-fringed eddies out of the main current or quieter shallows below rapids.

Although the adult fish feed mainly on mosquito and midge larvae, they also take a certain amount of unicellular green algae, red algae and diatoms.

Sexual maturity is reached at a length of about $1\frac{1}{2}$ inches and the eggs mature in small batches.

Distribution: In the Kruger Park *Aplocheilichthys johnstonii* has only been recorded from a single locality i.e. Bobomene-drift in the Levubu at Pafuri. (Fig. xxxviii).



40. *Tilapia mossambica* Peters, 1852.
Synonyms: *T. natalensis* Weber, 1897.
T. vorax Pfeffer, 1893.
T. arnoldi Gilchrist & Thompson, 1917.
Largemouth or Red-fin Tilapia. Blue bream.
Bloukurper. Grootbekkurper. Mossambiekkurper.

As with other *Tilapia* species, colouration varies with age, sex and environment. Young individuals of less than 3 inches long display distinct vertical bars and a dark spot on the dorsal fin. These markings, as well as the fin spot disappear in older fish, but dark spots remain on the flanks. As a rule, there are only three spots on each side, but rows of dark dots are sometimes visible, often coalescing to form three irregular longitudinal stripes. In mature males, the colour becomes dark slate-blue to almost black above with no lateral spots visible, and belly white. The throat is also dark, but the lower lip paler, and the jaw and lower part of the operculum are almost white. The body colour of mature females is generally a dirty yellowish-olive, and the lateral dark markings often persist.

The dorsal, anal and caudal fins of mature males are edged with crimson. Immature fish taken from turbid water, are almost a uniform silvery grey in colour.

Old males may attain a weight of 6 - 7 lbs.

Tilapia mossambica is a remarkably adaptable species and can live in both fresh and saline water. Specimens transferred directly from fresh to sea water die, but, if the transition is gradual, they survive and adapt themselves to the change in salinity.

These fish favour warm waters and mature rapidly at high temperatures. The water of the sulphurous warm spring Matishibila, in the northern section

of the Park, reaches a temperature of 39.5°C and is colonized by a thriving population of largemouth tilapia. Cold waters, on the other hand, inhibit their activity and the lower limit for survival is about 7.8°C.

Still water, in quiet open pools, is the habitat of choice of *T. mossambica*, but they are also found in the more placid sections and larger hippo pools of our perennial rivers. Young fish often collect in large shoals at the point of inflow into a pool.

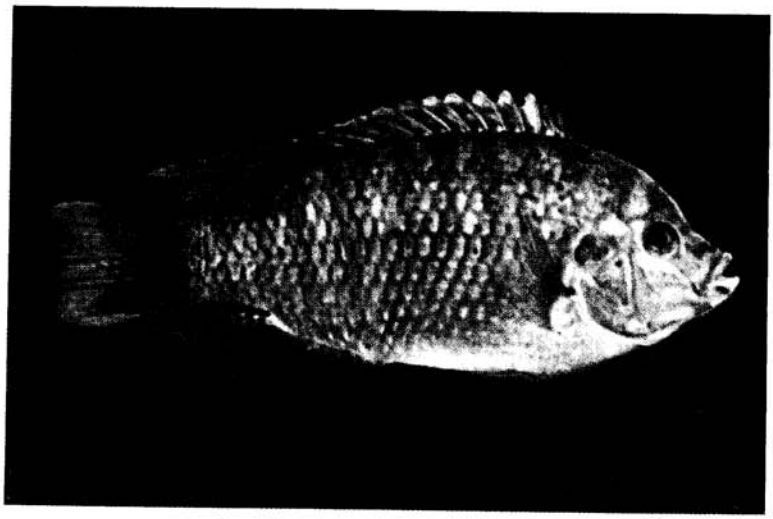
These fishes feed primarily on plant material. Young *mossambica* take many small crustaceans, such as *Daphnia*, but the bulk of their stomach contents consists of algae, particularly unicellular diatoms. Larger fish feed mainly on the filamentous green algae which develop in sluggish currents, or on the shiny algae which cover the bottom of ponds as well as submerged vegetation such as water lily stalks, etc. In addition, adult *mossombica* also ingest aquatic insects, crustaceans, earthworms and even small fish, as well as bottom sludge rich in organic material. Large adults may exhibit cannibalistic tendencies on occasion.

Largemouth tilapia breed at a very early age — often when the fish are barely 6 months old. In populations where a normal growth rate is maintained, a length of at least 6 inches is attained before eggs and milt ripen. Males usually exceed females of the same age in length and weight.

Gravid females deposit their eggs in shallow depressions (such as enlarged game or hippo tracks), a foot or more in diameter, which the males excavate in the sandy bed of the pool, and which are guarded and patrolled by them against the intrusion of other males. After fertilizing the eggs, deposited by the female, in such a hollow, the parental duties of the male is terminated as the female carries off the fertilized eggs in her mouth. Water is circulated over the eggs by chewing movements of the jaws and in 3-5 days the eggs hatch out. The tiny fry soon become free swimming, but for another 7 days or so the shoal of newly hatched fish is closely attended by the mother, who gathers them up in her mouth at the least sign of danger.

T. mossambica is a very fecund species and several spawnings a year are not unusual for this fish. Tiger-fish and barbel are the most important natural predators, keeping *Tilapia* populations in check, but crocodiles, otters and predatory birds also take their toll.

Distribution: A common species, widely distributed in all the perennial rivers and most seasonal rivers throughout the Park. (Fig. xxxix).



41. *Tilapia sparrmanii* A. Smith, 1840.
Synonyms: *T. deschauenseei* Fowler 1913.
T. guinasana Trewavas, 1936.
Green-chested Tilapia. Banded bream.
Vleikurper. Gebande-kurper.

The colour of *T. sparrmanii* is variable from silvery-grey to dark olive-green, with up to nine vertical bars of dark grey or green. The lower lip is white. During the breeding season, which extends from November to March, there is a distinctive transformation in the body markings of both sexes. Breeding adults develop nine black vertical bars along the flanks, two horizontal bars across the snout, and a circular stripe through the eyes and over the forehead. In males, the dorsal and caudal fins are edged with red and there are iridescent blue-green spots on the dorsal and anal fins. The 'Tilapia spot', usually present on the dorsal fin of juveniles only, is retained in this species throughout life.

This species was named for the Swedish scientist Anders Sparrman, who sailed round the world with Captain Cook, and it makes a beautiful and interesting aquarium subject.

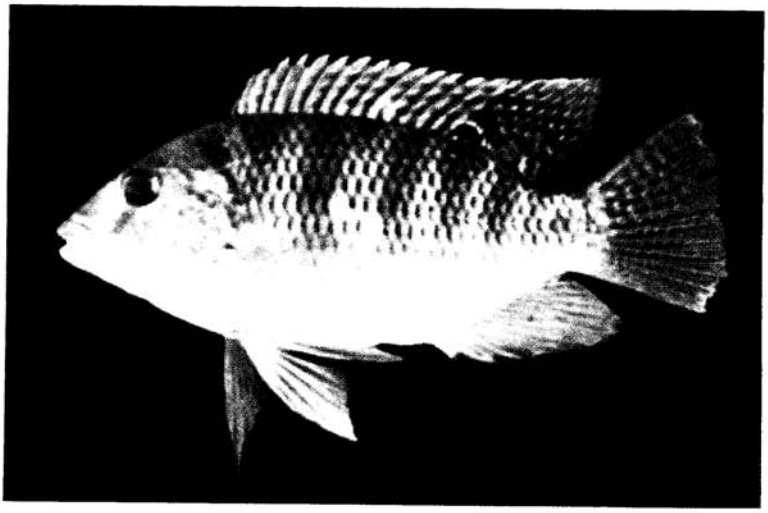
T. sparrmanii is the smallest of the *Tilapia* species inhabiting the Park waters and adults seldom attain 6 inches in length. It is much more tolerant of cold than the other two endemic species of *Tilapia,* and is rarely found in the Lowveld at levels below 2,000 ft. elevation. Green-chested tilapias are decidedly rare in Park waters and their curious and widely separated points of distribution are difficult to explain. Although they are well adapted to life in rivers and streams, this species has never yet been found in any of the perennial rivers traversing the Park. The three isolated habitats, where their presence has been established beyond doubt, are all permanent pools in seasonal rivers. The general condition of the habitat in all cases is swampy, with an abundance of floating and submerged aquatic vegetation.

The diet of *sparrmanii* is mainly vegetarian, and although young specimens may also take some small crustaceans, such as *Daphnia,* and midge larvae, the bulk of food taken by adults consists of diatoms, filamentous algae, partly decomposed plant debris and portions of soft-leaved aquatic vegetation.

Du Plessis and Groenewald (1953) provide an excellent account of the breeding activity of this fish:

"The breeding habits are very similar to those of *T. melanopleura.* The oblong olive-green eggs are laid on a stone, the stem of a reed or a clean spot on the hard bottom. The male and female both guard the eggs. One of them lies over the eggs, fanning them with its breast fins, while its mate is on guard some distance away. Roughly every minute they change positions. When hatched, the young are kept in small holes in the bottom until they commence swimming. Every alevin has four mucus glands on the head. These secrete a sticky, colourless mucus by means of which the small fish is anchored to the bottom or sides of the hole. In order to ensure circulation of water in the hole, every alevin's tail is constantly vibrating. Every day the parent takes them in its mouth one by one, and transfers them to a new hole: there are usually three holes for each. When the alevins commence swimming, they are called fry; they move in a compact shoal guarded by both parents. Predatory fish sometimes dart right into such a shoal in order to scatter them so that they can be caught more easily. When one brood of young ones becomes independent, the parents rest for only a short while before making another nest".

Distribution: *T. sparrmanii* has been recorded with certainty in the Park only from the Shipandane pools in the Tsende, Nkukulutane waterhole in the Nwaswitsontso and in the permanent waterholes of the Munweni river on the eastern boundary. (Fig. xL).



42. *Tilapia melanopleura swierstrae* Gilchrist & Thompson, 1917.
Synonyms: *T. druryi, T. mackeani, T. sykesii* and *T. kirkhamii* all Gilchrist & Thompson, 1917.
Red-breasted Tilapia. Smallmouth bream.
Rooiborskurper. Stompneuskurper.

In outward appearance the young of *Tilapia melanopleura swierstrae* are very similar to *T. sparrmanii,* but display a smaller number of (5-6) dark, vertical bars on the lateral surface than the latter (8-9), as well as a characteristic pink flush on the throat. The 'Tilapia spot' on the dorsal fin is prominent in both species, but in the case of *melanopleura* it disappears in adult fish. The bright red infusion of the throat and breast is very prominent in breeding males. The colour of the caudal fin is also distinctive, being dark greyish in the upper half and yellowish-pink in the lower half.

T. melanopleura swierstrae is a fine sporting fish and grows to a weight of about 4 lbs. Although it is primarily a vegetarian, it may be caught on a wide variety of baits such as earthworm, crickets, fish flesh and even small bass plugs.

In the Kruger Park red-breasted tilapias inhabit the perennial rivers in preference to pools in the seasonal rivers and dams. In this respect it differs from *T. mossambica,* although even in the larger rivers they are more commonly found in the weedy, quiet backwashes and gullies and large placid pools.

It is a less adaptable species than the other two tilapias, being less resistant to high salinity than *mossambica,* and more sensitive to cold water than *sparrmanii.*

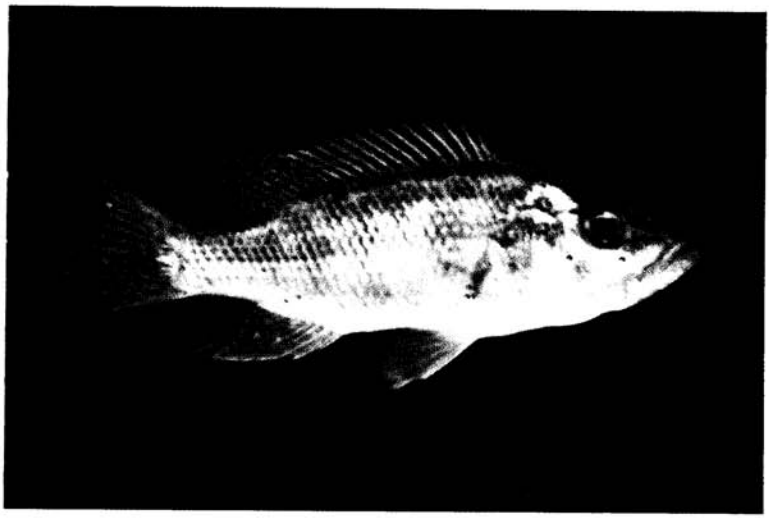
Plankton is the main source of food for small specimens, but adult *melanopleura* feed primarily on the leaves, stalks, etc. of soft aquatic plants.

Where such food is scarce, however, these fish will consume even tough, fibrous plants such as bullrushes or such items as water lily leaves. They are, therefore, a useful species for controlling excessive aquatic vegetation in ponds or dams. If food supplies are inadequate, red-breasted tilapias may become predacious and even cannibalistic.

Sexual maturity is attained at an age of about 4-5 months and thereafter, breeding occurs with intervals of about 6 weeks throughout every warm season. Breeding activity is arrested if the temperature of the water drops below about 21°C.

This species is not a mouth breeder, but as in the case of *sparrmanii*, both parents take part in the care of eggs and young. The eggs, which are about one-tenth of an inch in diameter. They are deposited in a saucer-shaped depression excavated in the sandy bottom by the male, and usually hatch about 3 - 6 days later, depending on the temperature of the water. The nest is situated in shallow water on gently sloping banks and, in addition to the main depression, a number of small pits or hollows are excavated. The newly hatched young are transferred to these pits by the parents, and they are guarded here until the fry become free swimming and disperse.

Distribution: Widespread in all the perennial rivers and many of the seasonal rivers throughout the Park. (Fig. xLi).



43. *Serranochromis meridianus* Jubb, 1967.
Confused with *Serranochromis thumbergi* (Castelnau) and *Chetia flaviventris*, Trewavas, 1961.
Yellow-bellied or Concertina-mouth bream.
Laeveldse Kanariekurper.

This brightly-coloured Cichlid is generally olive-yellow on the sides and belly with dark olive-brown dorsal surface. In some specimens, particularly young individuals, there is a dark lateral band. The anal fin is spotted with bright red. Darker brick-red markings occur in the dorsal and caudal fins, the former being edged with bright yellow. Breeding males have an overall yellow appearance and display brighter colours.

The yellow-bellied bream of the upper Limpopo and Incomati-systems have for many years been confused with the brown-spotted bream of the upper Zambezi River, *Serranochromis thumbergi* (Castelnau). They are smaller fish than the latter and generally do not attain a length of more than 12 inches and 2 lbs. 10 oz. in weight.

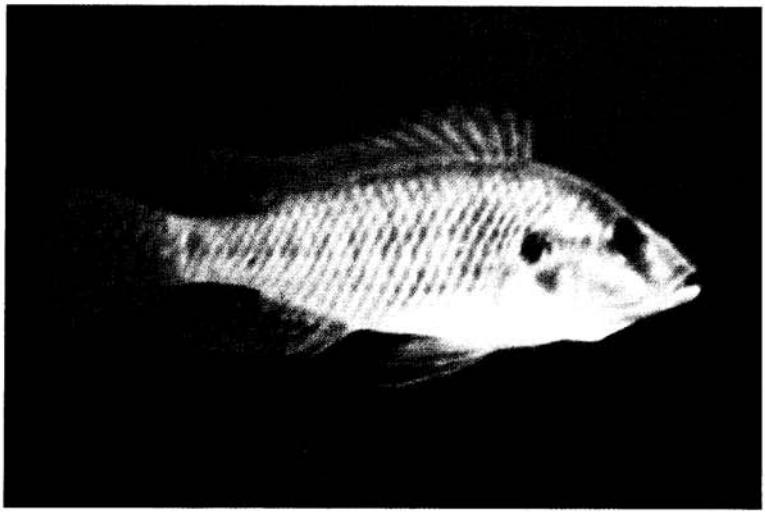
It has recently been found, however, that fish from the Incomati system exhibit features which differ markedly from typical *Chetia flaviventris* from the Crocodile River of the upper Limpopo system. These features identify them more closely with members of the *Serranochromis* genus, and the species has recently been described by Mr. Jubb as *S. meridianus*.

In the Kruger Park, *Serranochromis meridianus* inhabits the quieter backwashes and gullies of the Sabi- and Sand Rivers, but it is inexplicably absent from the Crocodile River. Another new, and closely related species, *Chetia brevis* Jubb has been found by Gaigher in the Lower Komati and Lomati rivers.

S. *meridianus* is a predator, and feeds on small fish, insects and freshwater snails. Because of its mollusc preference, it may be a useful species in campaigns against bilharzia-carrying snails.

Like *T. mossambica* it is a mouth breeder, but little else is known of its breeding activities.

Distribution: Has been recorded along the whole length of the Sabi River within the Park, as well as in the Sand River and pools in the seasonal tributaries, Nwatimhiri and Mlondozi. (Fig. xLii).



44. *Hemihaplochromis philander* (M. Weber), 1897.

Synonym: *H. moffati* (non Castelnau, 1861) Boulenger, 1907.

Rainbow bream. Dwarf bream.

Reënboogkurper. Dwergkurper.

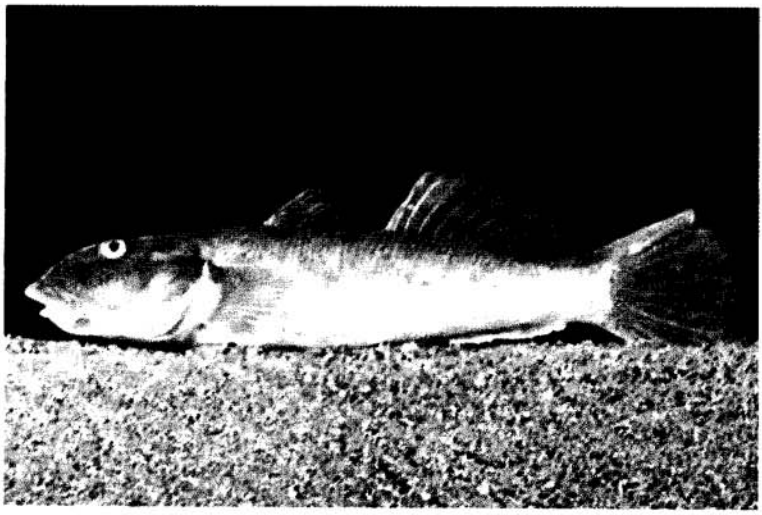
This beautiful and most widespread of all Cichlid species in the Transvaal, is a small fish which rarely exceeds 3 inches in length. In colour they are generally yellowish-olive with darker dorsal surface and a series of dark markings along the lateral line, and a black spot on the operculum, in line with the eye. The lateral body scales have a bluish-green iridescence. Breeding males become very colourful — apart from the brilliant bluish iridescence, some of the lower body scales show a central red spot. There is also a bright blue line along the lower jaw. The fins are golden. The dorsal and anal fins are edged with bright red and there is a series of rounded sky-blue spots on the caudal, dorsal and anal fins. The pectoral fins are streaked with red. Unlike that of any other Cichlid in our area, the caudal fin is distintcly rounded.

Although it is widespread, it is not a particularly common fish in the Park. It inhabits both running and still waters, particularly where the water is not too deep or muddy, and where cover is provided in the form of marginal vegetation. It is more commonly netted along the shallower, sandy stretches of our rivers.

The comparatively short gut of the rainbow bream indicates that it is not primarily a vegetarian. The diet is omnivorous, with a mainly insectivorous component, but adult specimens also feed on shrimps and other small crustaceans, as well as the fry of associated fishes.

Hemihaplochromis is a female mouth-breeder, and several broods of young are raised during the summer season. It will breed in captivity and makes a very attractive, but pugnacious aquarium species, as it is inclined to worry other fish in the same tank.

Distribution: *Hemihaplochromis* is common in the Sabi and Sand Rivers and has also been recorded in the Mutale, Shingwedzi, Mbyashishi and Tsende Rivers. Rainbow bream are know to inhabit the upper reaches of the Komati, Lomati and Crocodile Rivers, but to date it has not been found in the lower Crocodile River, where it forms the southern boundary of the Park. (Fig. xLiii).



45. *Platygobius aeneofuscus* (Peters), 1852.
Variegated Goby. Langsnoet-sandvis. Bont-sandvis.

The gobies belong to a group of marine fishes, some of which are also adapted to live in fresh water. Many are found in estuaries, but only two species, both of which are dealt with here, have invaded our inland waters. They are relatively small, sluggish, bottom-dwelling fishes and of no significance in the angling sense.

In some inland waters they are quite abundant and may provide a source of food for predacious species. The mouth of most gobies is large, the body elongate without a lateral line, there is a pair of dorsal fins, one behind the other, and the ventral fins are united to form a sucker-like disc.

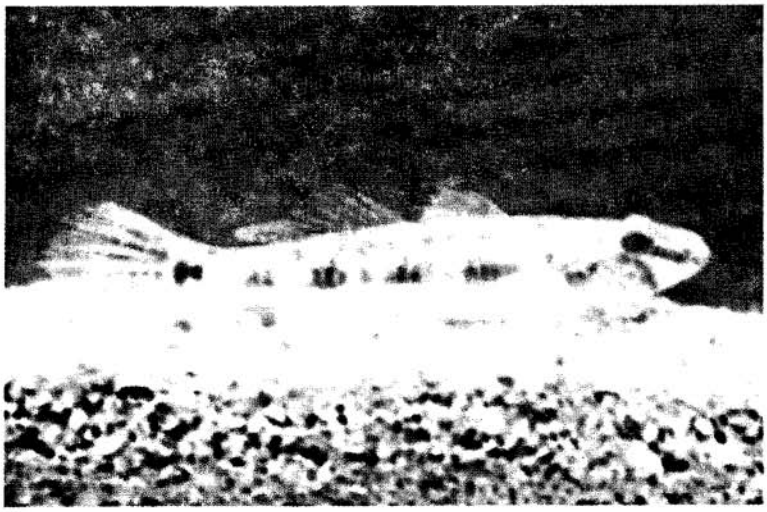
In *Platygobius* the colouration is yellowish-brown to greenish above and translucent, with darker mottling. Undersides are paler and the iris is white. The fins are sometimes tinged with green or reddish. Maximum size about 9 - 10 inches. (Plate 49).

9 - 10 inches.

Variegated gobies have been recorded in running water, as well as isolated pools. They are usually associated with sandy sub-stratums into which they often burrow, by means of the pectoral fines, so that only the head and eyes emerge. It is a predacious species which feeds on any small aquatic organism that it can capture, and is sometimes caught on earth-worm bait set by anglers for bream and yellow-fish.

The presence of very small specimens in our inland waters appear to indicate that this fish breeds in fresh water as well as in the coastal estuaries, which form their main habitat.

Distribution: It is not a common species in Park waters and has been recorded in the Levubu at Pafuri, the waterhole at Mashikiri poort, the lower reaches of the Letaba River, and a permanent waterhole in the Mbyamiti River, 3 miles from its confluence with the Crocodile River. (Fig. xLiv).



46. *Glossogobius giuris* (Hamilton-Buchanan), 1822.
Previously recorded as *Gobius giuris* (Barnard, 1943).
Flatheaded goby. Platkop-sandvis.

In contrast to the previous species, the lower jaw of this goby is longer and projects beyond the upper jaw. Colouration is cryptic and variable, but is generally a translucent greyish-yellow, with the head covered in fine black spots. Dark brown spots and blotches extend along the upper part of the body and on to the caudal fin. Flatheaded gobies grow to a size of about 20 inches, but these large specimens are not common.

This highly adaptable species is equally at home in salt, brackish or fresh water, but it is a poor swimmer and is not found in the torrential parts of rivers. Although they have been netted from placidly-flowing streams, particularly where there is a sandy bottom, the usual habitat is sandy-bottomed pools and backwashes of even seasonal rivers, or flood pans. In suitable environments large populations of *Glossogobius* are not uncommon and it seems certain that this species also breeds in inland waters during the summer season.

Young flatheaded gobies feed primarily on aquatic insects, such as midge larvae, and other small creatures, but the large adults are quite capable of preying on small fish, tadpoles, etc. When captured on hook and line, the gill covers are lifted and the body inflated — a pose which is quite startling to the unwitting angler.

Distribution: Far more common in Park waters than *Platygobius* and has been recorded in all the perennial rivers and most of the seasonal rivers throughout the area. (Fig. xLv).

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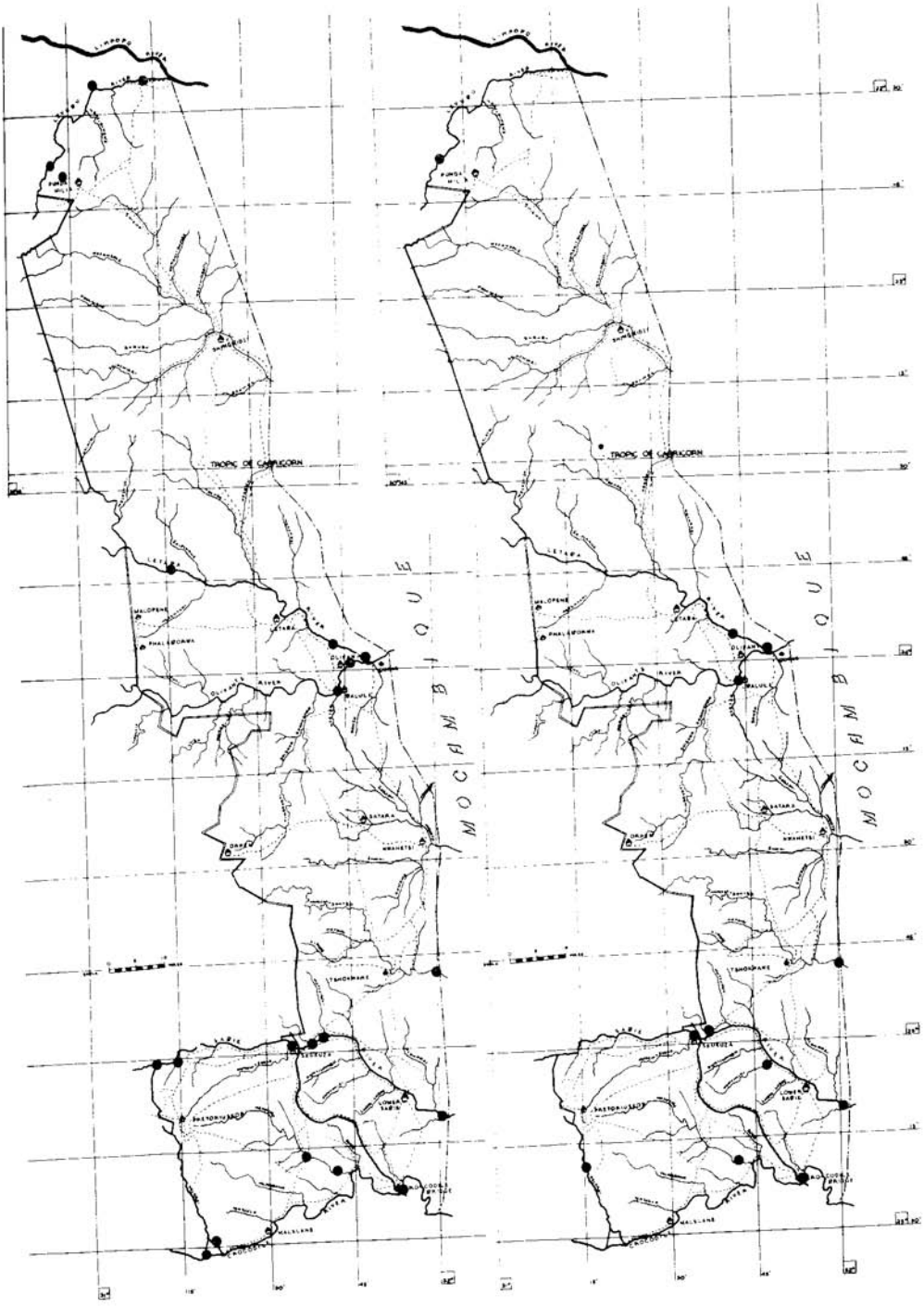

Fig. (i) *Gnathonemus macrolepidotus* (Peters)

Fig. (ii) *Petrocephalus catostoma* (Günther)