# A new *Barbus* minnow (Pisces, Cyprinidae) from the eastern Cape Province, South Africa

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A new cyprinid minnow taken from a tributary of the Kei River system, eastern Cape Province, *Barbus amatolicus* sp. nov., is described. The Amatola barb is most similar to the widespread and sympatric chubbyhead barb (*Barbus anoplus*) and the redtail barb (*Barbus gurneyi*) but differs most clearly in male secondary sexual characteristics (breeding colours and nuptial tubercles).

'n Nuwe ghieliemientjie van die Cyprinidae, uit 'n sytak van die Keiriviersisteem in die oostelike Kaapprovinsie, *Barbus amatolicus* sp. nov., word hier beskryf. Die Amatola-ghieliemientjie lyk baie soos die wydverspreide en simpatriese dikkop-ghieliemientjie *Barbus anoplus* en die rooistert-ghieliemientjie *Barbus gurneyi*. Die grootste verskil word by die mannetjie se sekondêre geslagskenmerke aangetref, naamlik die broeikleure en die tuberkels.

## Introduction

Several general fish distribution surveys have been carried out by the various provincial Nature Conservation departments during the past few decades. These surveys have resulted in the discovery of many undescribed species in South African rivers. Thus Crass (1960) described four new species collected during surveys carried out by the Natal Parks Board in the late 1950s and early 1960s. In the late 1960s a comprehensive survey of the Transvaal rivers by officers of the Division of Nature Conservation also produced several new fish species that were described by Dr R.A.Jubb (e.g. Jubb 1966, 1967, 1968a). In the Cape Province the first general survey conducted by the then Inland Fisheries Department and the South African Museum in the late 1930s resulted in several new freshwater fish species being described by Barnard (1938). Another survey of the rivers of the Cape was initiated by the Cape Department of Nature and Environmental Conservation in the late 1970s. Although the fish fauna of the Cape Province was considered to be well known (e.g. Jubb 1965) two undescribed species were discovered during these latter surveys, namely *Austroglanis barnardi* (Skelton 1981) and the minnow described below.

The freshwater fish fauna of the Cape Province shows a high degree of endemicity (Barnard 1943; Jubb 1965). Several of the species are included in the South African Red Data Book — Fishes (Skelton 1987). The threats to the freshwater fish fauna of this province are varied and widespread (Gaigher, Hamman & Thorne 1980). It is essential that all the endemic species are discovered and described. Only by knowing of rare and threatened species can positive steps be taken to ensure their survival. This paper describes a hitherto unrecognized minnow species discovered in the Isidenge River, an upper catchment tributary of the Kei River system.

Measurements were made according to Skelton (1988). Vertebral counts are taken from radiographs. Institutional abbreviations follow Leviton, Gibbs, Heal & Dawson (1985).

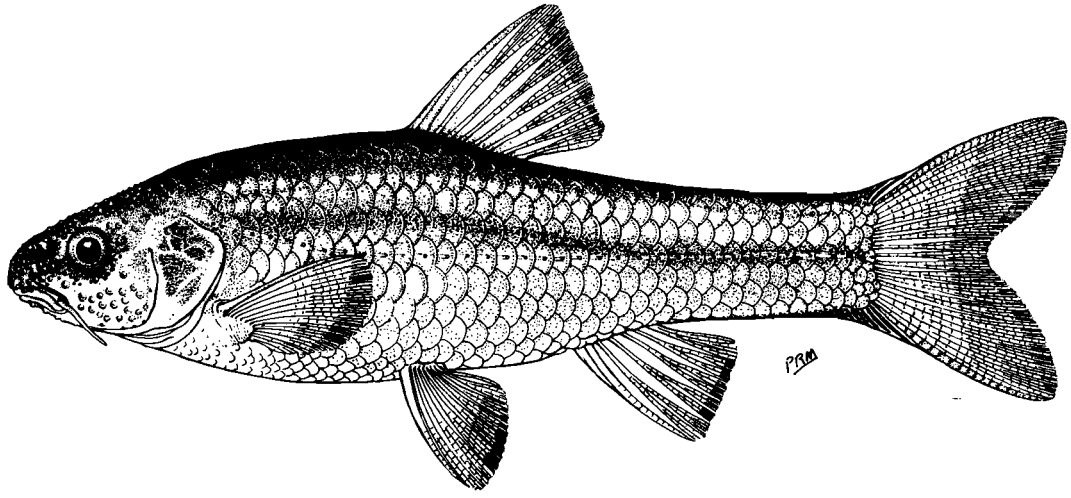

**Figure 1** Holotype of *Barbus amatolicus*, AMG/P 12622; male 60,8 mm SL. Drawn by P. Meakin.

***Barbus amatolicus* sp.nov.** Figure 1

Amatola barb

*Holotype:* AMG/P 12622, male, 60,8 mm SL. Collected from the Isidenge River, tributary Kubusi – Kei River System, on farm Isidenge Valley (32°40′S / 27°19′E), Stutterheim district, eastern Cape Province, South Africa by P.H. Skelton, A.Bok, H.M. Heard and M. King, 9 November, 1981.

*Paratypes:* AMG/P 8666, 3 males and 4 females, 45,4–63,2 mm SL, collected with the holotype.
AMG/P 8451, 11 (3 males, 7 females, 1 juvenile), 27,7–69,0 mm SL, Isidenge River, (32°40′27″S / 27°17′31″E), by M. King, 22 July 1981.
AMG/P 8454, 21 juveniles, 22,3–35,4 mm SL, Isidenge River near Sidenge Forest Station (32°39′33″S / 27°17′11″E), by M. King, 23 July 1981.
AMG/P 8458, 10 specimens, Isidenge River near Oakland Farm, (32°39′33″S / 27°20′19″E), by M. King, 23 July 1981.
AMG/P 8463, 20 (8 males, 12 females), 40,6–55,6 mm SL. Isidenge River on road to Sunrise Farm, (32° 38′ 20″S / 27°22′51″E), by M. King, 23 July 1981.
AMG/P 12623, 3 cleared and stained, collected with AMG/P 8451.
AMG/P 12624, 3 cleared and stained, collected with AMG/P 8454.

*Other material:* AMG/P 12625 (from AMG/P 8454), 37 specimens, collection data as above.
AMG/P 12626 (from AMG/P 8458), 42 specimens, collection data as above.
AMG/P 12627 (from AMG/P 8463), 19 specimens, collection data as above.
AMG/P 8465, 1 specimen, Isidenge River at Goodhope farm, (32°37′22″S / 27°23′17″E), by M. King, 23 July 1981.
AMG/P 8047, 9 specimens, Colosa River at Idutywa–Umtata main road crossing, Bashee River system, Transkei (31°49′S / 28°30′E), by D. Baird, July 1977.

## Diagnosis

*Barbus amatolicus* is a small (maximum recorded size 69 mm SL) barbine cyprinid without striking pigment markings or coloration, with a single pair of well-developed barbels, a soft-rayed dorsal fin and moderate-sized radially striated scales. The most characteristic feature is the extensive development of conical tubercles on the head of breeding males (see Figure 4).

## Description

Based on the holotype and 74 paratypes. Proportional measurements, scale, finray and vertebral counts are given in Table 1.

General body shape is fusiform, predorsal profile convex. Adults sexually dimorphic with respect to body depth, fin lengths and tubercle development.

Head obtusely rounded, slightly longer in males (3,5 times in SL), females 4 times in SL, deepest at nape, depth 1,4 times length. Eye lateral in position i.e. visible from both above and below, moderately small (5 times in head length, twice in interorbital space). Snout longer than orbit diameter but less than postorbital length. Nostrils close to orbits, each divided into short tubular anterior naris and simple open posterior naris. Mouth U-shaped, inferior in position. Lips moderately developed. Single pair of well-developed barbels from the base of mouth angle, longer than orbit diameter in adults. Gill openings from level above orbits to ventral side of head, branchiostegal membrane broadly attached below. First gill arch with 2 or 3 short, stubby gill rakers.

Body depth greatest before dorsal fin. Caudal peduncle moderately long, 4,2 times in SL, its depth 1,74 times in length. Dorsal fin origin above origin of pelvic fins and equidistant from tip of snout and mid-base of caudal fin. Longest simple anterior dorsal fin ray slender and flexible, hind margin of fin regular and straight. Pectoral fins rounded, in males reaching close to origin of pelvics, in females short of pelvic origin by 2 scale rows. Pelvics rounded not reaching origin of anal fin. Anal fin short based with straight hind margin. Caudal fin forked shallowly, lobes obtuse.

Head naked, body entirely scaled. Scales moderately small, aligned in regular rows, indistinct on nape and embedded between pectoral fins and antero-ventral region. No distinct axil scale at base of pelvic fins. Dorsal and anal fins without scale sheaths. Lateral line complete, gently curved over abdomen but running over myoseptum along caudal peduncle. Scales radiately striated with numerous striae (Figure 2).

Pharyngeal bones falcate with 2;3;5–5;3;2 recurved pointed teeth (Figure 3). Gut with single S-flexure, its length less than SL. Peritoneum lightly pigmented with scattered melanophores.

### Tubercles (Figure 4)

In ripe breeding males the head is covered with small, relatively even-sized (up to 0,1 mm in basal diameter and height) conical tubercles. The tubercles are most densely distributed on the snout but are evenly spread over the dorsal head surface and the cheeks. Few scattered tubercles occur on the lips and the lower jaw; in the holotype, the specimen with the most extensive development of tubercles, two or three isolated tubercles occur on the operculum. Shagreen-like bands of small tubercles also occur on the upper surface of the first to the sixth or seventh pectoral fin rays. In the holotype there are minute tubercles along the free edge of the anterior dorso-lateral (nape and shoulder) scales. Tubercles do not occur on the female specimens examined.

### Pigmentation and colour

In life both sexes of this species are a translucent fleshy colour with silvery abdomen and white or silvery white ventral parts. The cheeks and operculum are also silvery. Males and females are similar and breeding males are only differentiated by the whitish tints to the head imparted by the tubercles. Fins are colourless and hyaline. In preserved specimens the body pigment is uniform and relatively light, with an ill-defined dark band over the

**Table 1** Proportional measurements and meristic values of the holotype and measured paratypes of *Barbus amatolicus* sp.nov. Unless otherwise noted $n = 50$. Frequency of occurrence in brackets

| Measurement | Holotype | Mean | Min | Max | *SD* | Var |
|---|---|---|---|---|---|---|
| Standard length (mm) | 61 | 45 | 22 | 69 | | |
| **As % of SL** | | | | | | |
| Predorsal length | 49 | 51 | 47 | 54 | 1 | 2 |
| Head length | 24 | 24 | 24 | 29 | 1 | 1 |
| Dorsal fin | 23 | 25 | 22 | 27 | 1 | 2 |
| Pectoral fin | 18 | 20 | 18 | 23 | 1 | 1 |
| Pelvic fin | 16 | 18 | 14 | 21 | 1 | 1 |
| Anal fin | 16 | 19 | 16 | 21 | 1 | 1 |
| Body depth | 27 | 24 | 21 | 29 | 2 | 3 |
| Body width | 15 | 15 | 12 | 20 | 1 | 2 |
| Caudal peduncle length | 25 | 25 | 24 | 27 | 1 | 1 |
| Pectoral to pelvic | 22 | 21 | 18 | 24 | 1 | 2 |
| Pelvic to anal | 16 | 16 | 13 | 19 | 1 | 2 |
| **As % of HL** | | | | | | |
| Head depth | 71 | 68 | 63 | 73 | 3 | 6 |
| Snout length | 30 | 29 | 26 | 32 | 1 | 2 |
| Orbit diameter | 33 | 37 | 33 | 42 | 2 | 3 |
| Postorbit | 50 | 51 | 49 | 56 | 2 | 3 |
| Interorbit | 33 | 37 | 33 | 42 | 2 | 3 |
| Barbel length | 27 | 26 | 0 | 37 | 9 | 87 |
| **As % of caudal peduncle length** | | | | | | |
| Caudal peduncle depth | 121 | 51 | 42 | 121 | 11 | 113 |
| Dorsal rays | iii,7 | iii,7 (47) | iii,8 (3) | | | |
| Pectoral rays | 15 | 14 (17) | 15 (30) | 16 (3) | | |
| Pelvic rays | 8 | 8 (33) | 9 (17) | | | |
| Anal rays | iii,5 | iii,5 (49) | iii,6 (1) | | | |
| Caudal rays | 10+9 | 10+9 (48) | 10+10 (1) | 11+9 (1) | | |
| Lateral line scales | 34 | 33 (3) | 34 (27) | 35 (14) | 36 (2) | 37 (1) |
| Caudal peduncle scales | 16 | 14 (1) | 15 (10) | 16 (35) | 17 (1) | |
| Lateral line to dorsal | 7 | 5 (3); | 6 (43) | 7 (1) | | |
| Lateral line to pelvic | 4 | 3 (14) | 4 (33) | | | |
| Lateral line to anal | 4 | 3 (2) | 4 (45) | | | |
| Predorsal scales | 15 | 12 (1) | 13 (7) | 14 (26) | 15 (3) | |
| Gill rakers | 3 | 2 (3) | 3 (27) | 4 (14) | 5 (3) | |
| Vertebrae | | 30 (3) | 31 (24) | 32 (5) | | |
| Abdominal vertebrae | | 13 (2) | 14 (2) | 15 (28) | | |
| Caudal vertebrae | | 16 (3) | 17 (23) | 18 (6) | | |
| Predorsal vertebrae | | 6 (9) | 7 (23) | | | |
| Preanal vertebrae | | 15 (22) | 16 (10) | | | |

myoseptum and, in most specimens, a small pigment spot at the base of the caudal peduncle.

## Osteology

A detailed study has not been made but examination of cleared and stained specimens indicates that the osteology of this species is similar to certain other small species from southern Africa such as *B. anoplus* and *B. gurneyi* (Skelton, unpublished). Noteworthy features are short lower jaws (angulo-articular and dentary) and vestigial or weakly ossified supraneural elements. The infraorbital bones are slender.

## Distribution (Figure 5)

*Barbus amatolicus* is found in Isidenge River, an upper catchment tributary of the Kubusi sub-system of the Kei River system. The Kubusi catchment including the Isidenge River drains the eastern slopes of the Amatola mountains. A collection of this species from the Colosa River, Bashee River system in the Transkei (AMG/P 8047), indicates that it is likely to be more widespread in the Kei and other systems to the north-east in the Transkei.

## Comparison with other species

*Barbus amatolicus* is most similar to two other southern

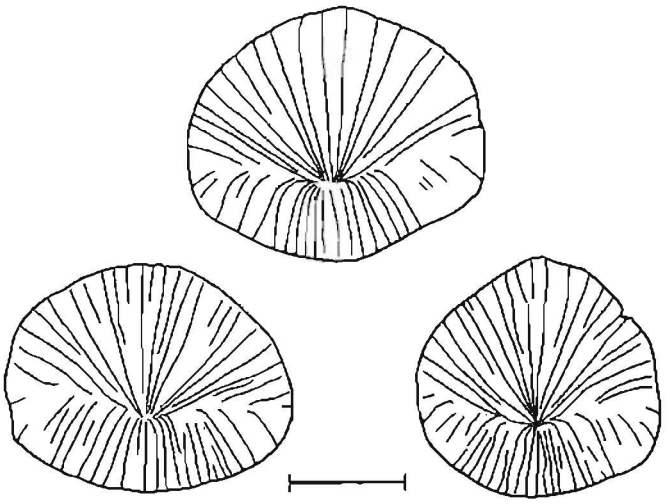

**Figure 2** Examples of scales from the right flank of a paratype of *Barbus amatolicus* sp. nov. Scale bar is 1 mm.

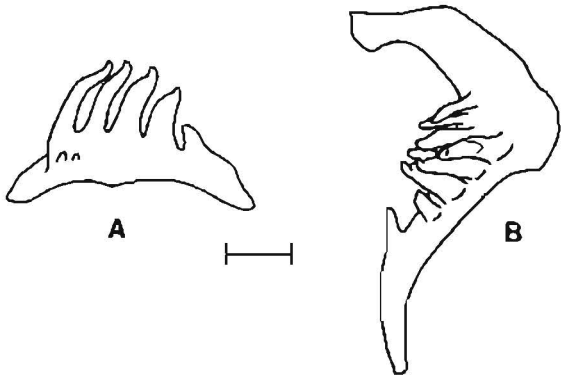


**Figure 3** A — Ventral view of the left pharyngeal bone and major row teeth of *Barbus amatolicus* sp.nov. B — Posterior view of the right pharyngeal bone and teeth of *B. amatolicus* sp.nov. Scale bar is 1 mm.

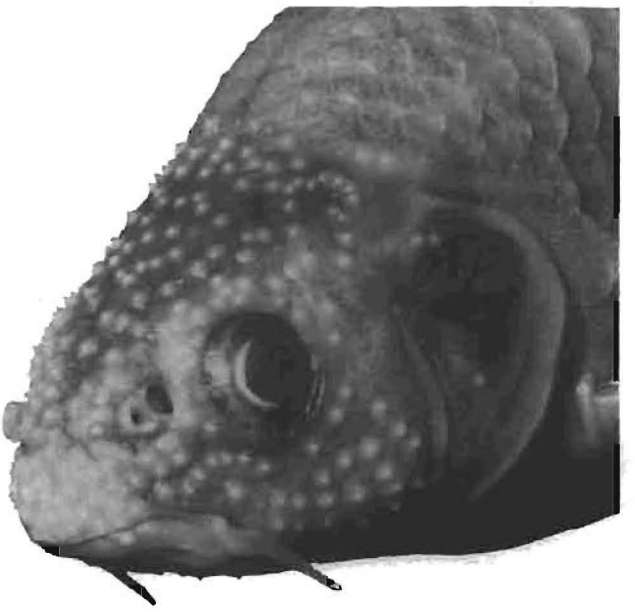

**Figure 4** The nuptial tubercles on the head of the holotype of *B. amatolicus* sp.nov. (AMG/P 12622).

African minnows, the widespread and sympatric chubbyhead barb *Barbus anoplus* and the red tail barb *Barbus gurneyi*. It differs from both species in having an inferior mouth (compared with a terminal mouth). Its single pair of well-developed barbels differs from the relatively short single or double pairs of *B. anoplus* and (usually) the two pairs of well-developed barbels of *B. gurneyi*. The breeding colours and nuptial tubercles of male *B. amatolicus* contrast with the bright golden breeding dress and absence of nuptial tubercles on the head of *B. anoplus*. The tubercles are similar to those of *B. gurneyi* but differ in details of pattern: in the latter species the tubercles tend to occur in clusters, are concentrated around the snout and do not cover, or are small and

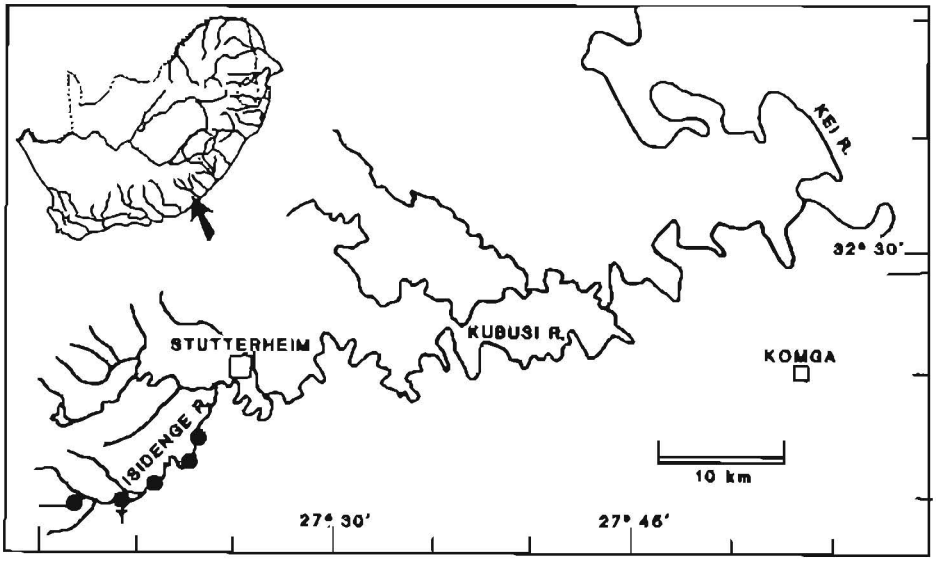


**Figure 5** Map of the Kubusi subcatchment of the Kei River system, eastern Cape Province, South Africa, showing collecting sites of *B. amatolicus* in the Isidenge River. Site T is where the holotype of *B. amatolicus* was collected.

sparsely distributed behind, the interorbital zone. The breeding colours of male *B. gurneyi* include a reddish hue and salmon red fins. The lateral line does not curve ventrad to the same extent in *B. amatolicus* with the result that there are four scales between the lateral line and the base of the pelvic fins and only two or occasionally three in *B. gurneyi*. The gill rakers are more numerous (six or seven) and extend the length of the first gill arch in *B. gurneyi* compared to the two or three in *B. amatolicus*.

The phylogenetic relationships of this new species have yet to be established but are likely to include the *B. anoplus–B. gurneyi* complex on the basis of their clearly close similarity and agreement in certain derived characteristics e.g. weakly developed supraneural bones, tubercles, scale morphology and squamation pattern.

### Conservation

The Isidenge River catchment is within well developed agricultural and forestry areas. Most streams in this area are stocked with alien predators (bass and trout) and the waters of the streams are subject to agricultural run-off, alien riparian plant invasion, and abstraction for irrigation. Such factors could well threaten this species. The Cape Department of Nature and Environmental Conservation is aware of these threats and is working on a conservation plan for the Isidenge River (Dr A. Bok, pers. comm.).

### Etymology

The species name refers to the Amatola Mountains from which the Isidenge River arises.

## Discussion

The specific status of *B. amatolicus* is not in doubt, especially as it occurs sympatrically with its most similar congener *B. anoplus*. The latter species is extremely widespread in South Africa and shows much intraspecific variation in terms of certain characters such as barbel and lateral line development. *B. anoplus* is closely allied to, and possibly even not specifically distinct from, *B. motebensis* Steindachner (Gaigher 1976). The only known difference between *B. anoplus* and *B. motebensis* is the absence of nuptial head tubercles on males of the former and their presence on males of the latter (Jubb 1968b). The head tubercles of *B. motebensis* occur on the snout only and not on the lower jaw, cheeks or on the top of the head. The breeding males of both *B. anoplus* and *B. motebensis* are a bright golden yellow.

Skelton (1986) considers the *B. anoplus* group of endemic southern African minnows to be part of a relatively old fauna whose focus of distribution is the Orange River basin and adjacent basins. The precise phylogenetic relationships of this particular group still require investigation but there is an excellent opportunity for applying varied approaches such as morphological and osteological, behavioural, karyological and biochemical (protein electrophoretic and molecular DNA analysis) techniques to the problem. Elucidation of these phylogenetic relationships could provide valuable insight into the biogeography of the Amatola outlier.

The Amatola mountains form the eastern extension of the Winterberg-Amatola range. The range is a prominent feature on the landscape and is considered a bypassed residual structure in terms of the geomorphological retreat of the Great Escarpment (Wellington 1928). The more eastern parts of the range are relatively well watered and the southern and eastern slopes are both naturally and plantation forested. The streams, forests and other upland environments provided by these mountains include a large number of endemic vertebrate and invertebrate species (e.g. Branch 1988; Stuckenberg 1962). *Barbus trevelyani* is an endemic freshwater fish from the southern slopes of the range. The anabantid, *Sandelia bainsii*, is another closely associated species but has a range extension from these mountains to the Kowie River system.

The conservation status of the new species is one of concern. Not only is the apparent natural distribution range of the species extremely restricted but there are several obvious adverse pressures on the stream environment. The Isidenge catchment is greatly altered by agricultural and forestry activities. The stream itself appears turbid and its banks are lined with invasive vegetation. Rainbow trout (*Oncorhynchus mykiss*) have been introduced to the Isidenge and spotted bass (*Micropterus punctulatus*) are in the Kubusi (de Moor & Bruton 1988). There is even a possibility that the chubbyhead barb which occurs in the Isidenge is also introduced as this species was widely distributed by the authorities from the Pirie trout hatchery in former years (see e.g. Harrison 1952). The status of the rivers and fishes of Transkei is uncertain but the relatively poor condition of river catchments there is generally recognized. A fish survey of the rivers from the Kei through Transkei is certainly needed to establish the true distribution and status of this new species and other fishes in the area.

The discovery of *Barbus amatolicus* once again highlights the value and importance of thorough distribution surveys to both the conservation and scientific communities. The general deterioration of riverine habitats in southern Africa (e.g. O'Keeffe, Davies, King & Skelton 1989) and the variety of man-made threats to individual species requires that restricted taxa such as *B. amatolicus* are exposed so that the necessary conservation steps to ensure their survival can be taken.

## Acknowledgements

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## References

BARNARD, K.H. 1938. Notes on the species of *Barbus* from the Cape Province with descriptions of new species. *Ann. Mag. Nat. Hist.* (11)2: 80–88.

BARNARD, K.H. 1943. Revision of the indigenous freshwater fishes of the S.W. Cape region. *Ann. S. Afr. Mus.* 36(2): 101–262.

BRANCH, W. 1988. Distribution and diversity of reptiles and amphibians of the Eastern Cape. In: Towards an Environmental Plan for the Eastern Cape (eds, M.N.Bruton and F.W.Gess), Rhodes University, Grahamstown. pp. 218–245.

CRASS, R.S. 1960. Notes on the freshwater fishes of Natal with descriptions of four new species. *Ann. Natal Mus.* 14: 405–458.

DE MOOR, IRENE J. & BRUTON, M.N. 1988. Atlas of alien and translocated indigenous aquatic animals in southern Africa. *S. Afr. Nat. Sci. Prog. Rep.* No.144: 310pp.

GAIGHER, I.G. 1976. Geographical variation and synonymy of the minnows *Barbus motebensis* Steindachner, 1894 and *B. anoplus* Weber, 1897. Cape Department of Nature and Environmental Conservation, Research Reports 1976: 171–178.

GAIGHER, I.G., HAMMAN, K.C.D. & THORNE, S.C. 1980. The distribution, conservation status and factors affecting the survival of indigenous freshwater fishes in the Cape Province. *Koedoe* 23: 57–58.

HARRISON, A.C. 1952. Cape minnows ('rooivlerke' and 'gillieminkies'). *Piscator* 6(24): 117–128.

JUBB, R.A. 1965. Freshwater fishes of the Cape Province. *Ann. Cape Prov. Mus.* 4: 1–72.

JUBB, R.A. 1966. A new species of *Barbus* (Pisces, Cyprinidae) from the Sabie River, north-eastern Transvaal. *Ann. Cape Prov. Mus.* 5: 157–160.

JUBB, R.A. 1967. A new *Serranochromis* (Pisces, Cichlidae) from the Incomati River System, Eastern Transvaal, South Africa. *Ann. Cape Prov. Mus. (Nat. Hist.)* 6(5): 55–62.

JUBB, R.A. 1968a. A new *Chetia* (Pisces, Cichlidae) from the Incomati River System, Eastern Transvaal, South Africa. *Ann. Cape Prov. Mus. (Nat. Hist.)* 6(7): 71–76.

JUBB, R.A. 1968b. The *Barbus* and *Varicorhinus* species (Pisces: Cyprinidae) of Transvaal. *Ann. Transv. Mus.* 26(4): 79–97.

LEVITON, A.E., GIBBS, R.H., HEAL, E. & DAWSON, C.E. 1985. Standards in herpetology and ichthyology: Part I. Standard symbolic codes for institutional resource collections in herpetology and ichthyology. *Copeia* 1985(3): 802–832.

O'KEEFFE, J.H., DAVIES, B.R., KING, J.M. & SKELTON, P.H. 1989. The conservation status of southern African rivers. In: Biotic diversity in Southern Africa (ed. B.J. Huntley). Oxford University Press, Cape Town. pp. 266–289.

SKELTON, P.H. 1981. The description and osteology of a new species of *Gephyroglanis* (Siluriformes, Bagridae) from the Olifants River, South West Cape, South Africa. *Ann. Cape Prov. Mus. (Nat. Hist.)* 13(15): 217–250.

SKELTON, P.H. 1986. Distribution patterns and biogeography of non-tropical southern African freshwater fishes. *Palaeoecol. Afr.* 17: 211–230.

SKELTON, P.H. 1987. South African Red Data Book — Fishes. *S. Afr. Nat. Sci. Prog. Rep.* 137: 199 pp.

SKELTON, P.H. 1988. A taxonomic revision of the redfin minnows (Pisces, Cyprinidae) from southern Africa. *Ann. Cape Prov. Mus. (Nat. Hist.)* 16(10): 201–307.

STUCKENBERG, B.R. 1962. The distribution of the montane palaeogenic element in the South African invertebrate fauna. *Ann. Cape Prov. Mus.* 2: 190–205.

WELLINGTON, J.H. 1928. Some physical factors affecting the economic development of the eastern Cape Province and adjoining areas. *S. Afr. geogr. J.* 11: 22–27.