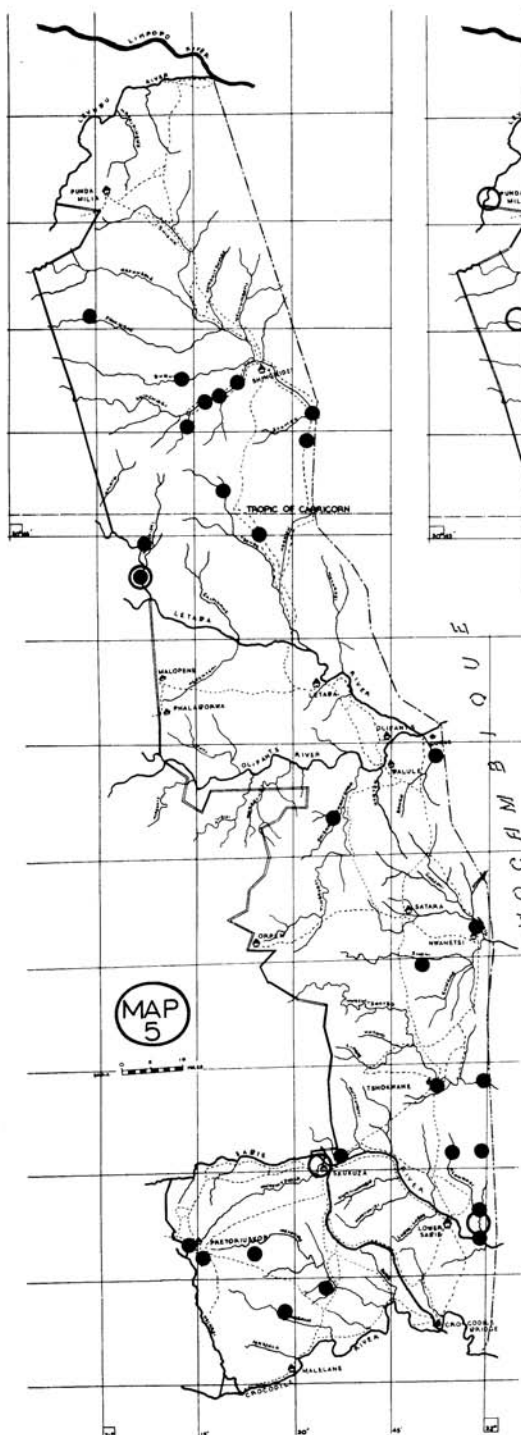
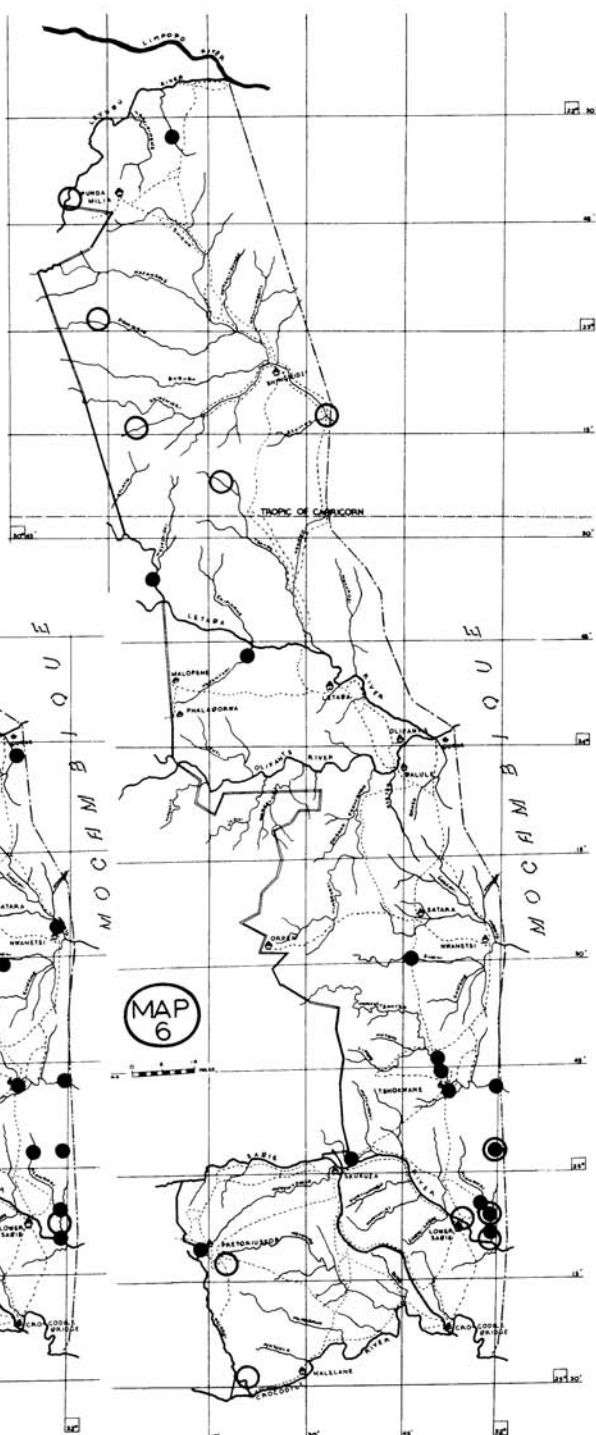


○ BULINUS (B) TROPICUS (KRS.).
 ● BULINUS (B) RETICULATUS M-B.

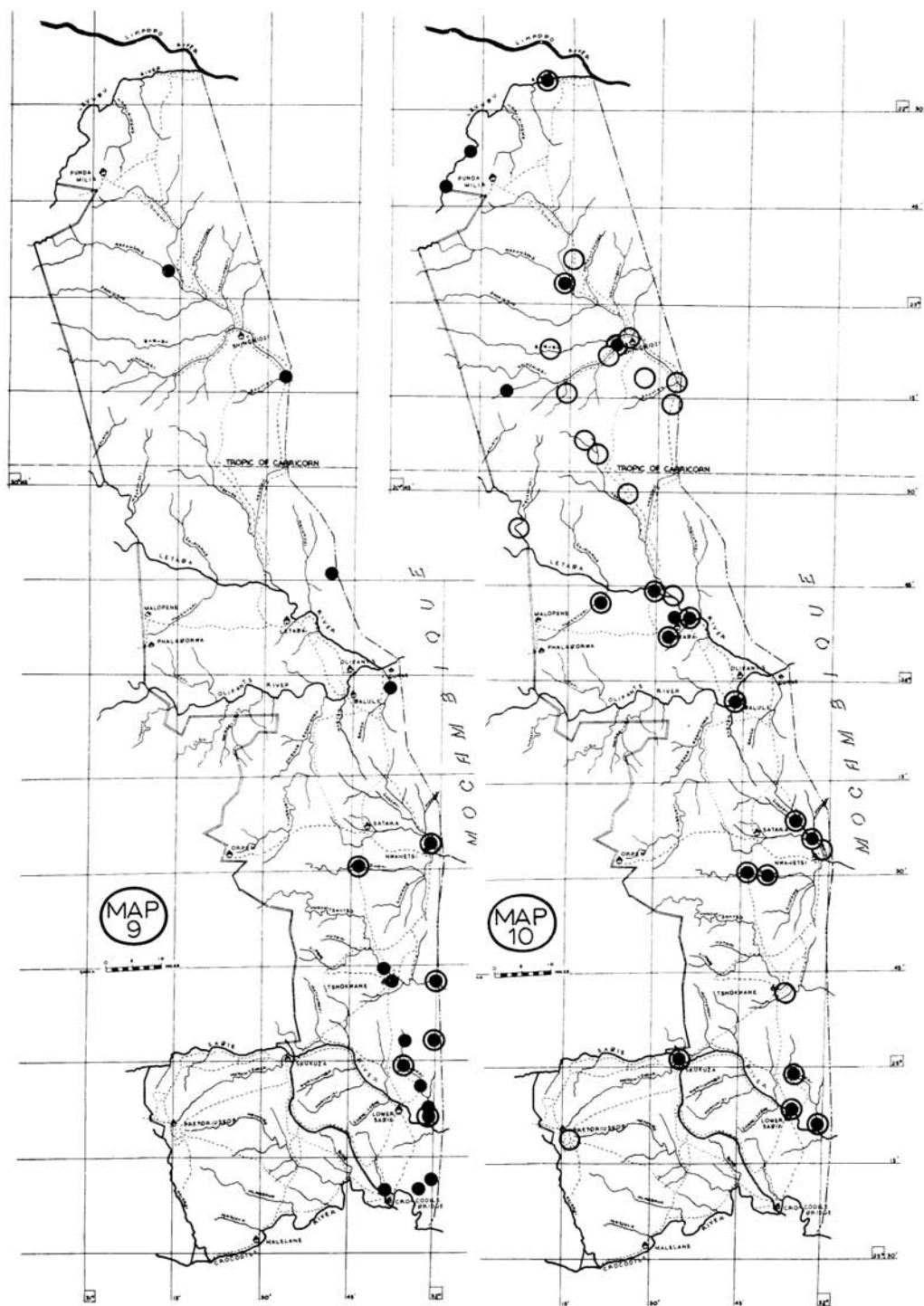
● BULINUS (B) FORSKALI (EHRN.).

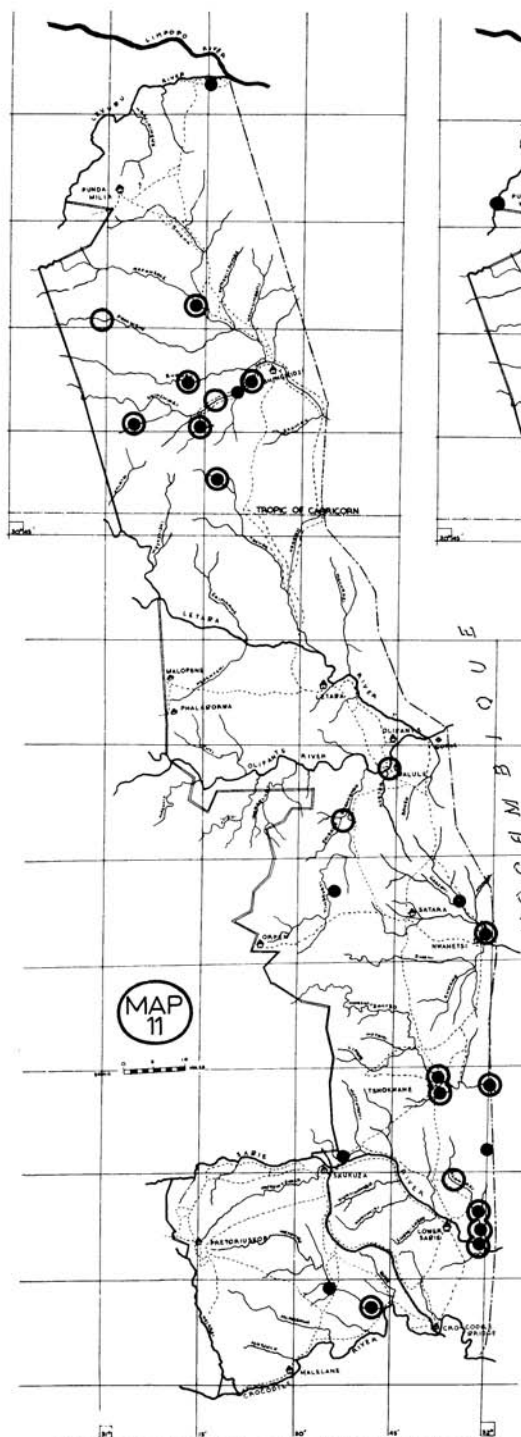


● LYMNAEA NATALENSIS KRS.
○ LYMNAEA COLUMELLA SAY

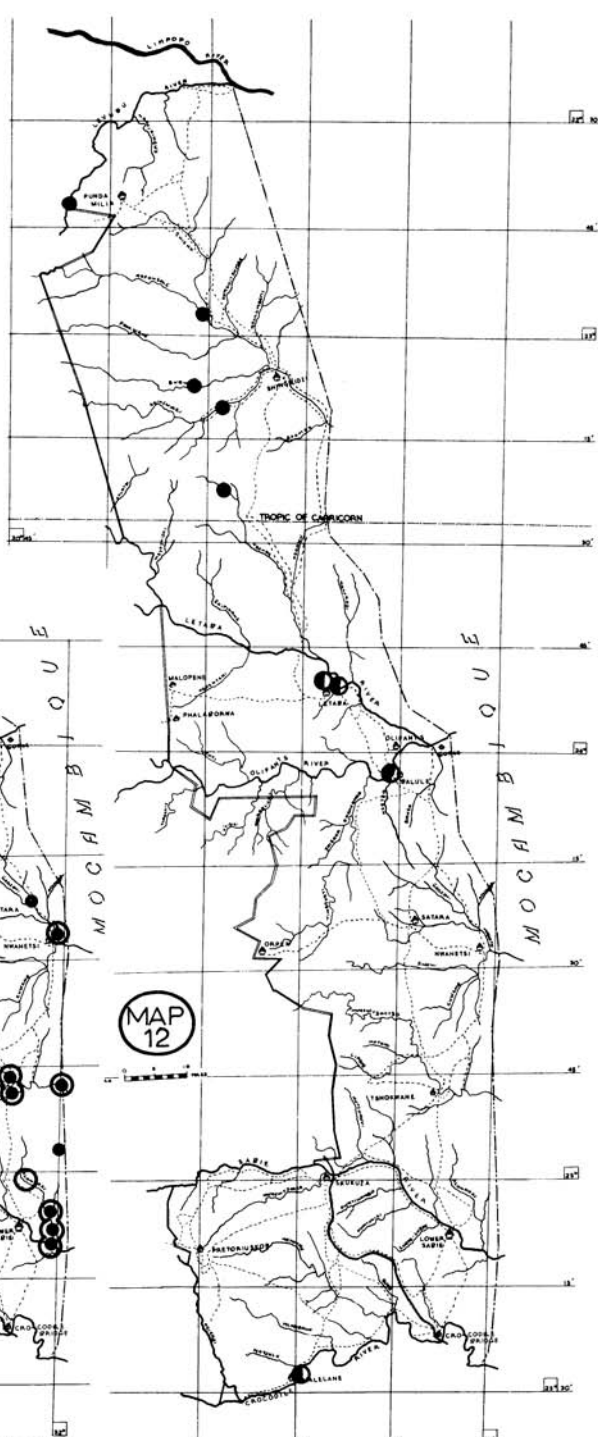


● ANISUS NATALENSIS (KRS.).
○ GYRAULUS COSTULATUS (KRS.).

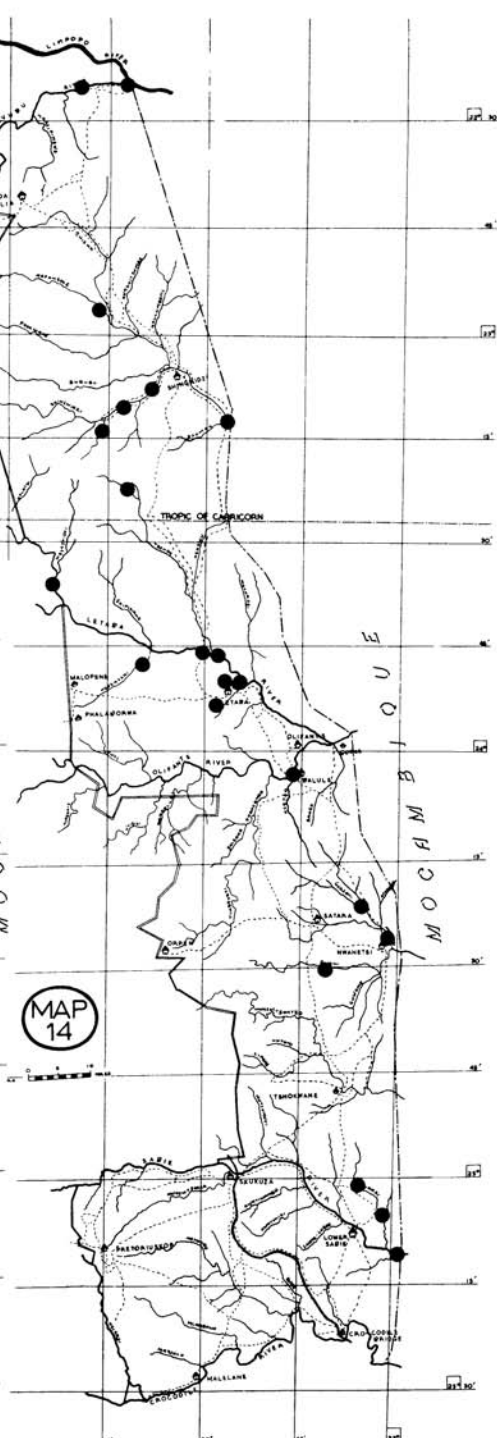
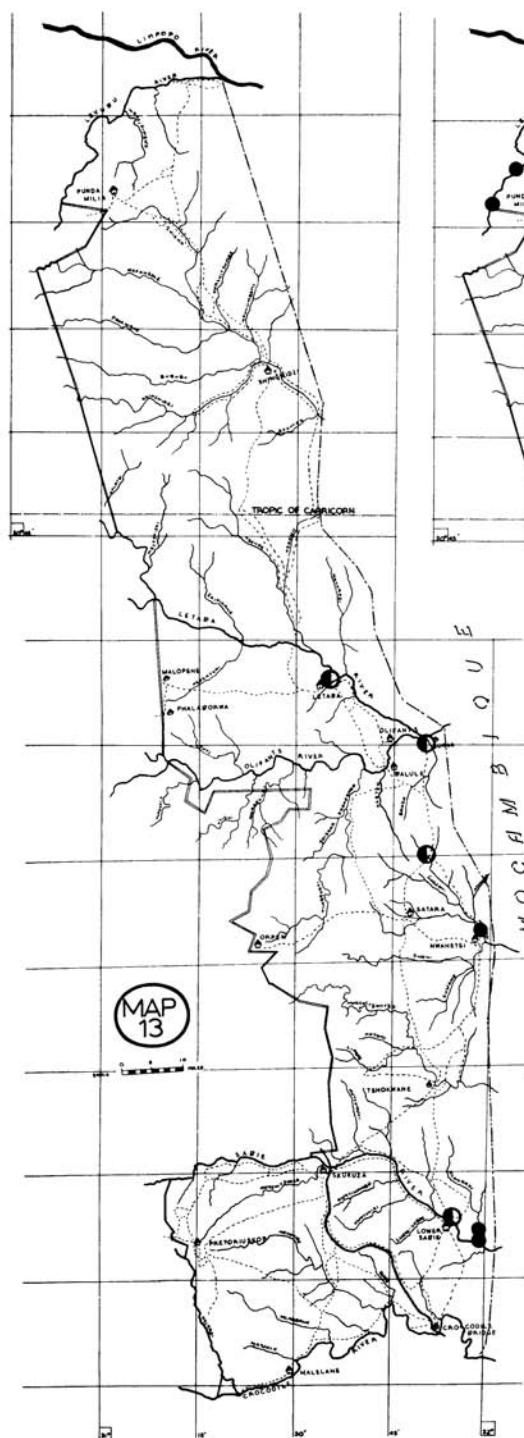




- ASPATHARIA(S) WAHLBERGI (KRS.)
- ASPATHARIA(S) PETERSI (MTS.)

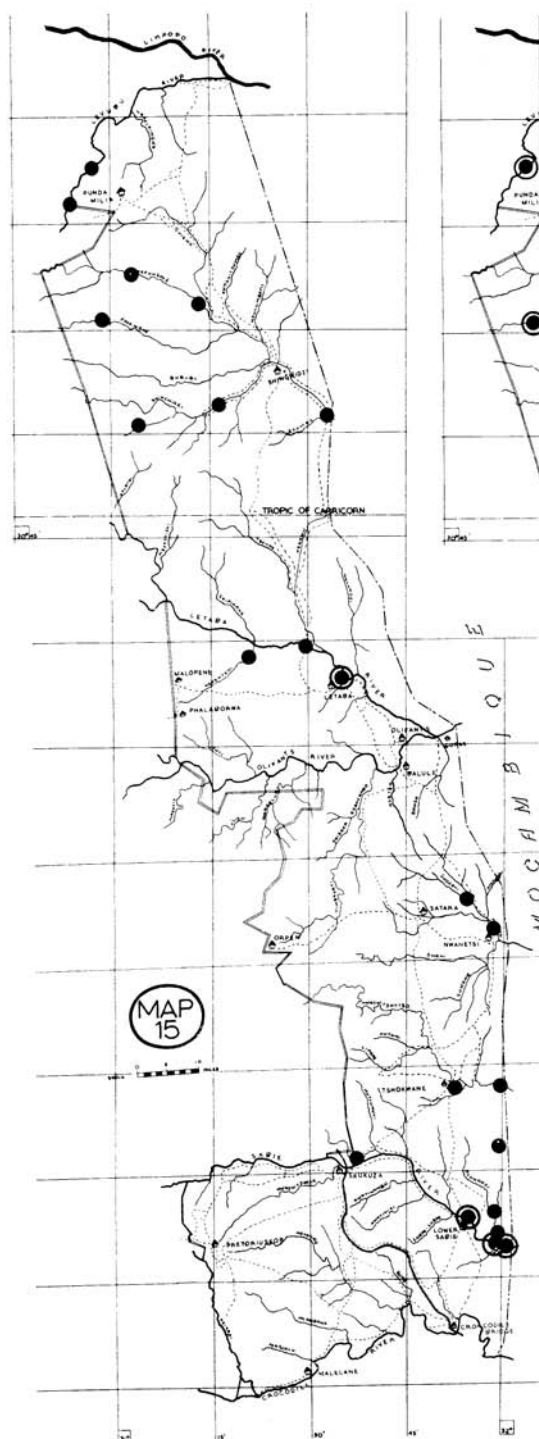


- UNIO CAFFER KRS.
- LOCALITIES BY HAAS (1936).

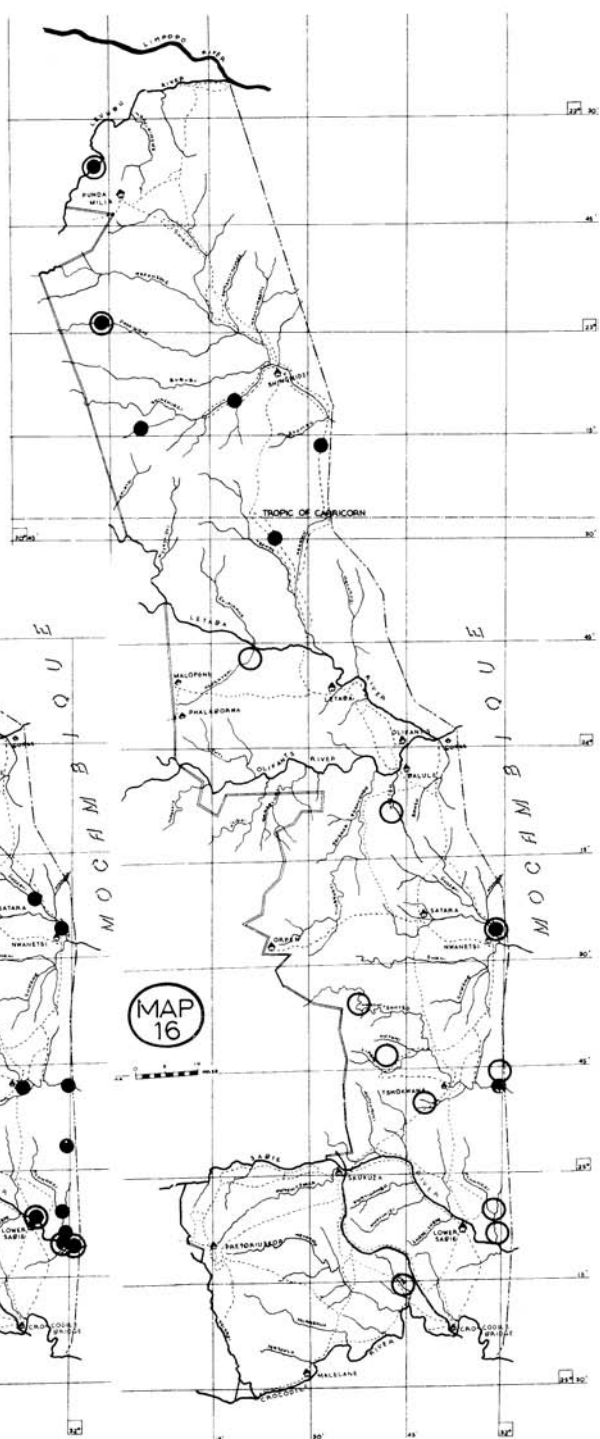


● UNIO FRAMESI (CONN.).
○ LOCALITIES BY HAAS (1936)

● CORBICULA AFRICANA (KRS.)



- EUPERA FERRUGINEA (KRS.)
- PISIDIUM PIROTHI (JICK.)



● BURNUPIA
○ FERRISSIA

GYRAULUS COSTULATUS (Krauss). (Fig. 22a-b).

Previous records.

Haas (1936) reports this species from the Sabie river at Lower Sabie rest camp. Connolly (1939) reports its presence from seven localities in Natal, one in Zululand, three in the northern Transvaal and one locality near the Little Lebombo hills in the southern part of Mocambique. Fraga de Azevedo et al. (1961) adds 16 records to the latter area and Schutte and Frank (1964) mention that it is well represented in south-eastern Transvaal and adjacent northern Swaziland. Finally our own records show it to be rather widespread in the Transvaal, particularly on the highveld and in the Vaal river catchment area.

Distribution. (Map 6).

The distributional pattern presented by this species is the opposite of that of *A.natalensis*. These species never occurred in the same habitat in the Park except in the extreme south east (Mlondozispruit and Munywini) and whilst *A. natalensis* seems to be limited to the area between the Great Letaba and the Sabie rivers, this species shows a break in distribution in this area.

Taxonomy.

The younger specimens do not display a carination on the periphery, a feature which is markedly developed in the larger specimens exceeding three whorls. The angulation and height of the shell are variable characteristics, the second apparently influencing the first because the flatter the shell the more pronounced the angulation and vice versa.

LENTORBIS CARRINGTONI (Fraga de Azevedo, de Medeiros; da Costa Faro, de Lourdes Xavier, Gandara & de Morais) (Figs. 23a-c).

Previous records.

This species was described from Nacala, Mocambique Province, Mocambique and is also recorded from one locality in Natal near Durban (Brown, in press).

Distribution. (Map 7).

It was found in four localities in a limited area along the south-eastern border of the Park. Three of these are from different places in the Mlondozispruit and the fourth is from Munywinispruit a little further north.

Taxonomy.

This species is placed in the genus *Segmentorbis* by Fraga de Azevedo et al. (1961), but since it lacks the appendix to the penis which characterises this genus, it should rather be included under the genus *Lentorbis* (Mandahl-Barth, 1954). Conchologically speaking, the difference between *L.junodi* (Connolly) and this species seems almost negligible. A more pronounced difference, however, is to be found in the anatomy of the copulatory organ. In *L.junodi* the penis sheath is described as being swollen at its upper end,

encasing the penis proper which lies uppermost in closely winding coils (Mandahl-Barth, 1954) while the penis sheath is approximately twice the length of the praeputium (Fraga de Azevedo et al., 1961). *L.carringtoni*, on the other hand, lacks the swelling of the penis sheath and no coiling of the penis proper has been reported while the penis sheath is about three times the length of the praeputium and much narrower than the latter (Fraga de Azevedo et al., 1961). Brown (1965), however, in his description of *L.junodi* from Ethiopia, states that the penis is not coiled although, according to his fig. 32 (p. 73), the uppermost part of the penis sheath is swollen as illustrated by Fraga de Azevedo et al. (1961).

The copulatory organ in our own material as depicted in Fig. 24, indicates it to be similar to that figured by the authors of *L.carringtoni*. A very short, slightly coiled epiphallus seems to be present in addition to a lobe similar to that observed by Mandahl-Barth (1954) for *L.junodi*. This lobe probably plays an important part in the process of eversion of the penis and it would seem that it passes out first, pulling the praeputium with it.

The shell is very variable, ranging from distinctly lenticular and narrowly umbilicate forms (remining of *S.(Hippeutis) emicans* (Connolly) to forms which are much less lenticular with a more open umbilicus. The septa normally range from one to four pairs but may sometimes be undetectable. An extremely delicate concentric sculpture, similar to that of *Segnetorbis kanisaënsis* Preston but much more delicate and closer set, is present.

SEGMENTORBIS KANISAËNSIS (Preston) (Fig. 25a-c).

Previous records.

Originally described from the Nile at Kanisa. Merebank, Natal is the only South African locality listed by Connolly (1939). It has since been reported from Uganda and Tanganyika (Mandahl-Barth, 1954), Gambia (Smithers, 1956), the Ivory Coast (Binder, 1957) and from northern Angola (Wright, 1963).

Distribution. (Map 7).

We collected it in the Park at three localities only, each sample consisting of two or three specimens. The extremely rare occurrence of this species might be explained by the fact that it is extremely small and is easily overlooked. This fact, however, does not account for its very limited occurrence in the Park where we specifically looked out for it.

Taxonomy.

No attempt has been made to dissect these specimens for fear of damaging the limited number of shells available. The shell, however, leaves little doubt as to its identity.

LANISTES OVUM Troschel. (Fig. 26).

Previous records.

According to the data summarised by Connolly (1939) the only South African records, up till now, are "Lebonibo" (Lebombo?) in the Transvaal and in the Pongola river in Zululand. To these Schutte and Frank (1964) add

localities in the eastern parts of south-eastern Transvaal and the adjacent Swaziland and we have a record of one locality in Zululand. Connolly further lists 11 localities in Mocambique and one in Southern Rhodesia. Fraga de Azevedo et al. (1961) report it from all the Provinces in Mocambique except Gaza.

Distribution. (Map 8).

This species probably entered the Park from the east at two places viz. via the Sabie river in the south, where it colonised the Mlondozispruit, and via the Shingwedzi river in the north, whence it could have spread to the localities mapped.

Taxonomy.

The specific difference between this species and *L.ellipticus* Martens is not altogether clear. Pilsbry & Bequaert (1927) remark that *L.ellipticus* appears to be quite distinct from the *L.ovum* group by the inflation of the upper part of the last whorl, the narrow, somewhat straightened columella and the microscopic sculpture of very fine, nearly regular striae in the direction of the growth lines. These differences, however, are not brought out by a comparison of figure 8 on Pl. XVII of these authors and Connolly's (1939) figure 13 of *L.ovum* on Pl. XVII. On the other hand Connolly states that, typically, *L.ellipticus* is very distinct from *L.ovum* in its upright elliptical form, shouldered whorls, vertical instead of rather diagonal aperture, and strong angulation around the umbilicus. But neither the strong angulation nor shouldered whorls is evident from his figure of the paratype of *L.ellipticus* (Pl. XVII, fig. 15) and he significantly remarks that intermediate forms are found which are difficult to determine.

This last statement is supported by some of our specimens from the Park for, although their general shape is that of *L.ovum*, a rather pronounced angulation around the umbilicus of some specimens recalls that described for *L.ellipticus*.

CLEOPATRA FERRUGINEA (Lea). (Figs. 27-29).

Previous records.

In addition to the four localities listed by Connolly (1939), Fraga de Azevedo reports its presence in four Provinces in Mocambique. In South Africa it was known only from Manuan Creek and the Ototolini (Otobotini?) district in Zululand until Schutte and Frank (1964) reported it from the extreme eastern areas of the south-eastern Transvaal and the adjacent northern Swaziland. Our own collection contains records of four localities in Zululand.

Distribution. (Map 9).

We collected this species from 18 localities all of which are roughly confined to the eastern parts of the Park. The localities indicated by a circle represent the finding places of another form commented on below.

Taxonomy.

It is with some hesitation that we refer the specimens from the Park to *C.ferruginea* because of the fact that we were not in a position to examine the type specimen (series?) of this species and the literature available to us is inadequate. However Connolly (1939) remarks that all the South African examples examined by him appeared to be fairly typical of Lea's species and it seems wise to follow this author until further investigation proves him wrong.

In the area under discussion matters are complicated by a second form which, to us, differs appreciably from the forms here assigned to *C.ferruginea*. This form (Fig. 29) occurs in company with *C.ferruginea* in six localities all of which lie between the Sabie and Nwanedzi rivers. It differs from the latter in being more slender, reaching a bigger maximum length and having the aperture more evenly rounded. Generally speaking Connolly's description of *C.ferruginea* fits this form better than it does those mentioned earlier on and which might have to be regarded as a south-eastern race of *C.morelli* Preston. Insufficient material, however, precludes a settlement of the issue at this stage and, for the present, both forms are regarded as representing *C.ferruginea*. The number, width and position of the coloured bands depicted in Figures 27-29 are very constant in all our specimens.

MELANOIDES TUBERCULATA (Müller). (Figs. 30-31).

Previous records.

Connolly (1939) lists this species from one locality in Southern Rhodesia, one in Zululand, four in Natal, two in the Transvaal and six in Mocambique to which Fraga de Azevedo et al. (1961) add all the Mocambique Provinces south of the Zambesi river. In south-eastern Transvaal and the adjacent northern Swaziland Schutte and Frank (1964) report it to be most abundant in the south-eastern and north-eastern zones. To the number of South African localities, excluding the Park, we may, from our own records, add four in Zululand, five in the Natal coastal area, one near Port Elizabeth in the Cape Province, six in the vicinity of Johannesburg and Pretoria and one in the far western Transvaal. We also have records of seven localities in Swaziland. Haas (1936) lists six localities in the K.N.P. three of which were confirmed by our own survey.

Distribution. (Map 10).

The species is well represented from north to south. It occurs in 34 localities and is by far the most wide spread of the prosobranchs not only in the Park but also in the whole of the Republic of South Africa extending westwards almost to the middle of the Transvaal, with one locality in the far western Transvaal.

Taxonomy.

The comments of Connolly (1939) on this species in general applies to our specimens from the Park. Figure 30 depicts a rather youngish specimen which adequately displays the spiral and transverse sculpture. The older specimen figured in Fig. 31 shows the weak transverse superstructure on the later whorls (cf. Connolly, 1939, p. 567). Occasionally a population is encountered in which the transverse ridges on the shells are strongly developed, even on the later whorls (cf. the specimen illustrated by Fraga de Azevedo et al., 1961, pl. LVI.)

MELANOIDES VICTORIAE (Dohrn). (Fig. 32-33).

Previous records.

Apart from three localities in the central Transvaal (Connolly, 1939), Schutte and Frank (1964) also collected it from a few places in the south-eastern zone of south-eastern Transvaal in or near the Komati, Lomati and Black Umbuluzi rivers. Some of our own South African samples enumerated under *M.tuberculata* may include this species.

Taxonomy.

Connolly (1939) unites *M.crawfordi* with this species and remarks that his sole reason for preserving at least one of the two names (i.e. *M.victoriae*) is because the inland forms of the genus are smoother and less tuberculate than those (i.e. *M.tuberculata*) which appear to be extending their range westwards along the coast of Natal and is so common in fossil condition about the Kalahari. We have not had the opportunity to examine the type specimens of either *M.victoriae* or *M.crawfordi* nor other literature on these apart from Connolly (1939), but our specimens from the Park conform so well to the description given by this author for *M.victoriae* that we feel justified in regarding our specimens as true representatives of Dohrn's species.

Connolly (1939) remarks that certain features of shell sculpture, are also apparent in many more northern races attributable to Müller's species and may not be of specific value in the South African forms. Our samples of *Melanoides* from the K.N.P., however, definitely seem to be separable into two groups corresponding to *M.tuberculata* and *M.victoriae*.

The differences between *M.victoriae* and *M.tuberculata* become evident by referring to figs. 30-33. In the Park *M.victoriae* is the smaller of the two species (our largest specimen measures 21 mm. at about seven whorls) and its whorls increase more rapidly in diameter. The sides of these whorls of which the contour is not influenced by the heavy sculpture is flatter and the greatest diameter of each whorl is near its basal suture instead of on the equator as it is in *M.tuberculata*. The differences as regards to sculpturing are sufficiently dealt with by Connolly (1939) and need not be repeated here.

ASPATHARIA (SPATHOPSIS) WAHLBERGI (Krauss) (Figs. 34-35).

Previous records.

Haas (1936) records this species from five localities in the Park, one in Mocambique and one in Southern Rhodesia. Connolly (1939) records it from four localities in the central and northern Transvaal, one in Natal, one in Zululand, two in the south of Mocambique (Lourenco Marques Province) and five in Southern Rhodesia. It is also reported from south-eastern Transvaal by Schutte & Frank (1964).

Distribution. (Map 11).

Taxonomy.

According to Haas (1936) and Connolly (1939) the basic difference between this species and *A. petersi* (Martens) lies in the relatively higher altitude of *A. wahlbergi*. This statement is fully borne out by Fig. 37. Haas furthermore states that the anterior, dorsal and posterior margins are more evenly rounded in the latter species (Haas, 1936). Connolly (1939) maintains that the dorsal and basal margins, which diverge antero-posteriorly in *A. petersi*, are parallel in *A. wahlbergi*. According to Krauss (1845) fig. 1 in Tab. II and Haas' (1936) figs. 5 and 6 in Tab. 7 this statement seems to be incorrect. According to these figures the dorsal margin slopes upwards to the rear in both species, but markedly more so in *A. wahlbergi* than in *A. petersi*. Our specimens from the Park are in agreement with this.

The younger shells of *A. wahlbergi* have a nearly straight dorsal margin up to the point where the shell reaches its maximum altitude (Fig. 35), while in the larger shells it becomes gently curved (Fig. 34). The ventral margin in the younger shells is evenly rounded (Fig. 35) but straightens out slightly in the larger shells, sometimes displaying a slight upward curvature round about the mid-vertical line. In *A. petersi* the dorsal and ventral margins are nearly straight (Connolly, 1939), the latter sometimes displaying a curvature similar to but more marked than that occasionally found in *A. wahlbergi*.

It would also seem that in the K.N.P.-area *A. wahlbergi* reaches a larger maximum size than *A. petersi* (Fig. 37) although Haas (1939) reports a length of 171 mm. for the latter species.

The ratios calculated from our own measurements of Haas' (1936) figures and from the measurements given by Connolly (1939) are included in Fig. 37 and designated by a circle around the dot or cross.

ASPATHARIA (SPATHOPSIS) PETERSI (Martens) (Fig. 36).

Previous records.

Haas (1936) reports this species from six localities in the Park. In five of these they were found in the company of *A. wahlbergi*. He also reports it

from two localities in Southern Rhodesia, occurring in the company of *A.wahlbergi* in one of these. Connolly (1939) reports it from three localities in Mocambique and it is also reported from the south-eastern Transvaal by Schutte & Frank (1964).

Distribution. (Map 11).

We collected it in 21 localities in 14 of which *A.wahlbergi* was also present.

Haas (1936) remarks on the fact that *A.petersi* does not seem to extend its range as widely to the south and west as *A.wahlbergi* since it seems to be absent from Natal and central Transvaal. He further states that it is only in the east that they occur in the company of each other. On present evidence, unfortunately, we can neither confirm nor refute these claims.

UNIO CAFFER Krauss (Fig. 39).

Previous records.

Connolly (1939) describes this species as widespread in South Africa and supports this claim with an impressive list of localities which include localities in Natal, Zululand, Orange Free State, Cape Province, Namaqualand, Griqualand West and Bechuanaland. He also cites four localities in the Transvaal but adds that it is frequent in smaller streams in the Transvaal as far north as Pietersburg. He furthermore cites one locality in British Bechuanaland and six in Southern Rhodesia. The four localities listed for this species by Haas (1936) are shown together with our localities in Map 12. In strong contrast to the foregoing picture Fraga de Azevedo et al. (1961) record this species from one locality only in Mocambique north of the Zambesi river. These authors moreover based their identification on one juvenile specimen only, and, judging from their figures on plate IX one gets the impression that they might have been dealing with a juvenile specimen of the higher shelled species (*U.framesi* or *U.mossambicensis*) rather than with a juvenile specimen of *U.caffer*.

Distribution (Map 12).

U.caffer is fairly frequent in the Transvaal as far north as Pietersburg (Connolly, 1939). On the other hand it seems to be absent from Mocambique south of the Zambezi river and occurs sporadically in very limited numbers in the Park. Another interesting fact is that this species seems to be present only between the Olifants and the Levubu rivers, being absent from the waters between the Crocodile and the Olifants rivers. Haas (1936) reports it from the larger rivers in the Park i.e. the Letaba, Olifants and Crocodile rivers. These rivers together with the Levubu river originate deep inland and it is possible that *U.caffer* spread into the Park by way of these larger rivers. However, judging from the limited numbers in which it occurs, it does not

seem to be very successful in adapting itself to the environmental conditions prevailing in the eastern Transvaal Lowveld.

Taxonomy.

The great variability of this species (Connolly, 1939) becomes evident even in such a limited number of samples and specimens such as our own from the Park. Until such a time as more material could be obtained for analysis, further comments are inadvisable.

UNIO FRAMESI (Connolly) (Fig. 40).

Previous records and distribution. (Map 13).

Connolly originally described this species from a locality near Premier Mine, Pretoria, Transvaal but also records it from Gorongosa district and Inhanga in Mocambique. Haas (1936) records it from four localities in the Park which do not extend beyond the Letaba Rest Camp in the north and the Lower Sabie Rest Camp in the south.

Our own records consist of one sample from the Sabie river near its confluence with the Mlondozispruit, one from the Mlondozispruit itself and a third, consisting of one valve only, from the Nwanedzi dam. Haas' localities are included in Map 13.

Taxonomy.

It is largely due to the fact that Haas (1936) identified *U.framesi* from the Park that we assign our material to this species for, on the evidence available to us our specimens could, with a certain amount of justification, be identified as *U.mossambicensis* Mts. Connolly (1939), for example, cites an opinion that the beak sculpturing of the latter species, where discernible, shows two short lines of isolated pimples. A similar sculpturing on our young specimens from the Sabie river is illustrated in Fig. 40. Furthermore, the zigzag sculpturing and the fine green rays on the hinder end of juvenile shells of *U.mossambicensis* (Haas 1936) are also found on our juvenile material. On the other hand Fig. 38 seems to support us in our view that we are dealing with *U.framesi* as identified both by Connolly and Haas. In this figure the maximum height and maximum thickness of all our specimens from the Sabie river are plotted against their maximum length and, for purposes of comparison the equivalent measurements of *U.framesi* given by Connolly and Haas are included in the same figure.

CORBICULA AFRICANA (Krauss) (Figs. 41-43).

Previous records.

Connolly (1939) reports this species from four localities in the Transvaal, one in Natal, one in Zululand and two in Mocambique. To this last area

Fraga de Azevedo et al. (1961) ad seven localities and Schutte & Frank (1964) report its presence in south-eastern Transvaal. Haas (1936) lists this species from six localities in the Park three of which is confirmed by our own investigation.

Distribution (Map 14).

It is fairly well represented throughout the Park north of the Sabie river.

Taxonomy.

Haas (1936) recognises *C.albida albida* Krauss, *C.astartina* (Martens) and *C.fluminalis natalensis* Clessin from the Park. Connolly (1939) regards the last species as synonymous with *C.africana* and retains *C.albida* as a variety of the nominate species thereby acknowledging only *C.africana* and *C.astartina* as valid species. The same author states that, in the typical form at least, *C.astartina* is separable from its confrères. Haas (1936) reports *C.astartina* from the Letaba river at the Letaba river at the Rest Camp, but our series from this locality does not agree sufficiently with *C.astartina*, as regards the shell dimensions, to merit its inclusion under this species (table 3). Although populations are sometimes encountered in which the shells are relatively low compared with length (table 3, specimens from the Limpopo at S.A., S.R., and Mocambique border), thus approaching *C.astartina* in this respect, their thickness is appreciably greater than in this species, falling somewhere between the value for *C.astartina* and the rest of our samples.

It seems advisable, for the present at least, to refer all our specimens from the Park to *C.africana*, distinguishing at most the yellow coloured var. *albida* which was commonly encountered.

Figs. 42 and 43 depict two young shells of the *albida* type (from the Limpopo river) which illustrates the variation sometimes encountered in the coarseness of the costulae in one population (cf. Connolly, 1939 p. 620).

EUPERA FERRUGINEA Krauss. (Figs. 44-46).

Previous records.

This species is reported by Connolly (1939) from the Victoria Falls in Southern Rhodesia, from Avoca and Illovo Lagoon in Natal and Schutte & Frank (1964) remark on its presence in south-eastern Transvaal. Haas (1936) records this species from the Great Letaba river at the rest camp which comprises the only record from the Park.

Distribution. (Map. 15).

Taxonomy.

Pilsbry & Bequaert (1927) remark that Krauss' figure (1848, pl. 1, fig. 6) of the type was drawn free hand, which might explain the narrow anterior

TABLE 3.

COMPARATIVE DATA ON THE RATIOS LENGTH : HEIGHT AND LENGTH : THICKNESS OF THE CORBICULA MATERIAL FROM THE K.N.P. AND THE TYPE SERIES OF C.ASTARTINA

Locality	Number of specimens (Length range in brackets)	Mean value for L/H^\dagger (range in bracket)	Mean value for L/C^* (range in bracket)
Letaba river at Rest Camp	19 (8.4—13.0 mm)	1.21 (1.1—1.3)	1.82 (1.6—2.1)
Letaba river at bridge to Shingwedzi	17 (10.0—16.6 mm)	1.21 (1.1—1.3)	1.88 (1.7—2.0)
Klein Letaba river at Leleboem	11 (10.5—17.0 mm)	1.16 (1.1—1.2)	1.80 (1.7—1.9)
Letaba river, 3 miles downstream from bridge to Shingwedzi	4 (8.8—10.0 mm)	1.22 (1.2—1.3)	1.87 (1.7—2.0)
Letaba river at Bl. N223	5 (5.3—13.1 mm)	1.24 (1.2—1.3)	1.96 (1.9—2.0)
Sabie river at Kwelanini	1 (6.5 mm)	1.18	2.03
Olifants river at Balule	4 (12.3—14.7 mm)	1.17 (1.1—1.2)	1.80 (1.8)
Tsange dam	10 (14.5—20.0 mm)	1.10 (1.0—1.2)	1.68 (1.6—1.8)
Shingwedzi river at Spirowiri	5 (10.4—17.5 mm)	1.18 (1.1—1.2)	1.72 (1.7—1.8)
Shingwedzi river at João	7 (9.7—18.6 mm)	1.08 (1.0—1.1)	1.68 (1.6—1.8)
Levubu river at Nyala picnic spot	7 (8.4—14.8 mm)	1.22 (1.1—1.5)	1.81 (1.6—2.1)
Levubu river at Dongadziba	5 (9.2—13.9 mm)	1.20 (1.2)	1.92 (1.9—2.0)
Limpopo river at S.A., S.R. and Mocambique border	9 (7.4—12.8 mm)	1.23 (1.2—1.3)	2.00 (1.9—2.1)
Mphongola river at Mavatsani	4 (10.9—26.8 mm)	1.12 (1.1—1.2)	1.72 (1.7—1.8)
Type series: <i>C. astartina</i> (after Connolly, 1939)	7 (5.9—16.0 mm)	1.28 (1.2—1.5)	2.27 (2.0—2.5)

$^\dagger L/H$ = maximum length : maximum height

* L/C = maximum length : maximum thickness

end depicted in this figure. One or two similar specimens were, however, found amongst the specimens of a sample from the Park (Fig. 44). Specimens similar to that figured by Connolly (1939) were more frequently encountered. The three specimens figured (Figs. 44-46) represent the approximate range of variation in shell shape of the specimens collected in the Park.

A specimen from the Letaba river at Skukuza Rest Camp was submitted to Dr. Kuiper who identified it as *E. parasitica* (Deshayes). If this identification be accepted it would indicate a very isolated locality for this species in an area otherwise relatively well populated by what has hitherto been regarded as *E. ferruginea*. For this reason we compared the ratios of certain shell measurements of our material with those calculated from the equivalent measurements given for the type of *E. ferruginea* (Haas, 1936), the measurements given by Connolly (1939) for the same species and those given for *E. parasitica* and *E. ovata* (Mandahl-Barth, 1954). The values obtained are given in tables 4 and 5 from which we concluded that, in respect of these admittedly limited numerical data, there seems to be no valid reason for regarding our material as not being *E. ferruginea*. From the foregoing reasoning and the variability of our material as regards shell shape, sculpturing and pigmentation, we feel justified for the present to regard all the specimens from the Park as representing *E. ferruginea*.

The data in tables 4 and 5 indicate that the ranges of values for the ratio length/height of specimens from the Park vary but slightly, indicating that the height of the shells relative to length is fairly constant not only within a population but also in different populations. The rather high value obtained in the case of the three specimens from the Sand river bridge (table 5) is due to a large and longish specimen which greatly influences this value.

On the other hand, the ratio length/thickness varies more than in the case of ratio length/height, indicating that the length of the shell relative to cross diameter is a more variable characteristic.

PISIDIUM PIROTHI Jickeli (Fig. 47).

The taxonomic history of this species has been dealt with by Kuiper (1957 & 1964), and we are indebted to this author for identification of our specimens from the Letaba river.

Distribution. (Map 15).

This species was first collected in South Africa only in the Letaba river at the Rest Camp by Haas in 1931 (Haas, 1936 fide Kuiper, 1964) and was again obtained from the same locality in 1963 during one of our collecting trips. Excluding this locality it was found to be present only in the Sabie river system. Figure 47 represents a specimen from the Mlondozi river at its confluence with the Sabie river.

TABLE 4.

COMPARATIVE DATA ON THE RATIOS LENGTH : HEIGHT AND LENGTH : THICKNESS OF THE EUPERA MATERIAL
FROM THE K.N.P.

Locality	Number of specimens (Length range in brackets)	Mean value for L/H† (range in brackets)	Mean value for L/C* (range in brackets)
Phugwane dam	4 (3.7—5.9 mm)	1.45 (1.4—1.5)	2.07 (2.0—2.1)
Nwanedzi dam	4 (5.9—7.0 mm)	1.50 (1.5—1.5)	2.17 (2.1—2.3)
Shingwedzi-poort	4 (4.8—6.5 mm)	1.45 (1.4—1.5)	2.17 (2.1—2.2)
Levubu river at Shizivani	12 (5.0—6.1 mm)	1.43 (1.4—1.5)	1.93 (1.9—2.1)
Letaba river at bridge to Shingwedzi	57 (3.3—8.9 mm)	1.46 (1.4—1.7)	2.06 (1.8—2.3)
Munywinispruit	12 (4.1—8.2 mm)	1.39 (1.3—1.5)	2.18 (2.0—2.3)
Orpen Dam	3 (4.4—6.1 mm)	1.43 (1.4—1.5)	2.13 (2.1—2.2)
Sabie river at bridge near Rest Camp	55 (5.0—8.8 mm)	1.42 (1.3—1.5)	1.95 (1.8—2.1)
Gudzani Dam	20 (5.3—8.9 mm)	1.50 (1.4—1.6)	2.19 (2.0—2.3)
Sand river bridge at Skukuza	3 (3.8—8.1 mm)	1.57 (1.5—1.7)	2.00 (1.8—2.1)

† L/H = maximum length : maximum height

* L/C = maximum length : maximum thickness

TABLE 5.

COMPARATIVE DATA ON THE RATIOS LENGTH : HEIGHT AND LENGTH : THICKNESS OF EUPERA FERRUGINEA,
E. PARASITICA AND E. OVATA.

Identity	Locality	Number of specimens (Length range in brackets)	Mean value for L/H† (range in brackets)	Mean value for L/C* (range in brackets)
E. ferruginea	K.N.P. (10 populations)	174 (3.7—8.9 mm)	1.46 (1.39—1.57)	2.08 (1.93—2.19)
E. ferruginea (type; Krauss, 1848)	Knysna river, Cape Province	1 (3.2 mm)	1.33	2.28
E. ferruginea (Connolly, 1939)	Avoca?	1 (6.7 mm)	1.34	2.09
E. parasitica (Mandahl-Barth, 1954)	Jinja Bay?	1 (7.5 mm)	1.50	2.34
E. ovata (Mandahl-Barth, 1954)	Fort Portal?	1 (6.0 mm)	1.33	2.00

† L/H = maximum length : maximum height

* L/C = maximum length : maximum thickness

BURNUPIA and *FERRISSIA* species.

The taxonomy of the Ancyliidae of Southern Africa is in a very unsatisfactory condition owing to the fact that, excluding morphological studies on one or two *Burnupia* species practically nothing is known of the soft anatomy of the remaining species belonging to these genera. To this end we refrained from naming the specimens collected in the Park and present here only the distribution of both genera (Map 16).

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Resumé

Based on collections made over a period of ten years, the distribution and present day taxonomic status of the freshwater molluscs of the Kruger National Park is discussed, elucidated by a series of distribution maps and illustrations. Identification to species level was not always possible due to insufficient material available in some cases.

A superficial zoogeographical treatment of its mollusc fauna supports the idea that the Kruger National Park constitutes part of a transitional area between the tropical fauna of Mocambique and the non-tropical fauna of the central highlands.

REFERENCES

- Azevedo, J. F. de, Medeiros, L. and Faro, M. (1957) — Os moluscos de agua doce do Ultramar Portugues. 2. Moluscos do Sul do Save (Mozambique). Estudos, Ensaios e Documentos, 31 : 1-116, 34 pls. Ministerio do Ultramar, Lisboa.
- Azevedo, J. F. de, et al. (1961) — Os moluscos de agua doce do Ultramar Portugues. 3. Moluscos de Mozambique. *ibid*: 88 : 1-394, 62 pls., 62 figs.
- Van Aardt, W. J. (1961) — Bydraes tot die morfologie van *Bulinus* (*Physopsis*) *africanus* (Krauss) (Mollusca: Basommatophora). M.Sc. thesis: Univ. Potchefstroom.
- Barnard, K. H. (1948) — Addendum to Connolly (1939).
- Brown, D. S. (1965) — Freshwater gastropod mollusca from Ethiopia. *Bull. Brit. Mus. nat. Hist.*, 12 (2): 37-94, 47 text figures.
- Brown, D. S. (1966) — Os certain morphological features of *Bulinus africanus* and *Bulinus globosus* (Mollusca: Pulmonata) and the distribution of these species in south eastern Africa. *Ann. Natal Mus.* 18:401-415.

- rBown, D. S. (1967) — A review of the freshwater Mollusca of Natal and their distribution. *Ann. Natal. Mus.* 18(3):in press.
- Brynard, A. M. (1964) — The influence of veld burning on the vegetation and game of the Kruger National Park. In Davis, D. H. (Ed.), *Ecological studies in S.A.* Junk, The Hague. pp. 371-393.
- Codd, L. E. W. (1951) — Bome en struik van die Nasionale Kruger Wildtuin. Plantkundige opname pamflet No. 26, pp. 1-192. Staatsdrukker, Pretoria. Vert. H. P. van der Schyff.
- Connolly, M. (1939) — A monographic survey of South African non-marine Mollusca. *Ann. S.A. Mus.*, 33 : 1-660.
- Van Eeden, J. A. (1959) — Report to the South African Council for Scientific and Industrial Research. (Unpublished).
- Van Eeden, J. A. and Brown, D. S. (1966) — The colonisation of fresh waters in the Republic of South Africa by *Lymnaea columella* Say (Mollusca: Gastropoda). *Nature, Lond.* 210:1172-1173.
- Van Eeden, J. A., Brown, D. S. and Oberholzer, G. (1965) — The distribution of freshwater molluscs of medical and veterinary importance in south-eastern Africa. *Ann. trop. Med. Paras.* 59 : 413-424.
- Van Eeden, J. A. and Oberholzer, G. (1965) — On the occurrence of *Bulinus* (*Bulinus*) *reticulatus* M-B. (Mollusca) in South Africa. *Ann. Mag. nat. Hist. Series 13*, 8 : 403-407.
- Frank, G. H. (1964) — The ecology of the intermediate hosts of bilharzia. In Davis, D. H. (Ed.) *Ecological studies in S.A.* Junk, The Hague. pp. 353-362.
- Haas, F. (1936) — Binnen-Mollusken aus Inner-Afrika. *Abh. Seckenberg. naturf. Ges.*, 431 : 1-156, Frankfurt a.M.
- Krauss, F. (1848) — Die südafrikanischen Mollusken, Ebner und Seubert, Stuttgart. pp. 1-140.
- Kuiper, J. G. J. (1964) — Contributions to the knowledge of the South African species of the genus *Pisidium* (Lamellibranchiata). *Ann. S.A. Mus.*, 48 (3): 77-95.
- Mandahl-Barth, G. (1954) — Freshwater Mollusca of Uganda and adjacent territories. *Ann. Mus. Afr. centr. Tervuren*, 32 : 1-206, 96 figs.
- Mandahl-Barth, W. (1957) — Intermediate hosts of *Schistosoma*: *Africana Biomphalaria* and *Bulinus*. *Bull. Hlth. Org.*, 16 : 1103-1163 and 17 : 1-65.
- Mandahl-Barth, G. (1965) — The species of the genus *Bulinus*, intermediate hosts of *Schistosoma*. *Bull. Wld Hlth Org.*, 33 : 33-44.
- Pienaar, U. de V. (1963) — The large mammals of the Kruger National Park — their distribution and present day status. *Koedoe* 6 : 1-38.
- Pienaar, U. de V. (1964) — The small mammals of the Kruger National Park — a systematic list and zoogeography. *Koedoe* 7 : 1-25.
- Pilsbry, H. A. and Bequaert, J. (1927) — The aquatic mollusks of the Belgian Congo with a geographical and ecological account of Congo malacology. *Bull. Amer. Mus. nat. Hist.* 53 (2) : 69-602, 67 pls., 93 figs.
- Poynton, J. C. (1960) — Preliminary note on the zoogeography of the Amphibia in Southern Africa. *Science* (56) 12 : 307.

- Poynton, J. C. (1964) — The biotic divisions of Southern Africa as shown by the Amphibia. In Davis, D. H. (Ed.) Ecological studies in S.A. Junk, The Hague. pp. 206-218.
- Roberts, A. (1951) — The Mammals of South Africa. Trustees of "The Mammals of S.A." Book Fund, Johannesburg.
- Schutte, C. H. J. and Frank, G. H. (1964) — Observations on the distribution of freshwater Mollusca and chemistry of the natural waters in the south-eastern Transvaal and adjacent northern Swaziland. Bull. Wld Hlth Org., 30 : 389-400.
- Wright, C. A. (1961) — Taxonomic problems in the molluscan genus *Bulinus*. Trans. Roy. Soc. trop. Med. hyg., 55 (3): 225-231.
- Wright, C. A. (1963) — The freshwater gastropod molluscs of western Aden Protectorate. Bull. Brit. Mus. (nat. Hist.), 10 (4): 257-274, 2 pls., 12 figs., 1 map.
- Wright, C. A. (1963) — The freshwater gastropod Mollusca of Angola. Bull. Brit. Mus. (nat. Hist.), 10 (8) : 447-528, 16 pls., 126 figs.