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HYDROBIOLOGIA

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Mountain Streams of the Barberton Area, Eastern Transvaal. Part I, A Survey of the Fauna

Also Part II

by

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(with 3 figs. and 5 photos)

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Mountain Streams of the Barberton Area, Eastern Transvaal. Part I, A Survey of the Fauna

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INTRODUCTION

In the introduction to their studies of the Great Berg River, Western Cape Province, HARRISON & ELSWORTH (1958) drew attention to the fact that theirs was the first detailed chemical and biological investigation of an entire South African river system, for the most part unpolluted. Prior to this, practically nothing was known of South African rivers except for incidental information gleaned from taxonomic papers on a few animals found in streams. This was followed by subsequent studies: OLIFF (1960) conducted a similar survey on the Tugela river system in Natal; ALLANSON (1961) studied the Jukskei-Crocodile river systems; HARRISON & AGNEW (1962) considered the streams of the Western and Southern Cape Province, and CHUTTER (1963) has surveyed the Vaal River. Of these, those of HARRISON & ELSWORTH (1958), OLIFF (1960) and HARRISON & AGNEW (1962) embraced the mountain stream and foothill reaches, with their characteristic communities. Sampling from other regions and notably OLIFF'S (1960) survey of the Tugela River made it apparent that a component of the fauna found in the Berg River and its tributaries did not recur elsewhere. To determine the limits of

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this apparently endemic "acidobiontic" fauna of the South Western Cape and to examine the affinities of the fauna of this area, HARRISON & AGNEW (1962) investigated the streams flowing off the Eastern extensions of the Table Mountain sandstone system between Cape Town and Port Elizabeth. They showed that there was a fauna endemic to the acid streams of the Southern Cape which extended eastwards to the limits of the Table Mountain sandstone system. In the less acid streams were found species more characteristic of the temperate Transvaal highveld and the Natal highlands.

OLIFF (1960) concluded that the fauna of the Tugela was transitional between temperate and subtropical. This, however, was based on comparisons which were acknowledged to be inadequate.

It was the intention, then, of this survey to add to the knowledge of the faunal communities of the upper reaches of rivers by studying streams in an area in which no studies had been made, and by comparison of the results of this survey with the small body of existing literature, to assess the faunal affinities. The survey was conducted in the Barberton area of the Eastern Transvaal (see maps, Fig. 1 and 2) where the mountain streams have their origins on the escarpment of the highveld and flow down into the lowveld below.

In addition, the possibility of extensive development of mining operations in the area suggested that a descriptive survey of existing conditions would be invaluable as a basis for future pollution studies.

GENERAL DESCRIPTION OF THE AREA AND STREAMS

Topography

In the Barberton district of the Eastern Transvaal (Fig. 1) streams having their origins on the great escarpment of the highveld, and on the Makonjwa range (5,000 to 6,000 feet), flow steeply into the valley below (2,000 to 2,500 feet) to form or flow into the Queens River, which, after joining the Suidkaap and subsequently the Noordkaap Rivers, flows into the Crocodile River near Kaapmuiden.

The kloofs and upper valleys are generally well wooded, but especially in their lower reaches, some are without shading for considerable distances.

The mean annual rainfall, which falls predominantly in the summer months, amounts to between 75 and 100 cm.

The mean monthly air temperature for January and July are 23.3°C and 15.5°C respectively, while the mean maximum temperature for January, and the mean minimum temperature for July are 28.5°C and 9.2°C respectively. The absolute maximum and minimum being 41.1°C and 1.6°C respectively (Weather Bureau Publications nos. 19 and 20.).

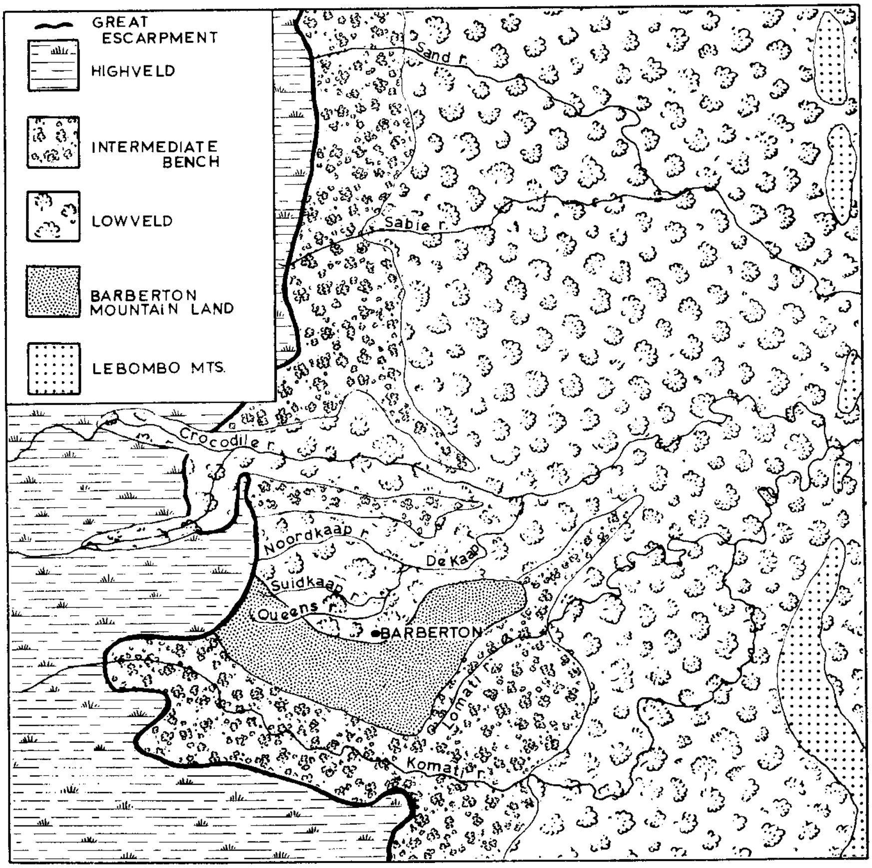

Fig. 1. Topography of the Barberton area.

Geomorphology of the area drained by the streams under investigation

The great escarpment of the highveld on the West, and the lowveld on the East, stretches for 100 miles from North of the Olifants River to the "Duiwels Kantoor" at the head of the De Kaap Valley. These rocks belonging to the Transvaal and other systems, rest upon older granite rocks which underlie most of the lowveld to the East. In the South, the escarpment is less bold as it passes round the head of the upper valley of the Komati River, and it is overshadowed by the mass of the Barberton Mountain Land (including the Makonjwa range). This is an easterly projection of the highveld formed by a great succession of rocks comprising the Primitive Systems. It is this mountain mass which is drained by all the streams under investigation.

Water-types, bottom characteristics and zonation

ALLEN'S (1951) classification of water types is used. The streams are divided into pools, flats, stickles and cascades. This classification was utilized by HARRISON & ELSWORTH (1958) who have defined these types. In addition, the use of their term "backwater" to denote "small sheltered parts of the stream out of the main current" has been adopted. A new category, namely "sprayed flanking regions" is used to denote the perpetually sprayed regions flanking the cascades.

Stones, sand and mud were the predominant bottom types. Marginal and submerged aquatic vegetation were so seldom encountered that they were considered atypical and consequently not sampled.

The mountain stream region surveyed falls entirely within Zone II, the Mountain Torrent zone, and Zone III, the Foothill Stony Run zone of HARRISON & ELSWORTH (1958). (Sponges and cliff waterfalls making up their Zone I are absent).

THE FAUNA

Sampling stations are indicated on the map (Fig. 2). Each station was sampled using recognised techniques suitable for the form of the stream at the station. The bulk of the sampling took place during the period January to July, 1961 with intermittent sampling of certain groups, individuals and regions throughout the following two years.

Due to the general lack of taxonomic knowledge of the larval and nymphal forms of southern African stream animals, identification of many groups is not yet possible. Those species which can be separated but not identified to species have been recorded in the tables below, under family or generic name accompanied by an arbitrary number, e.g. Tipulidae sp. 5. In the species list the catalogue reference number accompanies the name of the animal, e.g. Tipulidae sp. 5 (BTN 10 B). Catalogues and reference collection are housed in the National Institute for Water Research (N.I.W.R.), South African Council for Scientific and Industrial Research, Pretoria, where they are accessible to systematists. It is hoped that many of the taxonomic gaps will in due course be filled.

In a few instances, notably the Coleoptera, the species is accorded an N.I.W.R. reference letter or number. This indicates that the species in question has not been identified but has been found to be identical to that species in the reference collection of the National Institute for Water Research, Pretoria.

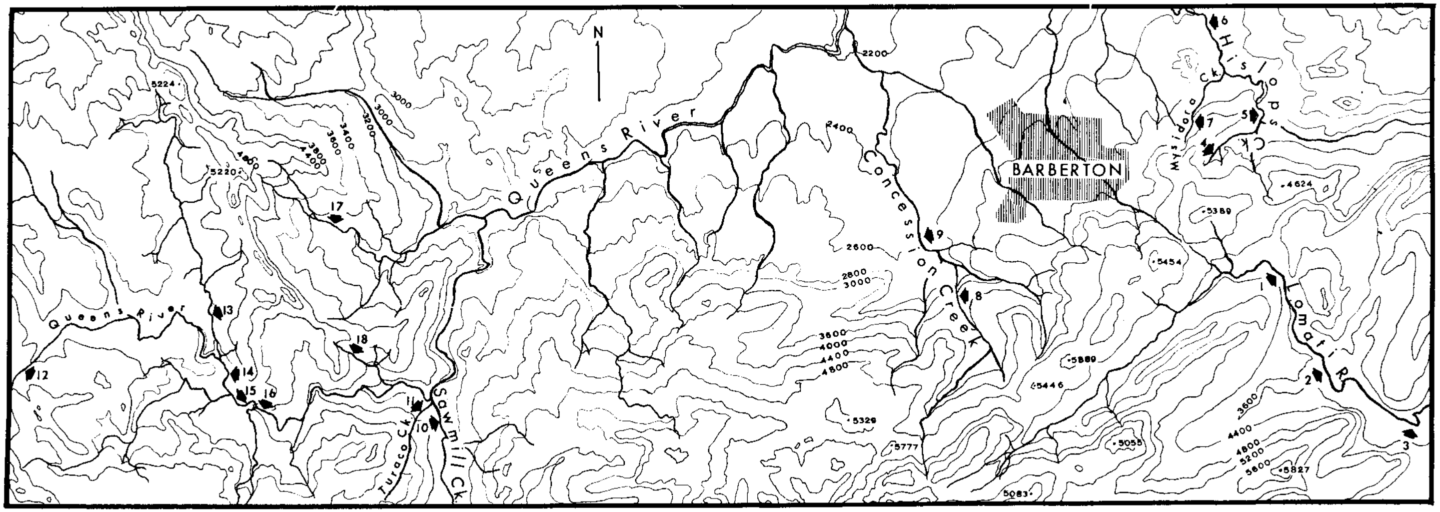

Fig. 2. Map of the streams sampled in the Barberton Area.

In presenting the results, the stations sampled are grouped into those providing similar biotopes. These are:

1. Cascades (Plate I a)
2. Sprayed Flanking Regions (Plate I b)
3. Stickles (Plate II a)
4. Backwaters (Plate II b)
5. Pools (Plate III)

1. Cascades

Two stations (3 and 16) are included in this group. Quantitative samples were taken at both stations using a cascade net. (Table I).

Station 3: This cascade was formed from the overflow of a large pool down a steep rock mass. Two samples were taken by scrubbing three areas, each of one square metre, immediately upstream of the cascade net.

Station 16: This cascade tumbled over a long 45° sloping rock face, (Plate I a). Two samples were taken in the same way as in Station 3, but only one square metre of rock was scrubbed in each case. In addition, a great deal of haphazard, non-quantitative sampling was carried out.

The distribution of most species within the cascade region is often extremely localized and then may be very dense. For this reason the results expressed in Table I do not reflect the actual composition or incidence of the cascade fauna but only the numbers found in the sample taken. The results of the additional non-quantitative sampling are reported below.

Station 3, was not easily accessible, very little sampling was carried out and this yielded no new information.

Station 16, the entire cascade surface was closely examined using S.C.U.B.A., (self-contained underwater breathing apparatus) and many samples were taken.

TABLE I

The fauna of the cascades: the quantitative sampling results.

The figures given are for number of individuals per one square metre.

		Station 3 (May 1961)		Station 16 (May 1961)	
Species	Sample No.	1	2	1	2
TURBELLARIA					
Planaria spp.		1	—	—	3
NEMATODA		—	—	3	34

TABLE I (Continued)

	Station 3 (May 1961)		Station 16 (May 1961)	
Species	1	2	1	2
OLIGOCHAETA				
Nais sp. 1	—	—	—	20
EPHEMEROPTERA				
Baetis harrisoni BARNARD	23	2	40	30
Acentrella natalensis CRASS	—	1	81	257
Centroptiloides bifasciatum LEST.	—	2	—	—
Caenidae sp. 1	1	—	—	—
Afronurus ? harrisoni	—	—	1	—
HEMIPTERA				
Micronecta dimidiata POISSON	—	—	1	—
TRICHOPTERA				
Hydropsyche sp. 1	1	—	3	—
Cheumatopsyche ? afra	—	1	—	5
Hydroptila sp. nov. det. K. M. F. SCOTT	2	—	17	3
Hydroptila ? cruciata	1	—	—	—
Orthotrichia sp. nov. det. K. M. F. SCOTT	—	—	2	—
LEPIDOPTERA				
Pyralididae ? *Elophila* sp. 2	—	—	—	1
COLEOPTERA				
Hydraenidae adult (N.I.W.R. type C)	—	—	—	2
Elmidae larvae (N.I.W.R. type 2)	16	2	25	1
DIPTERA				
Blepharoceridae larvae & pupae (? *Elporia* sp. 1)	50	41	—	—
Tipulidae sp. 10	—	1	—	—
Simulium spp. larvae	1	9	345	590
Chironomidae spp.	—	5	437	112
Tanytarsini spp.	37	—	—	—
Tanytarsus sp. 15	—	—	—	690
Orthocladinae spp.	31	—	1	—
Atrichopogon sp. 1	—	—	1	—
MOLLUSCA				
Burnupia sp. 1	90	—	—	—
TOTAL NUMBER OF ORGANISMS	254	64	956	1,748

A single specimen of the mayfly which AGNEW suggests is a new species of *Oligoneuriopsis* was taken from the smooth rock face of the cascade. Whether this is the typical niche of this species is not evident.

A number of other mayfly nymphs were common in this cascade. Of these, *Acentrella natalensis* was characteristically found in the swiftest regions. *Pseudocloeon maculosum* CRASS, *Baetis harrisoni*, *B. cataractae* CRASS, *Centroptilum sudafricanum* LEST., *C. parvum* CRASS and *C. varium* CRASS were all taken from beneath broken water, although their greatest numbers were always at the point immediately preceding the break up of water to form the cascade proper. Each of these species appeared to favour nooks with some shelter from the main flow. Of these, *Baetis harrisoni* was the most abundant and appeared to venture into regions of stronger flow than the others. Samples taken in March, 1961, showed high incidences of *Baetis cataractae* from this cascade (Station 16) and another. A few specimens of *Centroptilum excisum* BARNARD were taken from a sheltered region of the cascade. Small numbers of *Centroptiloides bifasciatum* were consistently taken, and a high density of Caenidae sp. 1 was found in a thick patch of *Potamogeton* (water grass) growing on the smooth rock forming the cascade substratum. Here they were probably protected from excessive turbulence.

Hydropsyche sp. 1 was the most abundant caddis fly. Its nets were found in all crevices beneath broken water, and in great numbers attached to the stems of *Potamogeton*, where their density was about 600 per sq. m. Another commonly found trichopteran was *Hydroptila*? *cruciata* of which the algal pupal cases were found in large numbers on the rock faces in the slower water of the cascade.

Larvae of two species of aquatic moths (Pyralididae) were abundant in the most swiftly moving parts of the cascades. These have been identified as probably being two species of *Elophila*. One was found beneath silken canopies approximately 5.0 cm in length attached to the rock. The other was found in high densities (about 675 per sq. m) in a *Potamogeton* patch. Their cases (about 2.0 cm long) were constructed from longitudinally arranged stalks of the "water grass" to which they were attached.

A large black elmid (Coleoptera) larva (N.I.W.R. type 2) occurred abundantly on more uneven patches beneath broken water, and an unidentified black beetle (Coleoptera BTN 110 A) was sometimes found in the sheltered regions behind water falling over sheer or overhanging rock faces.

Predaceous tabanid flies were constantly seen either walking over the sprayed flanking regions or hovering and darting over broken water awaiting the emergence of the adults and imagos of the stream forms. This habit is typical of empidid and asilid flies but is unusual for tabanids.

Black flies, *Simulium nigritarsis* COQUILLET, *S. medusaeforme* POMEROY and *S. debegene* DE MEILLON, were obtained by breeding out the collected pupae.

High incidences of the gastropod, *Burnupia* sp. 1 were found both in the main flow of the cascade and in the less turbulent side reaches.

From the base of the cascade at Station 7, *Baetis harrisoni*, *Centroptilum sudafricanum* and *C. varium* were taken in large numbers.

2. Sprayed flanking regions

This biotope is inevitably connected with the previous, as its existence is due to the spray from the cascades. Here many forms emerging from the cascade lay their eggs. Large numbers of imagines of *Pseudocloeon maculosum* were found ovipositing, and *Hydropsyche* sp. 1 egg masses were abundant. The spray trickled over clean rock faces or among moss and algae and here the numbers of animals found was higher than in any other biotope.

Two quantitative samples were taken from the moss covered rock faces at Station 7. The technique employed was that first used by PERCIVAL & WHITEHEAD (1929) to sample fine deposits, and subsequently adapted by them for moss samples. A round tin, with a cross sectional area of 75 sq m. replaced the square box used by them, but in all other respects the method was identical. The tin was placed over the moss and a blade run around the sides to free the vegetation, thus no loss was incurred and quantitatively accurate samples were taken. The results of the samples were pooled and are presented together in Table II. In addition, random samples were taken from Stations 7 and 16, and other similar biotopes.

Station 7: A single specimen of *Tallitroides* sp. (Amphipoda), a number of larvae of a very large tipulid (near *Dolichopeza*) and several larvae of a stratiomyid (near *Euparyphus*) were taken from similar moss clusters.

The fine-grained mud tubes (5 to 7 cm long) of a psychomyid (Trichoptera) probably *Tinodes* sp. were abundant (about 80 per square metre) on smooth damp rock faces.

Station 16: High densities (about 2,000 per square metre) of the turbellarian, *Dugeusia neumanni* (NEPPI) were found in thick algal mats on the steep damp rock faces.

Although high incidences of *Elporia* sp. 1 (Blepharoceridae) were found in cascade at Station 3, their greatest aggregations at this station were found only a few centimetres out of fast flowing water on exposed regions of rock which were being regularly immersed at short intervals by waves. This species was found at only one other site in the area and here it was found in low densities in a thin "trickle" on a steep rock face flanking a cascade.

Adult tabanids were abundant on the rock faces at all sprayed flanking regions. These and the Mountain wagtails (*Motacilla clara* *torrentium* TICEHURST) are the most important predators in this biotope.

TABLE II

The fauna of the sprayed flanking regions: the quantitative sampling results.
The figures given are for number of individuals per 75 square cm.

Species	Station 7 May 1961
TURBELLARIA	
Planaria spp.	25
NEMATODA	1,244
OLIGOCHAETA	
Limnodrilus sp. 1	1
HYDRACARINA	8
TRICHOPTERA	
Cheumatopsyche ? thomasetti	20
Hydroptilidae sp.	7
Orthotrichia sp. 1	21
COLEOPTERA	
Hydraenidae adult (N.I.W.R. type B)	1
DIPTERA	
Tipulidae sp. 6	1
Simulium spp.	3
Tabanidae sp. 1	1
Empididae sp. 1	2
Orthocladinae spp.	17
Tanytarsini spp.	40
Bezzia sp.	245
TOTAL NUMBER OF ORGANISMS	1,636

Intertwined masses of the fine sand and detritus tubes of a species of *Tanytarsus* were found among algal mats covering sheer damp stone faces.

Tadpoles of the frog *Heleophryne natalensis* (Leptodactylidae) were found attached to stone surfaces covered by a thin trickle of water. These have a remarkable ability to cling to sheer and even overhanging rock faces by means of their large suctorial mouth.

3. Stickles

This biotope lent itself to quantitative sampling and was almost exclusively sampled with a one sq. ft Surber sampler. Sampling took place at stations 4, 8, 9, 10, 11, 12, 13, 15 and 17; the results of which are recorded in Table III. In addition to these stations, stickles at stations 1, 2, 6, 10, 8 and 9 were sampled in the investigation reported in Part II of this paper.

TABLE III

The fauna of the stickles: the quantitative sampling results.
The figures given are for numbers of individuals per 900 square cm.

	Stn. 4 May 1961		Stn. 11 May 1961	Stn. 12 May 1961	Stn. 13 May 1961		Stn. 15 May 1961	Stn 17 May 1961	
pecies Sample:	1	2	1	1	1	2	1	1	2
IYDRIDA									
Hydra sp.	—	—	2	—	—	—	—	—	—
'URBELLARIA									
Planaria spp.	9	1	—	1	—	—	—	—	—
JEMATODA	16	24	6	—	8	8	8	—	—
)LIGOCHAETA									
Pristina sp.	8	—	—	—	—	—	—	—	—
Nais spp.	—	16	—	—	82	16	8	—	—
Lumbriculus spp.	50	—	—	—	—	—	—	4	4
)STRACODA	16	—	8	—	—	—	—	8	—
'OPEPODA	—	—	8	—	—	—	8	—	28
IYDRACARINA	—	24	4	—	64	—	—	18	16
'LECOPTERA									
Neoperla spio (NEUM.)	—	—	2	1	8	—	—	4	—
'PHEMEROPTERA									
Baetidae juvs.	—	—	—	—	40	—	—	—	16
Baetis harrisoni	—	—	—	—	5	26	36	4	7
Centroptilum sudafricanum	136	76	16	28	—	—	—	3	—
Caenidae sp. 1	—	—	2	6	7	1	1	7	33
Tricorythus discolor (BURM.)	—	—	—	—	—	—	3	6	—
Adenophlebia auriculata EATON	52	50	21	8	—	—	2	—	—
Castanophlebia calida BARN.	69	16	8	31	—	—	—	5	—
Euthraulus elegans BARN.	—	—	—	—	—	—	—	5	4
Afronurus ? harrisoni	—	—	—	—	1	1	5	8	2

Table 3: (Continued)

Species	Sample:	Stn. 4 May 1961 1	Stn. 4 May 1961 2	Stn. 11 May 1961 1	Stn. 12 May 1961 1	Stn. 13 May 1961 1	Stn. 13 May 1961 2	Stn. 15 May 1961 1	Stn 17 May 196 1	Stn 17 May 196 2
ODONATA										
Zygopteran juvs.		10	8	—	3	—	—	—	—	—
Chlorolestes sp.		—	—	4	—	—	—	—	—	—
Paragomphus cognatus Ramb.		—	—	2	—	—	1	—	2	4
Aeschna rileyi Calvert		—	—	—	—	—	—	1	—	—
Phyllomacromia sp.		—	—	—	—	—	—	—	—	2
Zygonyx sp. 1		—	—	—	—	3	—	—	—	—
HEMIPTERA										
Microvelia sp. 1		—	—	—	—	—	—	—	1	16
Laccocoris limnigenus Stal		—	—	—	—	—	1	—	—	—
TRICHOPTERA										
? *Protomacronema* sp. 1.		51	29	—	—	—	—	—	—	—
Cheumatopsyche ? *afra*		—	—	2	—	12	1	—	20	—
Cheumatopsyche ? *thomassetti*		—	—	2	3	—	—	9	35	—
Chimarra spp.		1	—	2	—	—	—	3	2	—
Hydroptila sp. nov. det. K. M. F. Scott		—	—	—	—	6	—	4	—	—
Georodes sp. 1		—	1	8	—	—	—	—	3	2
? *Adicella* sp. 1		—	—	—	2	—	—	—	—	—
? *Psychomyia* sp. 1		—	—	—	—	—	—	—	13	1
LEPIDOPTERA										
? *Nymphula* sp.		—	—	—	2	—	—	—	—	—
COLEOPTERA										
Orectogyrus sp.		1	1	—	—	—	—	—	1	—
Hydraenidae adult (N.I.W.R. type B)		—	—	—	—	6	—	—	—	—
Psephenidae sp. 1		—	—	2	—	—	—	—	3	—
Elmidae larvae (N.I.W.R. type 1)		—	—	17	2	243	134	2	20	5
Elmidae larvae (N.I.W.R. type 2)		—	—	—	—	—	—	—	1	—
Elmidae larvae (N.I.W.R. type 6)		—	—	—	—	—	—	—	—	12
Elmidae adult (N.I.W.R. type D)		—	—	—	—	—	—	—	2	—
Elmidae adult										

	Stn. 4 May 1961		Stn. 11 May 1961	Stn. 12 May 1961	Stn. 13 May 1961		Stn. 15 May 1961	Stn 17 May 1961	
pecies Sample:	1	2	1	1	1	2	1	1	2
(N.I.W.R. type F)	—	—	—	—	—	—	—	2	—
Ptilodactylidae larvae sp. 1	—	—	—	—	72	1	—	—	—
Helodidae nr. *Hydrosiphon* sp.	13	2	7	5	24	—	—	—	—
IPTERA									
Tipulidae sp. 2	1	—	—	—	—	—	—	—	—
Tipulidae sp. 4	—	—	—	4	15	—	—	1	—
Tipulidae sp. 6	3	—	—	—	—		—	—	—
Tipulidae sp. 7	—	—	2	7	—	—	—	—	—
Tipulidae sp. 8	—	—	—	—	81	27	—	—	—
Tipulidae sp. 9	—	—	—	5	—	—	—	—	—
Tipulidae sp. 12	—	—	—	1	—	—	—	—	—
Tipulidae sp. 14	—	—	2	—	—	—	—	—	—
Dixidae sp. 1	1	—	—	—	—	—	—	—	—
Simulium spp.	10	20	7	4	6	1	33	—	—
Pentaneura spp.	11	204	4	7	3	—	—	4	10
Orthocladinae spp.	—	1	27	3	175	26	38	26	30
Orthocladinae sp. 1	—	—	—	—	—	—	—	1	—
Orthocladinae sp. 5	8	—	—	—	—	—	—	—	—
Orthocladinae sp. 7	—	—	21	—	—	—	—	3	—
Orthocladinae sp. 8	9	—	—	—	—	—	—	—	—
Corynoneura sp.	—	132	—	—	—	—	—	—	—
Chironomini spp.	3	10	—	11	60	35	10	13	13
Chironomini sp. 4	—	—	7	—	—	—	—	2	—
Tanytarsini spp.	32	21	6	2	66	26	30	202	9
Atrichopogon sp. 1	8	2	—	1	—	—	24	—	—
Bezzia spp.	9	14	8	2	33	—	—	—	18
Tabanidae sp. 2	—	—	—	—	—	—	3	1	1
Rhagionidae near *Atherix*	3	3	12	—	—	—	—	—	—
Empididae spp.	8	—	2	—	9	—	—	—	—
IOLLUSCA									
Burnupia sp. 1	—	—	2	—	6	—	—	—	—
OTAL NUMBER OF ORGANISMS	538	655	223	161	1,038	305	228	420	234

In a qualitative sample taken in March, 1961, at Station 15, *Baetis cataractae* appeared in moderately high numbers. This station is immediately above a cascade (Station 16), where it was abundant at the same time. *Centroptilum sudafricanum* was also abundant at Station 15, but its numbers fell off in the cascade, (Station 16). *Centroptilum varium* was present in low numbers in March, 1961, at Stations 15, 17 and 18, and *Adenophlebia auriculata* was present at Stations 13 and 18 during this month.

The pupae of *Simulium nigritarsis*, *S. medusaeforme*, *S. hirsutum* Pomeroy and *S. alcocki* Pomeroy were taken.

Finally, the frogs *Rana angolensis* and *Rana oxyrhynchus* were both commonly associated with this biotope.

4. Backwaters

Two samples were taken at each of seven stations (i.e. Stations 1, 2, 4, 6, 8, 9 and 10). The nature of this biotope precluded the possibility of sampling quantitatively and the samples were collected by stirring up the sand, mud and/or debris with a handnet until sufficient material had been collected to half-fill a 16 ounce collecting jar.

No additional qualitative sampling was carried out. The results recorded in Table IV.

Due to their extremely irregular distribution, the hemipteran families, although well represented in backwaters, have generally been neglected in the survey. The following were, however, frequently taken from this biotope:

Table IV

The fauna of the backwaters: the qualitative sampling results. The figures given are for number of individuals per sample.

Species	Stn. 1		Stn. 2		Stn. 4		Stn. 6		Stn. 8		Stn. 9		Stn. 10	
	(All samples taken during July, 1961)													
HYDRIDA														
Hydra sp.	—	—	16	—	—		—	—	—	—	—	—	—	—
TURBELLARIA														
Planaria spp.	—	—	—	—	—	—	3	1	—	—	—	—	—	—
NEMERTEA														
Prostoma sp. 1	—	4	9	—	—	—	—	—	—	—	—	—	—	—
NEMATODA	32	30	30	—	16	8	—	—	—	—	—	—	3	—
OLIGOCHAETA														
Nais sp.	—	—	—	—	1	—	—	—	—	—	—	4	—	—
Limnodrilus sp.	—	—	—	—	—	5	—	—	—	—	—	—	—	—
COPEPODA	16	—	—	—	37	12	—	—	24	—	—	—	—	16
OSTRACODA	2	—	6	—	—	—	520	408	69	—	15	—	115	24
HYDRACARINA	—	—	—	—	—	—	—	16	250	3	120	—	3	40

Species	Stn. 1		Stn. 2		Stn. 4		Stn. 6		Stn. 8		Stn. 9		Stn. 10	
	(All samples taken during July, 1961)													
EPHEMEROPTERA														
Beatidae juvs.	—	—	—	—	—	4	—	—	—	—	—	—	—	—
Baetis harrisoni	6	—	—	9	—	—	8	4	6	35	12	12	1	—
Centroptilum sudafricanum	—	—	—	—	1	1	—	—	—	—	—	—	—	—
Centroptilum excisum	—	—	—	—	—	—	—	1	—	—	60	13	19	25
Caenidae sp. 1	—	—	—	—	—	—	289	73	29	5	988	163	31	48
Adenophlebia auriculata	—	—	—	—	3	7	—	—	—	—	—	—	—	—
Euthraulus elegans	—	—	—	—	—	—	20	—	—	—	—	—	2	—
Afronurus ? harrisoni	—	—	—	—	—	—	1	—	—	—	—	—	—	—
ODONATA														
Chlorolestes sp.	1	2	3	—	23	10	—	—	—	—	—	2	—	—
Anisoptera juvs.	—	—	—	—	—	—	—	—	15	—	—	—	—	—
Paragomphus cognatus	1	—	—	3	—	—	—	—	15	1	22	—	13	7
Aeschna rileyi	—	—	—	—	—	—	—	—	—	—	1	—	—	—
Trithemis sp.	—	—	1	—	—	—	—	—	—	142	13	—	—	—
Zygonyx sp. 1	—	—	1	—	—	—	1	—	—	—	—	—	—	9
HEMIPTERA														
Micronecta piccanin HUTCH.	—	—	—	—	—	—	52	—	—	—	—	—	67	39
TRICHOPTERA														
Georodes sp.	—	—	—	—	—	—	—		1	6	—	—	—	—
Hydroptila sp. nov. (det. K. M. F. SCOTT)	—	—	—	—	—	—	—	—	—	3	—	—	—	—
LEPIDOPTERA														
? *Nymphula* sp.	—	—	—	—	—	—	—	—	—	—	—	2	—	—
COLEOPTERA														
Hydraenidae adult (N.I.W.R. type B)	—	2	—	—	—	—	—	—	—	—	—	—	—	—
Psephenidae sp. 1	—	—	—	—	—	—	5	—	—	—	—	—	—	—
Elmidae larvae (N.I.W.R. type 1)	—	—	—	—	—	—	—	—	—	3	—	—	—	—
Elmidae larvae (N.I.W.R. type 6)	—	—	—	3	—	—	34	27	—	24	1	—	6	27
Elmidae adult (N.I.W.R. type V)	—	—	—	—	—	—	—	—	2	—	—	—	—	—
Helodidae larvae nr. *Hydrosiphon* sp.	—	—	—	—	1	—	—	—	—	—	—	—	—	—

Species	Stn. 1		Stn. 2		Stn. 4		Stn. 6		Stn. 8		Stn. 9		Stn. 10	
	(All samples taken during July, 1961)													
DIPTERA														
Tipulidae sp. 1	—	—	—	—	—	—	—	—	1	—	—	—	—	—
Tipulidae sp. 11	—	—	—	—	—	—	—	—	—	—	—	1	4	—
Culicidae sp. 1	—	—	—	—	1	—	—	—	—	—	—	—	1	—
Simulium spp.	18	—	6	12	—	—	—	—	5	—	1	—	—	—
Chironomidae juvs.	—	—	—	—	8	—	—	—	—	—	—	—	—	—
Pentaneura spp.	54	24	93	73	4	8	114	74	122	16	80	58	112	157
Orthocladinae spp.	3	—	3	9	—	—	—	—	32	2	1	—	—	98
Chironomini spp.	—	—	2	—	21	41	2	—	—	500	55	7	—	—
Tanytarsini spp.	—	—	—	12	41	34	3	8	150	12	31	—	27	60
Atrichopogon sp.	—	—	—	—	—	—	—	—	—	—	—	—	3	3
Bezzia sp.	8	4	9	—	9	28	16	5	33	—	98	—	202	88
Rhagionidae nr. *Atherix* sp.	—	—	—	—	—	—	2	3	4	—	—	—	—	—
Tabanidae sp. 1	—	—	4	—	—	—	—	—	—	—	—	—	—	—
Tabanidae sp. 2	—	—	—	—	—	—	—	—	—	—	2	—	—	1
Empididae sp.	2	—	—	—	—	—	—	—	—	—	—	—	—	—
MOLLUSCA														
Burnupia sp. 1	—	—	—	—	—	—	—	2	—	—	—	—	—	—
Pisidium sp.	2	8	15	3	—	—	—	—	—	—	—	—	—	—
AMPHIBIA														
Rana sp. tadpoles	—	—	—	—	3	—	—	—	—	—	—	—	—	—
TOTAL NUMBER OF ORGANISMS	145	74	194	124	173	154	1,067	624	759	753	1,499	262	808	642

Microvelia sp. 1 (Veliidae); *Enithares* sp. 1 (Notonectidae); *Micronecta piccanin.* (Corixidae), and *Laccocoris limnigenus* (Naucoridae).

5. Pools

Pools were sampled at Stations 3, 5 and 14, and they showed considerable differences from one another.

The pool at Station 3 was turbid, reed-fringed and muddy bottomed. The mud and debris, which had accumulated at the margins of the pool under approximately $1\frac{1}{3}$ metres of water was stirred up and a single sample taken by handnet.

At Station 5 the pool was clear with a stony bed. Two samples were taken, the first at $1\frac{1}{2}$ m and the other at 50 cm. In each case, the stones and coarse gravel of the substratum were stirred up by a handnet.

At Station 14 the water was turbid with muddy bottom and mud banks. The single sample was collected by stirring the bottom and bank regions by handnet.

The deepest part of each of these pools exceeded 2 m.

Table V records the results of this sampling.

TABLE V

The fauna of the pools: the qualitative sampling results.

The figures given are for number of individuals per sample.

Species	Stn. 3 May 1961	Stn. 5 May 1961		Stn. 14 May 1961
HYDRIDA				
Hydra sp.	—	—	—	8
NEMATODA	26	4	—	2
OLIGOCHAETA	32	—	—	—
Nais sp.	—	—	—	21
Lumbriculus sp.	—	48	16	—
COPEPODA	—	—	20	16
OSTRACODA	55	32	44	—
EPHEMEROPTERA				
Baetis harrisoni	2	—	—	1
Centroptilum pulchrum CRASS.	—	180	220	—
Caenidae sp. 1	—	144	168	1
Euthraulus elegans	—	—	28	—
ODONATA				
Anisoptera spp.	—	—	32	—
Aeschna rileyi	—	—	—	2
HEMIPTERA				
Micronecta piccanin	—	—	16	9
COLEOPTERA				
Elmidae larvae (N.I.W.R. type 2)	2	—	—	—
DIPTERA				
Blepharoceridae larvae? *Elporia* sp.	1	—	—	—
Tipulidae sp. 10	1	—	—	—
Chironomidae spp.	40	60	88	—
Pentaneura spp.	2	76	8	9
Bezzia sp.	1	4	128	—
Rhagionidae nr. *Atherix* sp.	—	4	24	—
MOLLUSCA				
Burnupia sp.	3	—	—	—
Pisidium sp.	92	—	—	—
Total number of organisms	257	552	792	69

In addition to these results haphazard sampling revealed two species of Cladocera from Station 14 which were identified as *Pleuroxus aduncus* (Jurine) and a species of *Chydorus*. Two species of copepod from the same station have been identified as species of *Platycyclops*.

Adults and tadpoles of the frog *Rana angolensis* and adults of *Hyperolius marmoratus* were both found frequently at Station 5.

Discussion of the data contained in tables I—V

Very little is known about the behaviour, physiological requirements and morphological adaptations of individual freshwater species. It is therefore very difficult accurately to assess what factors are limiting or favouring the distribution of each species. Consequently their distribution can be discussed only in general terms.

The biotopes examined in this survey are the function of the variation of a single factor, namely current velocity. There are therefore no clearly defined barriers between them. As can be expected from these conditions, only a small number of species are exclusive to any one biotope and the differences noted are predominantly those of incidence.

Cascades

These are characterized by their strong, fast current and stable substrata which in all stations sampled in this survey consisted of solid stone masses. Morphological or behavioural adaptation is a prerequisite for species capable of withstanding these conditions. It is likely that adaptation to such an extreme environment reflects the necessity in these species for a current over the body to satisfy their oxygen requirements (Ambuhl, 1961; Macan 1961). Linduska (1942) has pointed out the primary role played by current in the shaping of the substratum and the important limiting effect of the latter. He believed, however, that current only exerted a limiting effect indirectly through its influence on the substratum. Here, however, it appears that at least some of the species limited to the cascades (i.e. *Acentrella natalensis* and ? *Elophila* sp. 1 and sp. 2) appeared to be confined in these reaches by their dependence on the current to fulfil their respiratory requirements. Specimens transferred to collecting jars soon died whereas other species taken from the cascade survived long journeys. *Elporia* sp. 1 which is markedly adapted morphologically to withstand current flow was confined to cascades and sprayed flanking regions over which there was a steady trickle of water flowing. It is possibly also confined to these regions due to its respiratory requirements. This may also be the case with *Baetis cataractae* and *Centroptiloides bifasciata.* These two species like others found constantly within the cascades (e.g. *Baetis harrisoni*, *Hydropsyche* sp. and *Orthotrichia* sp. nov. BTN 22 A) probably depend on behavioural adaptation to maintain their positions within the current. AMBUHL (1959) has shown the use made by certain species of mayfly of the still "boundary layer" between stones and the main mass of moving water above them.

Sprayed flanking regions

This biotope consists of a thin film of water formed by the fine spray from the cascade trickling over a solid rock mass. The rocky substrata was sometimes covered by moss or algae which was frequently thick enough to allow fine sand and detritus to accumulate at the base of their clusters.

A number of species characteristic of these conditions appeared to be those with requirements for current for either respiratory or feeding purposes but which were incapable of physically withstanding greater water masses, e.g. juveniles of *Pseudocloeon maculosum* and *Hydropsyche* sp. and the larvae of ?*Tinodes* sp. (Trichoptera). The fine silt and detritus tubes of the latter were haphazardly aligned such that even a small increase in current would wash them away.

Other species found in this biotope were capable of withstanding greater currents, but it appeared that their respiratory requirements were satisfied in these conditions, e.g. *Plarania* spp., *Elporia* sp. 1 (Blepharoceridae) and *Burnupia* sp. 1 (Mollusca).

In the sand or mud at the base of moss tufts, a number of species normally found in the sand or mud of stickles, backwaters and pools were taken, e.g. Nematoda, Hydracarina and *Bezzia* spp. (Atrichopogonidae).

The shallow nature of this biotope made the fauna accessible to a number of predator species which were not important in any other biotope, namely, the Mountain Wagtail (*Motacilla clara torrentium*) and several species of tabanid flies.

Stickles

This biotope occupies the greater length of these streams and in it are found the greatest variety of current and substratum conditions. Consequently, the largest number of species were found here.

LINDUSKA (1942) has shown the preferences of a number of species of mayfly nymphs for particular bottom types and AMBUHL (1961) has shown that "the distribution of species in a small area of a river seems to be based on the preference of each species for a more or less specific current velocity". Although it is acknowledged that a complex of factors is probably operative in each case, in general terms it can be said that many of the species found within this biotope are those which require a current for respiratory purposes but which, in the absence of special morphological adaptation, are incapable of withstanding the more extreme conditions of cascades. The stony substratum of the stickles would afford protection from the current for such morphologically unadapted species.

Backwaters

This biotope is characterized by the virtual absence of current and the resultant increase in detritus, sand and mud on the substratum. The conditions favour those species unable to maintain themselves. within a current, e.g. Copepoda, Ostracoda, Hemiptera and frog tadpoles, while species dependent on a current, e.g. some mayflies and most caddis flies are excluded. The increase in detritus, sand and mud on the substratum is accompanied by a marked increase in the densities of *Pentaneura* spp. (Tanypodinae) and *Bezzia* spp. (Ceratopogonidae).

Pools

Only a few pools occurred in the area. They were generally found at the base of cascades where water action had, over the years, worn away the solid rock. They were characterized by limited water movement except at the inflow and outflow regions and depths in all cases greater than two metres.

Possibly as a result of this increase in depth, the number and densities of species were considerably lower than in the backwaters. There was a reduction in the numbers of those species typical of stickles but which were, however, frequently found in low incidences in the backwaters.

Marginal fringe netting and laboratory breeding out of adults and imagos

The netting of adults and imaginal forms of Chironomidae, Odonata and Ephemeroptera was occasional and randomly conducted. The following species were collected in this way in the field:

EPHEMEROPTERA
  Baetidae
    Baetis harrisoni
    Acentrella natalensis
    Centroptiloides bifasciatum.

Brachycercidae
Caenidae sp. 1

Ecdyonuridae
Afronurus harrisoni

ODONATA
Synlestidae
Chlorolestes longicauda BURM.
Chlorolestes fasciata BURM.

Lestidae
Lestes plagiatus BURM.

Protoneuridae
Ellatoneura glauca SELYS

Platycnemididae
Allocnemis leucosticta SELYS

Coenagriidae
Pseudagrion kersteni GERST.

Gomphidae
Crenigomphus hartmanni FORST

Libellulidae
Orthetrum stemmale (BURM.) subsp. *capense* CALVERT
Crocothemis sanguinolenta BURM.
Trithemis arteriosa BURM.
Trithemis stictica (BURM.)
Trithemis risi LONGFIELD

CHIRONOMIDAE
Tanypodinae
Pentaneura (Pentaneura) meilloni FREEMAN
Pentaneura (Pentaneura) interrupta GOET.
Pentaneura (Pentaneura) comata FREEMAN

Orthocladinae
Metriocnemus scotti FREEMAN
Metriocnemus dewulfi GOET.
Cricotopus albitibia WALKER
Cricotopus obscurus FREEMAN

Cricotopus scottae FREEMAN
Syncricotopus micans KIEFFER
Rheocricotopus capensis FREEMAN
Chaetocladius eastopi FREEMAN
Chaetocladius sp. nov. det. FREEMAN
Limnophyes natalensis KIEFFER
Smittia sp. nov. det. FREEMAN
Smittia hirtella FREEMAN

Chironomini
Chironomus satchelli FREEMAN
Chironomus (*Cryptochironomus*) *nudiforceps* KIEFFER
Stenochironomus harrisoni FREEMAN
Paratendipes crosskeyi FREEMAN
Paratendipes seydeli FREEMAN
Polypedilum (*Polypedilum*) *deletum* GOET.
Polypedilum (*Polypedium*) *kibatiense* GOET.
Polypedilum (*Polypedilum*) *allansoni* FREEMAN

Tanytarsini
Tanytarsus (*Tanytarsus*) *luctuosus* FREEMAN

Two methods of breeding out the nymphs and larvae were employed. In the first case, a simple well aerated aquarium was used, and in the second case, a loose fine-meshed netting, covering a wire frame, was placed over gauzed-in sections of a gutter through which there was a constant flow of water.

The following species were bred out in these ways:

EPHEMEROPTERA
Baetidae
Baetis harrisoni

Brachycericidae
Caenidae sp. 1

Leptophlebiidae
Adenophlebia auriculata
Euthraulus elegans

ODONATA
Gomphidae
Paragomphus cognatus

Aeschnidae
Aeschna rileyi

CHIRONOMIDAE
Tanypodinae
? *Pentaneura* sp. nov. det. FREEMAN
Pentaneura (Pentaneura) trifascia FREEMAN
Pentaneura (Pentaneura) meilloni
Pentaneura (Pentaneura) comata

Orthocladinae
Metriocnemus dewulfi
Cricotopus harrisoni FREEMAN
Cricotopus albitibia
Cricotopus obscurus
Syncricotopus micans
Rheocricotopus capensis
Trichocladius capensis FREEMAN
Cardiocladius latistilus FREEMAN

Corynoneurinae
Corynoneura dewulfi GOET.
Thienemanniella sp. indet.

Chironomini
Polypedilum (Polypedilum) fuscum FREEMAN
Polypedilum (Polypedilum) allansoni
Polypedilum (Polypedilum) dewulfi GOET.
Polypedilum (Pentapedilum) sp. nov. det. FREEMAN
Polypedilum (Pentapedilum) hamoni FREEMAN
Polypedilum (Pentapedilum) anale FREEMAN

Tanytarsini
Tanytarsus (Tanytarsus) pallidulus FREEMAN
Tanytarsus (Rheotanytarsus) guineensis KIEFFER

THE AFFINITIES OF THE FAUNA

The paucity of faunal surveys of mountain streams and their foothill reaches and the lack of systematic knowledge of many stream forms precluded detailed assessment of the zoogeographical affinities of the area.

The Ephemeroptera constitute one of the very few groups which can be readily identified and which have been well annotated in all surveys conducted in Southern Africa. In an attempt to deduce the relative affinities of the Barberton fauna only this group will therefore be considered.

The mayflies of the area can be compared with those occurring in Zone II and III A (Mountain Torrent and Upper Foothill stony run zone) of the Berg River (HARRISON & ELSWORTH, 1958) and zones 1, 2, 3 and 4 (embracing the region between and including the source zone and the foothill torrent zones) of the Tugela River (OLIFF, 1960). Recently CHUTTER has completed a survey of the Vaaldam catchment area (Transvaal highveld) and his unpublished sampling data has been made available. The mayfly fauna will also be compared with that found by KIMMINS in Nyasaland (1955) and Kenya (1960).

In the map in Fig. 3, the encircled numbers represent the number of species of mayfly common to those regions referred to by the associated arrows. Table VI records the names of the mayflies which are common to the various regions mentioned on the map.

TABLE VI (a to g)

Mayfly species common to various river systems and areas.

a. Species common to Barberton and the Berg River.
Baetis harrisoni
Pseudocloeon maculosum
Centroptilum excisum
Castanophlebia calida
Euthraulus elegans
Tricorythus discolor
Afronurus harrisoni

b. Species common to Barberton and the Tugela River
Pseudocloeon maculosum
Baetis harrisoni
Baetis cataractae
Acentrella natalensis
Centroptilum sudafricanum
Centroptilum excisum
Centroptilum parvum
Centroptilum varium
Centroptiloides bifasciatum
Tricorythus discolor
Adenophlebia auriculata
Castanophlebia calida
Euthraulus elegans
Afronurus harrisoni

c. Species common to Barberton and the Vaaldam Catchment Area
Baetis harrisoni
Centroptilum excisum
Centroptilum flavum
Centroptilum pulchrum
Centroptilum sudafricanum
Centroptiloides bifasciata
Pseudocloeon maculosum
Adenophlebia auriculata
Castanophlebia calida
Euthraulus elegans
Tricorythus discolor
Afronurus harrisoni

d. Species common to Barberton, Berg River, Tugela River and the Vaaldam Catchment Area
Pseudocloeon maculosum
Baetis harrisoni
Centroptilum excisum
Castanophlebia calida
Euthraulus elegans
Tricorythus discolor
Afronurus harrisoni

e. Species common to the Berg River and the Tugela River
Baetis harrisoni
Pseudocloeon vinosum
Pseudocloeon maculosum
Centroptilum excisum
Castanophlebia calida
Euthraulus elegans
Tricorythus discolor
Afronurus harrisoni

f. Species common to Barberton and Nyasaland
Euthraulus elegans

g. Species common to Barberton and Kenya
Centroptilum flavum

From this comparison of the mayfly fauna it appears that the fauna of the Barberton area has its greatest affinities with that of the Tugela and Vaaldam catchment areas.

Only species common to all South African streams were common to both the Barberton area and the Berg River. There was very little affinity with the tropical fauna of Nyasaland and Kenya, each of which territories shared only one species with Barberton. These findings appear to be supported by the literature concerning the remaining groups.

The as yet unstudied mountain areas of Eastern Southern Rhodesia must constitute an interesting transition zone between the southern temperate fauna and the tropical fauna of Central Africa.

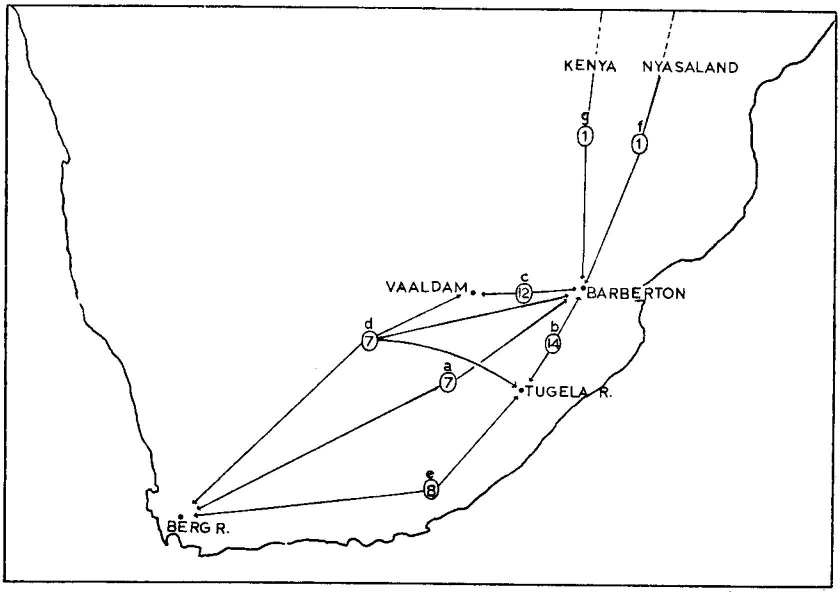

Fig. 3. The munber of species of mayfly common to varions river systems.

Record of the species collected in the area

The following is a complete list of the species that were collected during this survey:

HYDRIDA	
Hydridae	*Hydra* sp.
TURBELLARIA	
Planariidae	*Dugeusia neumanni* (NEPPI)
	Planaria spp.
NEMERTEA	*Prostoma* sp. 1 (BTN 10 K)
NEMATODA	Nematoda spp.
OLIGOCHAETA	
Naididae	*Dero* sp. 1 (BTN 1 w)
	Pristina sp.
	Nais sp. 1 (BTN 19 H)
	Nais sp. 2 (BTN 21 G)

Tubificidae	*Limnodrilus* sp. 1 (BTN 1 L)
Lumbriculidae	*Lumbriculus* sp. 1 (BTN 1 R)
CLADOCERA	
Chydoridae	*Chydorus* sp. 1 (BTN 23 D)
	Pleuroxus aduncus (JURINE)
COPEPODA	
Cyclopidae	*Cyclops* sp.
	Platycyclops sp.
Canthocamptidae	Canthocamptidae spp.
OSTRACODA	Ostracoda spp.
	Isocypris sp. 1 (BTN 2 Y)
AMPHIPODA	
Talitridae	? *Talitroides* sp.
DECAPODA	
Potamonidae	*Potamon* sp.
HYDRACARINA	Hydracarina spp.
PLECOPTERA	
Perlidae	*Neoperla spio* (NEUMAN)
EPHEMEROPTERA	
Oligoneuriidae	*Oligoneuriopsis* undescribed species, det. AGNEW (BTN 64 B)
Baetidae	*Pseudocloeon* undescribed species, det. AGNEW (N.I.W.R. type VAL 1019 B)
	Pseudocloeon maculosum CRASS
	Baetis harrisoni BARNARD
	Baetis cataractae CRASS
	Acentrella natalensis CRASS
	Centroptilum sudafricanum LEST.
	Centroptilum excisum BARNARD
	Centroptilum flavum CRASS
	Centroptilum parvum CRASS
	Centroptilum varium CRASS
	Centroptilum pulchrum CRASS (nec EATON 1885)
	Centroptiloides bifasciata (LEST.)
	? Baetidae undescribed species det. AGNEW (BTN 47 A)

EPHEMEROPTERA (Cont.)	
Caenidae	Caenidae sp. 1 (BTN 11 B)
Tricorythidae	*Neurocaenis discolor* (BURM.)
Leptophlebiidae	*Adenophlebia auriculata* EATON
	Castanophlebia calida BARNARD
	Euthraulus elegans BARNARD
Heptageniidae	*Afronurus harrisoni* BARNARD
ODONATA	
Zygoptera	
Synlestidae	*Chlorolestes longicauda* BURM.
	Chlorolestes fasciata BURM.
Lestidae	*Lestes plagiatus* BURM.
Protoneuridae	*Ellatoneura glauca* SELYS
Platycnemididae	*Metacnemis* sp. 1 (BTN 4 G)
	Allocnemis leucosticta SELYS
Coenagriidae	*Pseudagrion kersteni* GERST.
Anisoptera	
Gomphidae	*Paragomphus cognatus* RAMB.
	Crenigomphus hartmanni FORST
Aeschnidae	*Aeschna rileyi* CALVERT
Corduliidae	*Phyllomacromia* sp.
Libellulidae	*Orthetrum stemmale* (BURM.) subsp. *capensis* CALVERT
	Crocothemis sanguinolenta BURM.
	Trithemis arteriosa BURM.
	Trithemis stictica (BURM.)
Libellulidae	*Trithemis risi* LONGFIELD
	Zygonyx sp. 1 (BTN 6 R)
HEMIPTERA	
Gerridae	*Gerris* sp. 1 (BTN 105 B)
Veliidae	*Microvelia* sp. 1 (BTN 6a)
Notonectidae	*Enithares* sp. 1 (BTN 116 B)
Corixidae	*Micronecta dimidiata* POISSON (= *piccanin* HUTCH.)
Naucoridae	*Laccocoris limnigenus* STAL

TRICHOPTERA	
Sericostomatidae	*Goerodes* sp. 1 (BTN 3 h)
Leptoceridae	
Leptocerinae	? *Adicella* sp. 1 (BTN 18 B)
Hydropsycheidae	
Hydropsychinae	*Hydropsyche* sp. 1 (BTN 6 M) *Cheumatopsyche* ? *thomasetti* (BTN 6 N) *Cheumatopsyche* ? *afra* (BTN 10 D)
Macronematinae	? *Protomacronema* sp. 1 (BTN 2 D)
Psychomyidae	
Psychomyinae	? *Tinodes* sp. (BTN 7 c) ? *Psychomyia* sp. 1 (BTN 16 K)
Ecnominae	*Ecnomus* sp. (BTN 5 a)
Philopotamidae	*Chimarra* sp. 1 (BTN 2 G) *Chimarra* sp. 2 (BTN 6 X) *Chimarra* sp. 3 (BTN 11 G) *Chimarra* sp. 4 (BTN 11 F)
Hydroptiloidae	*Hydroptila* undescribed species, det. SCOTT (BTN 21 C) *Hydroptila* ? *cruciata* (BTN 22 F) *Orthotrichia* sp. 1 (BTN 1 C) *Orthotrichia* undescribed species, det. SCOTT BTN 22 A)
LEPIDOPTERA	
Pyralididae	*Nymphula* sp. 1 (BTN 18 C) *Eliophila* sp. 1 *Eliophila* sp. 2 (BTN 114 A)
COLEOPTERA	
Gyrinidae	*Orectogyrus* sp. 1 (BTN 8 F) *Orectogyrus* sp. 2 (BTN 13 A)
Hydraenidae	Hydraenidae (N.I.W.R. type B - adult) Hydraenidae (N.I.W.R. type C - adult)
Psephenidae	Psephenidae sp. 1 (BTN 10 C)
Dryopidae	Dryopidae sp. 1 (BTN 4 C)

Elmidae (larvae)	N.I.W.R. type 1 N.I.W.R. type 2 N.I.W.R. type 6
Elmidae (adult)	N.I.W.R. type D N.I.W.R. type E N.I.W.R. type F N.I.W.R. type H N.I.W.R. "lowveld type" N.I.W.R. type V (sp. nov.) N.I.W.R. type W (sp. nov.)
Ptilodactylidae	Ptilodactylidae sp. 1 (BTN 19 F)
Helodidae (larvae)	Nr. *Hydrosiphon* (Coleoptera) indet. (BTN 110 A)
DIPTERA Blepharoceridae (larvae & pupae)	*Elporia* sp. 1 (BTN 27 B pupae and 26 C larvae)
Tipuliidae (larvae)	Tipulidae sp. 1 (BTN 21 D) Tipulidae sp. 2 (BTN 9 E) Tipulidae sp. 3 (BTN 2 T) Tipulidae sp. 4 (BTN 1 P) Tipulidae sp. 5 (BTN 10 B) Tipulidae sp. 6 (BTN 21 d) Tipulidae sp. 7 (BTN 18 A) Tipulidae sp. 8 (BTN 20 a) Tipulidae sp. 9 (BTN 27 A) Tipulidae sp. 10 (BTN 44 A) Tipulidae sp. 11 (BTN 18 G) Tipulidae sp. 12 (BTN 25 C) Tipulidae sp. 13 (BTN G.T. sp. 14 (BTN 25 E)
Culicidae Dixinae (larvae)	*Dixa* sp.
Culicinae (larvae)	*Anopheles* sp.
Simuliidae	*Simulium alcocki* POMEROY *Simulium nigritarsis* COQUILLET *Simulium hirsutum* POMEROY *Simulium debegene* DE MEILLON *Simulium rutherfoordi* DE MEILLON *Simulium medusaeforme* POMEROY

DIPTERA (cont.)

Chironomidae

Tanypodinae

(larvae)	*Pentaneura* sp. 1 (BTN 4 F)
	Pentaneura sp. 2 (BTN 15 C)
	Pentaneura sp. 3 (BTN 20 C)
	Pentaneura sp. 4 (BTN 21 n)
	Pentaneura sp. 5 (BTN 4 F)
	Pentaneura sp. 6 (BTN 11 A)
	Pentaneura sp. 7 (BTN 12 B)
	Pentaneura sp. 8 (BTN 12 C)
	Pentaneura sp. 9 (BTN 16 H)
(adults)	*Pentaneura (Pentaneura) trifascia* FREEMAN
	Pentaneura (Pentaneura) meilloni FREEMAN
	Pentaneura (Pentaneura) interrupta GOETGHEBUER
	Pentaneura (Pentaneura) comata FREEMAN
	? *Pentaneura* undescribed species, det. FREEMAN

Orthocladinae

(larvae)	Orthocladinae sp. 1 (BTN 1 J)
	Orthocladinae sp. 2 (BTN 8 K)
	Orthocladinae sp. 3 (BTN 8 B)
	Orthocladinae sp. 4 (BTN 6 Y)
	Orthocladinae sp. 5 (BTN 1 v)
	Orthocladinae sp. 6 (BTN 6 Z)
	Orthocladinae sp. 7 (BTN 10 H)
	Orthocladinae sp. 8 (BTN 2 P)
	Orthocladinae sp. 9 (BTN 6 Q)
	Orthocladinae sp. 10 (BTN 11 C)
	Orthocladinae sp. 11 (BTN 12 F)
	Orthocladinae sp. 12 (BTN 18 H)
	Orthocladinae sp. 13 (BTN 38 C)
	Orthocladinae sp. 14 (BTN 49 A)
	Orthocladinae sp. 15 (BTN 49 B)
	Orthocladinae sp. 16 (BTN 51 A)
	Orthocladinae sp. 17
(adults)	*Metriocnemus scotti* FREEMAN
	Metriocnemus dewulfi GOET.
	Cricotopus harrisoni FREEMAN
	Cricotopus obscurus FREEMAN

DIPTERA (cont.)	
Chironomidae	
Orthocladinae	
(larve)	*Cricotopus scottae* FREEMAN
	Cricotopus albitibia WALKER
	Syncricotopus micans (KIEF)
	Rheocricotopus capensis (FREEMAN)
	Cardiocladius latistilus FREEMAN
	Chaetocladius eastopi FREEMAN
	Limnophyes natalensis KIEFFER
	Smittia undescribed species det. FREEMAN
	Smittia hirtella FREEMAN
Corynoneurinae	
(larvae)	*Coryneura* sp. 1 (BTN 4 A)
	Corynoneura sp. 2 (BTN 12 A)
(adult)	*Corynoneura dewulfi* GOET.
	Thienemaniella sp. indet.
Chironominae	
Chironomini	
(larvae)	Chironomini sp. 1 (BTN 13 A)
	Chironomini sp. 2 (BTN 5 G)
	Chironomini sp. 3 (BTN 3 B)
	Chironomini sp. 4 (BTN 6 AA)
	Chironomini sp. 5 (BTN 15 B)
	Chironomini sp. 6 (BTN 3 k)
	Chironomini sp. 7 (BTN 37 A)
(adults)	*Chironomus satchelli* FREEMAN
	Chironomus (*Cryptochironomus*) *nudiforceps* KIEFFER
	Stenochironomus harrisoni FREEMAN
	Paratendipes crosskeyi FREEMAN
	Paratendipes seydeli FREEMAN
	Polypedilum (*Polypedilum*) *deletum* GOET.
	Polypedilum (*Polypedilum*) *fuscum* FREEMAN
	Polypedilum (*Polypdilum*) *kibatiense* GOET.
	Polypedilum (*Polypedilum*) *allansoni* FREEMAN
	Polypedilum (*Pentapedilum*) undescribed species, det. FREEMAN
	Polypedilum (*Pentapedilum*) *hamoni* FREEMAN
	Polypedilum (*Pentapedilum*) *anale* FREEMAN

DIPTERA (cont.)

Tanytarsini (larvae)	Tanytarsini sp. 1 (BTN 2 F)
	Tanytarsini sp. 2 (BTN 2 Q)
	Tanytarsini sp. 3 (BTN 5 D)
	Tanytarsini sp. 4 (BTN 7 D)
	Tanytarsini sp. 5 (BTN 9 A)
	Tanytarsini sp. 6 (BTN 16 B)
	Tanytarsini sp. 7 (BTN 16 D)
	Tanytarsini sp. 8 (BTN 16 E)
	Tanytarsini sp. 9 (BTN 17 C)
	Tanytarsini sp. 10 (BTN 17 G)
	Tanytarsini sp. 11 (BTN 18 E)
	Tanytarsini sp. 12 (BTN 19 J)
	Tanytarsini sp. 13 (BTN 20 C)
	Tanytarsini sp. 14 (BTN 38 B)
	Tanytarsini sp. 15 (BTN 11 E)
	Tanytarsini sp. 16 (BTN 15 A)
	Tanytarsini sp. 17 (BTN 31 A)
(adults)	*Tanytarsus* (*Tanytarsus*) *luctuosus* FREEMAN
	Tanytarsus (*Tanytarsus*) *pallidulus* FREEMAN
	Tanytarsus (*Rheotanytarsus*) *quineensis* KIEFFER
	Stempellina sp. 1
Ceratopogonidae (larvae)	*Atrichopogon* sp. 1 (BTN 2 W)
	Atrichopogon sp. 2 (BTN 4 J)
	Bezzia sp. 1 (BTN 3 r)
	Bezzia sp. 2 (BTN 4 C)
	Bezzia sp. 3 (BTN 11 H)
Stratiomyidae (larvae)	Stratiomyidae sp. 1 (BTN 8 b)
	Stratiomydae sp. 2 (BTN 21 h)
Rhagionidae (larvae)	*Atherix* type (N.I.W.R.)
Tabanidae (larvae)	Tabanidae sp. 1
	Tabanidae sp. 2
Empididae (larvae)	Empididae sp. 1 (BTN 1 D)
	Empididae sp. 2 (BTN 11 D)

DIPTERA (cont.)	
Anthomyidae	
(larvae)	Anthomyidae sp. 1 (BTN 3 S)
PULMONATA	
Gastropoda	
Planorbidae	*Gyraulus costulatus*
Ancylidae	*Burnupia* sp. 1 (BTN 103 E)
Lymnaeidae	*Lymnaea* sp. 1 (BTN 23 C)
Pelecypoda	
Sphaeriidae	*Pisidium* sp. (BTN 17 F)
FISH	
	Amphilius natalensis BOUL.
ANURA	
Leptodactylidae	*Heleophryne natalensis*
Bufonidae	*Bufo regularis*
Polypedatidae	*Hyperolius marmoratus*
Ranidae	*Rana oxyrhynchus*
	Rana fuscigula angolensis
	Pyxicephalus natalensis
	Arthroleptella hewittii

SUMMARY

This paper records the results of a faunistic survey of the mountain streams of the Barberton area of the Eastern Transvaal. Sampling was carried out in five different biotopes; cascades, sprayed flanking regions, stickles, backwaters and pools.

Netting of the adults and imagos and breeding out of the larvae of Chironomidae, Odonata and Ephemeroptera was done.

The faunal affinities were assessed by a comparison of the mayfly fauna of this area with that reported in other surveys conducted in Africa.

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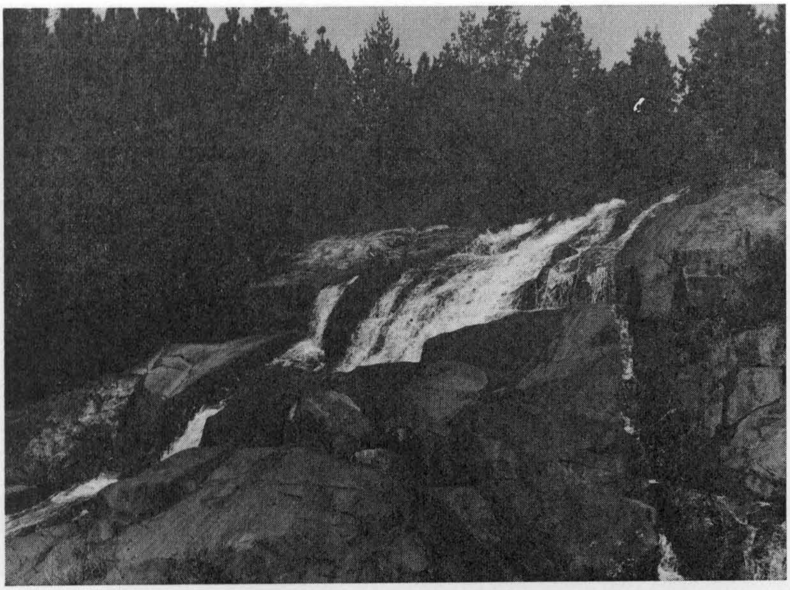
Plate I a. Cascade (Station 16).

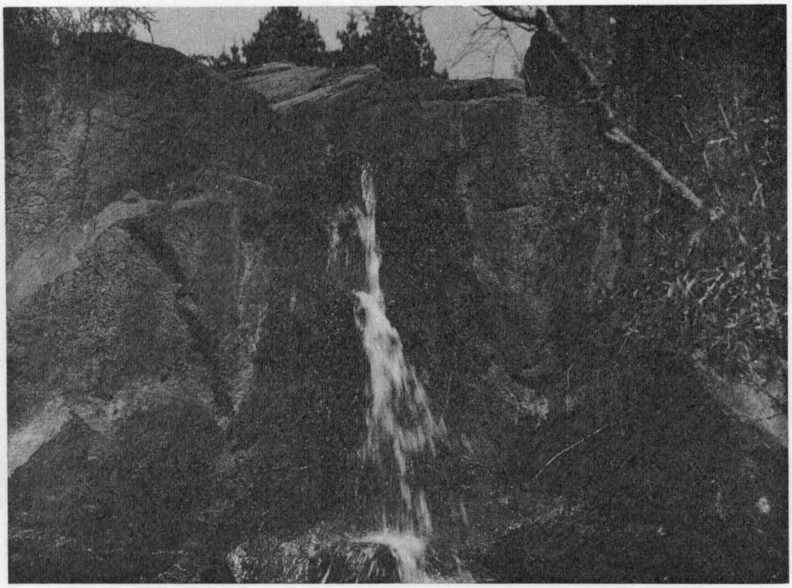
Plate I b. Sprayed Flanking Region (Station 16).

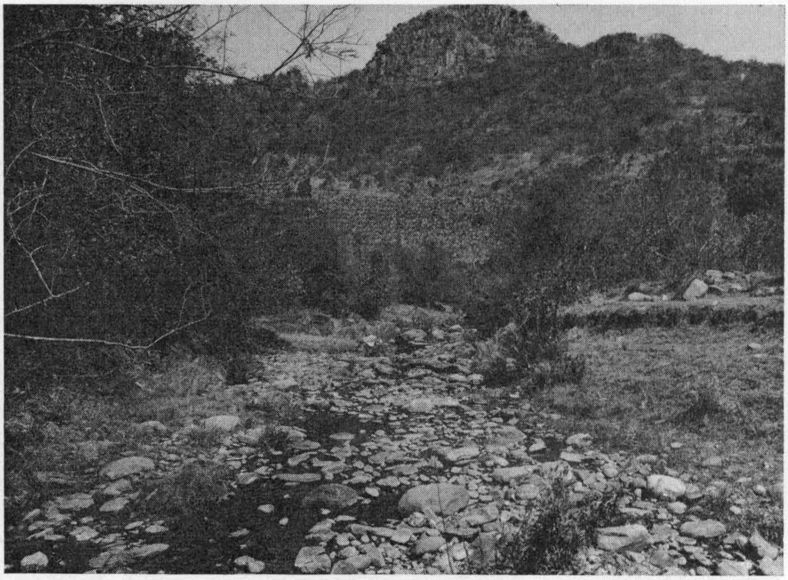

Plate II a. Stickles (Nr. Station 5).

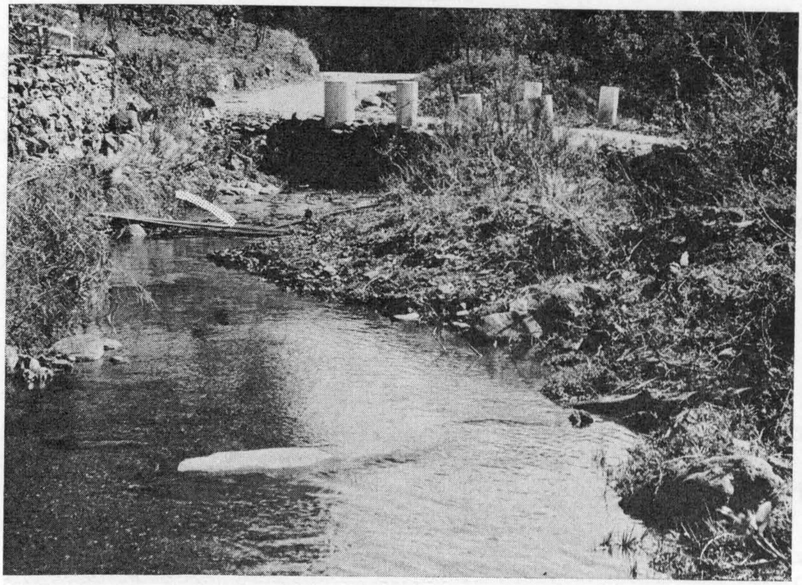

Plate II b. Backwater (Station 10).

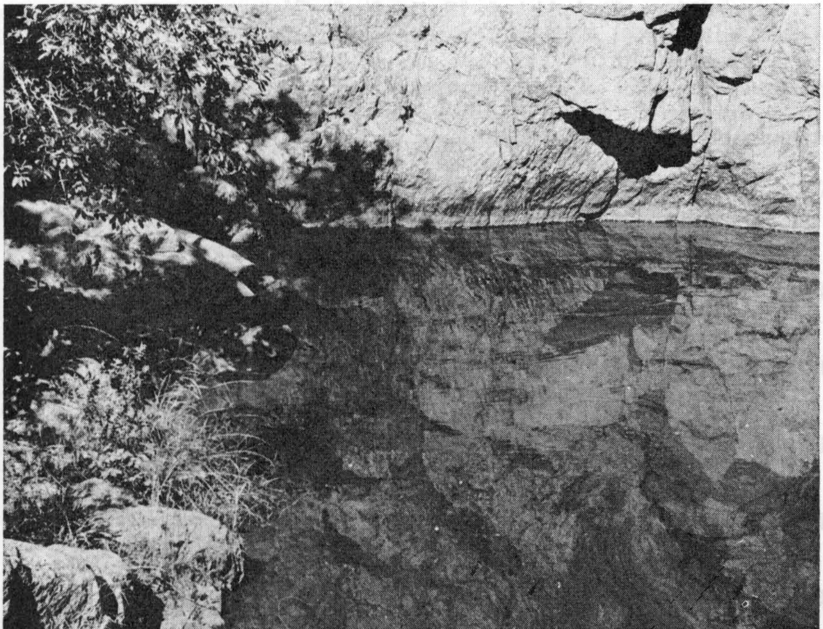

Plate III. Pool (Nr. Station 16).

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