A.D. Harrison & Y (15) 1953 1960.

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SOUTH AFRICAN HYDROBIOLOGICAL REGIONS

REPORT NO.5.

EXPLORATORY SURVEY OF EASTERN PART OF REGIONS A (SOUTH WESTERN CAPE) AND REGION B

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In report No.1 two hydrobiological regions were proposed for the South-western and western Cape Province, these were:

A. The Cape System Region:

Most of the South-western and Western Cape Province lies on Cape System geological formations, usually mountains of Table Mountain Sandstone and Bokkeveld shales resting on the underlying Malmesbury system which is exposed near the coast. Water from Table Mountain Sandstone is usually unbuffered and markedly acid but after it runs off this formation the pH rises and it can become alkaline. This region (see Report No.1, figs. 1 and 2) includes the Catchment of the Great Berg River and the Olifants River to the north, and the catchments of many other streams and rivers draining southwards into the Indian Ocean. It extends east to Port Elizabeth.

B. Recent Limestone Region, near Bredasdorp:

This is a small area in the southern Cape where streams originate as springs in Cretaceous limestones.

During March, 1960, 26 faunal samples were taken and numerous field pH measurements were made in the eastern part of Region A, i.e. the George, Oudtshoorn and Tsitsikamma districts. The main purposes of this survey was:

1. To determine if the distinctive elements of the fauna of the acid upper streams of the Berg River catchment, and of other acid streams near Cape Town, extended along the Table Mountain Sandstone formations to the limit of their extent near Port Elizabeth.

2. To determine the extent to which this distinctive "Table Mountain Sandstone association" was associated with low pH, i.e. if it was truly "acidobiontic" as suggested by the Berg River studies.

A secondary purpose was:

3. To determine the extent to which temperate or "High Veld" species had penetrated the non-acid streams of the region. Only a limited number had been found in the lower, non-acid zones of the Great Berg River.

One opportunistic sample was taken from region B and a chemical analysis of water obtained from a stream arising as a spring in the Cretaceous formations.

The sampling stations worked are shown on maps 1 and 2 of this ort. Faunal samples were collected with standard nets at all tions, field pH readings were taken with a Lovibond Comparator using ndard indicators. One water sample was taken from a typical acid

stream and special collections were made of Gyrinidae and Hydrachnellae and these have been despatched to specialists. Diatom samples were taken at all the localities. The area studied has not been covered before and the results are preliminary in nature, however an attempt is made to compare the limited results with those from the Great Berg River and the Swartkops River, north of Port Elizabeth.

Sampling Station (Fig. 1, table 1).

In Table 1 all the localities visited have been tabulated and classified into regions and river types, together with short notes on habitats and vegetation. As already pointed out, the streams in this region can be classified according to their chemistry, i.e., strongly acid, pH below 6, weakly acid, pH 6 to 7, and alkaline. This in turn can be correlated with the geology of the catchment, as will be discussed later. In presenting the biological results the samples have been grouped according to this scheme.

CHEMICAL RESULTS.

It was not the intention of this survey to give a detailed picture of the water quality of the region but to relate the faunal and diatom associations to the field pH readings. However, three water samples were taken, one from a typical, brown acid stream, one from a Cretaceous limestone stream and one from the upper estuary of a brown acid stream. The results are given in table 2. That for the Storms River, the brown acid stream, shows the unbuffered nature of the water and that the dissolved material was mainly chlorides, the total dissolved solids content was higher than in the upper Berg River. The estuarine sample shows the effect of the sea water. The sample from the stream originating in a spring in the Cretaceous limestone (marine beds) shows the unusual nature of the water, which has a high dissolved solids content, mainly chlorides and bicarbonates. Detailed pH values are shown on map No.2. Experience from the Berg River Survey shows that the pH in these acid streams varies quite considerably, though within a definite range, from this experience the snap field pH values have been used to classify the streams as in Table 1.

BIOLOGICAL RESULTS.

The Macroflora:

Two plants are particularly characteristic of the upper, acid streams in the Berg River catchment and other similar streams near Cape Town, the moss Wardia hygrometrica and a grass-like weed, Scirpus digitatus: the former was found commonly in acid streams in the region surveyed but there was no sign of the latter. Scirpus fluitans, which is common in acid to neutral waters all over the country, was found in a few cases. The characteristic bank plant of rivers and streams in the Western Cape, Prionium serratum (palmiet), was common all over the region and lined both acid and alkaline streams. It was also seen along the Swartkops River, near Port Elizabeth.

The Microflora:

Samples of diatoms, cyanophytes and other algae have yet to be analysed. However, previous samples taken from the Groot River (strongly acid) and the upper Swartkops river, weakly acid, showed that the diatoms associations were very distinctive and very different from one another.

The Fauna

Region B

Table 3 shows the fauna of the limestone stream at Nutsie, near Bredasdorp. Prominent are Cloeon type nymphs (probably C. lacunosum),

various Notonectidae and Corixidae, Chironomus larvae and Pentaneura. The incidence of the caddis Oxyethira (syn. Argyrobothrus) was high and the operculate snails, Tommichia sp. were extremely plentiful. This was not a true stream type of association but more characteristic of standing pools. A previous sampling of another such stream (1949) revealed an association including Gammaridae and the estuarine isopod, Pseudosphaeroma barnardi. Far more sampling will have to be carried out to obtain a true picture of the fauna and flora of the Cretaceous streams of this area.

Region A

The fauna of the acid, peat-stained waters (second group on Table 1). Table 4 lists the percentage analyses of five samples from the stones in current biotope. Especially characteristic are nymphs of Nemouridae (Leuctridae), Lithogloea penicillata, megalopteran larvae, certain caddis species and certain Elmidae. As the caddis are being studies by a specialist no effort was made to identify the rarer species. The faunal association was very similar to that of the upper, strongly acid zones of the Great Berg River.

Table 5 lists analyses of four marginal vegetation samples; Lithogloea harrisoni, Barbarochthon brunneum, Helodid larvae, Ptilodactylid larvae and Pseudocloeon vinosum were characteristic. The faunal associations were similar to the upper, acid parts of the Great Berg River.

In addition to these two main biotopes the following were sampled:

Stones in a quiet backwater: In the Kruis River the following association was obtained - Aphanicercella spp. (0.7%), Aphanicercopsis spp. (1.6%), Aprionyx peterseni (2.7%), Lithogloea penicillata (2.3%), Pseudocloeon Berg River sp.A (51.7%). Also present were Elmidae, Ptilodactylidae and total Chironomidae, unsorted comprised 6.2%. This fauna was very similar to that found in a similar situation at Station 1 on the Great Berg River.

The following was obtained from the Kaaimans River - Aphanicercella spp. (5.9%), Aphanicercopsis spp. (15.2%), Castanophlebia calida (1.2%), Choroterpes nigrescens (1.2%) Allocnemis leucosticta nymphs (17.6%), Chimarrha sp. (2.4%), Barbarochthon brunneum (4.7%), Athripsodes sp., sand grain cases, similar to A. bergensis (18.8%). Also present were Elmidae, Ptilodactylidae, Helodid, Berg River sp. A and chironomid larvae (9.4%). This fauna resembled that at station 3 on the Great Berg River except for Allocnemis leucosticta which was not found there.

Moss, Wardia hygrometrica, on rocks:

This was sampled in the Kruis River. The fauna was similar to that found in the upper Great Berg River, Lithogloea sp. A being the characteristic species.

Gravelly - sandy bottom of deep pool:

Storms River - the fauna consisted mainly of Cyclops spp. (10.8%), Pleuroxus sp. (7.2%), Gammarus (Paramelita) sp. (1.6%), nemourid nymphs (1.2%), Athripsodes sp. sand grain cases, similar to A. bergensis (27.4%), Elmidae (6.7%), Ptilodactylidae (1.0%), Tanypodinae (11.3%), other Chironomidae (10.8%), and Psidium sp. (8.9%). Also present were Lithogloea harrisoni and Ecchlorolestes sp. The fauna was similar in certain respects to associations from similar habitats in the Great Berg River but was richer in species and had a greater density.

4/...

the Gammarus sp. was not G. nigroculus which is occasionally found in the Great Berg River but one of the white-eyed species usually found in swampy situations.

The fauna of slightly-acid, clear streams (third group on Table 1). Table 6 shows the association present in the stones-in-current biotope. The fauna of these streams can be looked upon as a mixture of those elements of the acidobiontic associations which can live in a pH range of from 6 to 7, and those of the alkaline associations which can exist in slightly acid water. (Details of these associations are given in Appendices 1 and 2). In addition there are a number of very tolerant forms which are found both in acid and alkaline water, such as Baetis harrisoni, Pseudocloeon vinosum, Castanophlebia calida and Cheumatopsyche maculata. Certain acidobionts, such as certain caddis, do not appear to be able to colonise these streams at all; other species appear to be able to survive when washed down from a more strongly acid upper section of the stream. This could have been the explanation for the presence of Lithogloea pennicillata in the Buffelsnek and Assegaibosch streams. On the whole acidobionts associated with the Table Mountain Sandstone system are only found in slightly acid streams where these are connected to or very near to streams with a pH of below 6, such was the case with the first 3 stations in Table 6. The stream at van Stadens Pass had none, which is also the case with the upper Swartkops River; it is known that the T.M.S. in this region contains more soluble mineral matter and the run-off water is not so acid.

Table 7 shows the associations present in the marginal vegetation. None of the typical acidobiontic forms appeared in these samples. It was noted in the Great Berg River that, as the pH rose downstream, the acidobionts disappeared from the marginal vegetation sooner than from the stones in the current.

The fauna of alkaline streams.

Only one truly alkaline stream was sampled, the Grobbelaar's River between Oudtshoorn and the Cango Caves, this had a pH of 8.5. The faunal associations are given in Tables 8 and 9. Both the fauna of the stones in the current and of the marginal vegetation were typical of alkaline streams in the High Veld of the Transvaal and the upland regions of Natal.

DISCUSSION

Two distinctive faunal associations were found in clean, permanent streams in the area surveyed:

1. Table Mountain Sandstone, acidobiontic association. Details of this are given in appendix 1. This occurred in streams with a pH below 6 and was similar to that which has been studied in detail in the upper parts of the Great Berg River. Many of the characteristic species of this association appear to be truly acidobiontic but others may merely be species demanding rigidly oligotrophic conditions. The association also includes a number of fairly ubiquitous, non-pH-sensitive species such as Baetis harrisoni, Afronurus harrisoni and Pseudocloeon vinosum. No aquatic snails occur but Pisidium spp. are found.

2. Temperate climate association. This term is used for want of a better one, as this association has been found in all permanent streams in High Veld and other temperate parts of the country. It is best developed in definitely alkaline streams, such as the Grobbelaars River.

5/...

Some of the species comprising it are also found in weakly acid streams along with the non-pH-sensitive species mentioned above. Details of this association are given in appendix 2.

Both these association types show considerable "internal variations" in that the species composing them vary according to the river zone where they are found. For instance special species appear in the upper mountain streams in the Table Mountain System as shown by the fauna of the stream on the Outeniqua Pass, Table 4.

Extent of the Table Mountain Sandstone, acidobiontic association.

Sampling stations visited during this survey have been plotted on Map 2, together with a few stations studied previously on the Swartkops River, near Port Elizabeth and all the Stations used during the survey of the Great Berg River. In addition a few other scattered records have been plotted. The pH readings have been inserted next to the station when available except in the case of the Great Berg River. It will be noted that the faunal type is indicated symbolically according to the key.

What is here called the Table Mountain Sandstone, acidobiontic fauna was found to extend to very near the eastern limit of the T.M.S., especially in the acid, peat-stained, dystrophic waters of the George - Tsitsikamma region. The fauna is obviously one of very acid streams which are only found flowing off T.M.S. formations.

Weakly acid streams had a mixed fauna, mainly of non-pH-sensitive forms (see appendix 3) with a few acidobionts, when connected to an acid stream, and a few of the more resistant species normally found in alkaline streams in temperate parts of the country (appendix 2). Very often, as was the case in the Van Staden's Pass stream and the upper Swartkops River, the fauna could be looked on as a somewhat depleted "temperate" association.

Penetration of "Temperate" species.

As previously mentioned the fauna of the alkaline parts of the Great Berg River, and of other alkaline streams in the Western Cape Province, is composed of species which are found in the streams of the temperate High Veld of the Transvaal and O.F.S. and the uplands of Natal. However, many species found in the latter areas are not found in the Great Berg. This survey has shown that a number of these "missing species" are present in the eastern part of the Cape System Region. These include Centroptilum varium, Centroptilum indusii, Centroptiloides bifasciatum, Neoperla spio Eubrianax sp., and Simulium bequaerti. Some of these are also found in the warmer region of South Africa.

It must be pointed out that it is difficult to delineate the various associations clearly at present as the taxonomy of a number of groups still has to be worked out; these include the Hydrachnellae, Trichoptera, Chironomidae and Dryopoidea. Progress is being made with all these except the last.

RECOMMENDATIONS

Map 2 shows that there is a large "terra incognita" between the Berg River catchment and George which includes the important Breede River system. In addition there is the area to the north of the Berg River catchment which includes the important Olifants River near Clanwilliam. One assumes that the conditions found in the Berg River will grade into [illegible] eastern part of the region but it should be

realised that only a sketchy picture of these latter is available at the moment. It is therefore recommended that further sampling be carried out in the Cape System Region, possibly as an adjunct to projected ad hoc, pollution surveys,

1. to obtain a clearer picture of the distribution of the two main types of association, especially in the Breede River basin;

2. to map the northern extent of the T.M.S. fauna.

No investigation of the Cretaceous limestone streams near Bredasdorp is recommended in the near future, though samples should be taken if the opportunity offers.

PRETORIA
15th August, 1960
JDA/ADH/EW

APPENDIX 1

Preliminary list of Table Mountain sandstone, acidobiontic species. This list is built mainly from the survey of the Great Berg River and other records from the Western Cape Province. Species marked "E" were found during the recent survey of the eastern part of the Cape System Region, those marked (e) by previous workers in this eastern area.

PLECOPTERA

Namouridae (Leuctridae)

Aphanicerca capensis (e)
" uncinata
" lyrata
" bicornis
" bovina
" tereta

Aphanicercella barnardi
" scutata
" bifurcata
" nigra
" quadrata

Aphanicercopsis denticulata
" tabularis
" outeniquae (e)
" hawaquae

Desmonemoura pulchellum (e)

EPHEMEROPTERA

Baetidae

Pseudocloeon sp. A (E)

Leptophlebiidae

Aprionyx peterseni (E)
" tabularis
" pellucidulus

Aprionyx intermedius (e)
" rubicundus (E?)

Castanophlebia albicauda

Ephemerallidae

Ephemerellina barnardi

Lithogloea harrisoni (E)
Lithogloea sp. A (E)

Lithogloea penicillata (E)
Lithogloea sp. B

MEGALOPTERA

Corydalidae

Chloroniella peringueyi (E) (e)

Platychauliodes tenuis (e)
Platychauliodes woodi (e) (E?)

Platychauliodes capensis
Platychauliodes thorni

Taeniochauliodes ochraceopennis (e) (E)

TRICHOPTERA

Dyschimus thrymmifer

Dyschimus collyrifer (e)

Sinion hageni (E?)

Rhiozema saxiferum
" spinosum

Rhoizema montanum (e)
Rhoizema furciferum

Aselas camella — Cheimacheramus caudalis

Petroplax caricis — Petroplax phleophila (e)
Petroplax prionii — Petroplax curvicosta

Barbarochthon brunneum (e) (E)

Hydrosalpinx sericea

Petrothrincus circularis — Petrothrincus triangularis

Athripsodes schoenobates (e) — Athripsodes tabularis
Athripsodes promontorii — Athripsodes longistylis
" cedri — " potes (e)
" sylvaticus — " scramasax
" securis (e) — " tuckeri
" amplexus — " corrivalis
" oryx — " stephanus (e)
" elaphus — " caricaria
" bibulus — " spatula
" dieseli — " prionii
" bergensis (E?)

Leptecho scirpi — Leptecho lupi
" helicotheca

Oecetis modesta (e) — Oecetis lucipetens

Homilia elephas — Homilia knysnaensis (e)

Sciadorus acutus — Sciadorus obtusus (e) (E?)

Protodipseudopsis sp (E?) (Berg River species)

Chimarrha ambulans (e) (E?) — Chimarrha cerceris
" georgensis (e)

Thylakion urceolus (e) — Thylakion forcipatum

Myspoleo agilis (E) — Myspoleo murinus

COLEOPTERA

Gyrinidae

Brinck, in his monograph on Southern African Gyrindae lists 15 species of Gyrinidae, mostely Aulonogyrus, endemic to the Cape System Region. It is not known if these are affected by the pH of the water though most of them are confined to T.M.S. mountains.

Hydraenidae

There appear to be many species found only in acid streams of this region but none of them has been described. J. Balfour-Browne is producing a monograph.

Dryopidae

Strina sp GBG.7U (E) — GBG species 128A

Elmidae

GBG.8J (E) — GBG. 6AA (E)
GBG.125E (E) — GBG. 230C
GBG.3M — GBG. 81B

Helodidae

Berg River sp. A (E) — Berg River sp. B (E)
Berg River sp. C (E?)

DIPTERA

Blepharoceridae

Elporia barnardi (e)
Elporia spinulosa
Elporia capra
Elporia capensis
Elporia uniradius (e)

Simuliidae

Probably no species are limited to acid stream except, perhaps Simulium hessei which has only been found in T.M.S. mountains.

Chironomidae

Of the 80 or so species recorded by Dr. Scott from the Great Berg River and other localities in the Western Province, none is limited to acid streams.

HYDRACHNELLAE

It is possible that some of the species described by Viets from acid waters in the Western Province are acidobionts and limited to T.M.S. streams and pools. The following are suggested.

Plesiohygrobates pectinipalpis
Atractides pulcher
Ambiguobates permixtus
" (Ambiguobatella) peltophorus
Tortipalpus obscuriporus
Atractides coriacellus
Diversibates pilosus

The specimens collected on the last expeditions still have to be worked up.

A number of the species listed in this appendix may not be truly acidobiontic but oligotrophic and endemic to the Cape System mountains.

APPENDIX 2

"Temperate" species which appear to prefer alkaline water. Some are also found in slightly acid streams. This is a preliminary list of those found in the Cape System Region. New records for the region, found during the recent survey of the eastern part are marked (N).

NEMERTINI

Prostoma sp.

MOLLUSCA

Lymnaea natalensis (Swartkops R.)
" columella (exotic from U.S.A.)
Burnupia stenochorias
Ferrissia connollyi
Bulinus tropicus
Anisus natalensis
Burnupia gordonensis

Tomichia ventricosa

Pisidium costulosum

INSECTA
PLECOPTERA

Perlidae

Neoperla spio (N)

HETEROPTERA

Baetidae

Baetis bellus (also sub-tropical)
Baetis sp.B ("latus")
Centroptilum varium (N)
Centroptilum pulchrum
Cloeon lacunosum
Baetis sp A ("glaucus")
Centroptilum sudafricanum
Centroptilum indusii (N)
Centroptiloides bifasciatum (N)

Caenidae

Too little is known of this group to place the species.

Tricorythidae

Neurocaenis discolor

Leptophlebiidae

Euthraulus elegans

TRICHOPTERA

Cheumatopsyche thomassetti (syn. zuluensis)
Macronema sp (? natalensis)
Dipseudopsis capensis
Ecnomus spp

COLEOPTERA

Psephonidae

Eubrianax sp. (N)

Numerous Dytiscidae, Hydrophyllidae, Hydraenidae, Dryopidae and Helmidae almost certainly belong here but not enough is known of their distribution and taxonomy at the moment to place them.

DIPTERA

Simuliidae

Simulium ruficorne
Simulium bequaerti (N)
Simulium hirsutum (Swartkops River)
Simulium bovis
Simulium alcocki (Swartkops)

Chironomidae

Dr. Scott gives a full list of the species found in the acid and alkaline parts of the Great Berg River.

APPENDIX 3

Species which appear not to be pH sensitive. Most are limited to the temperate parts of the country, others are also found in sub-tropical parts (U). This is a preliminary list of those found in the Cape System Region.

DECAPODA

Potomon perlatus-sidneyi complex (U)

EPHEMEROPTERA

Baetis harrisoni
Pseudocloeon vinosum
Austrocloeon africanum (U)
Centroptilum excisum (U)
Austrocloeon virgiliae (U)
Acentrella capensis

Adenophlebia peringueyella and other species
Castanophlebia calida
Choroterpes nigrescens

TRICHOPTERA

Athripsodes harrisoni

Cheumatopsyche afra (syn. maculata)

Hydroptila capensis (U)
Orthotrichia sp (U)

Oxyethira (syn. Argyrobothrus) velocipes (U)

DIPTERA

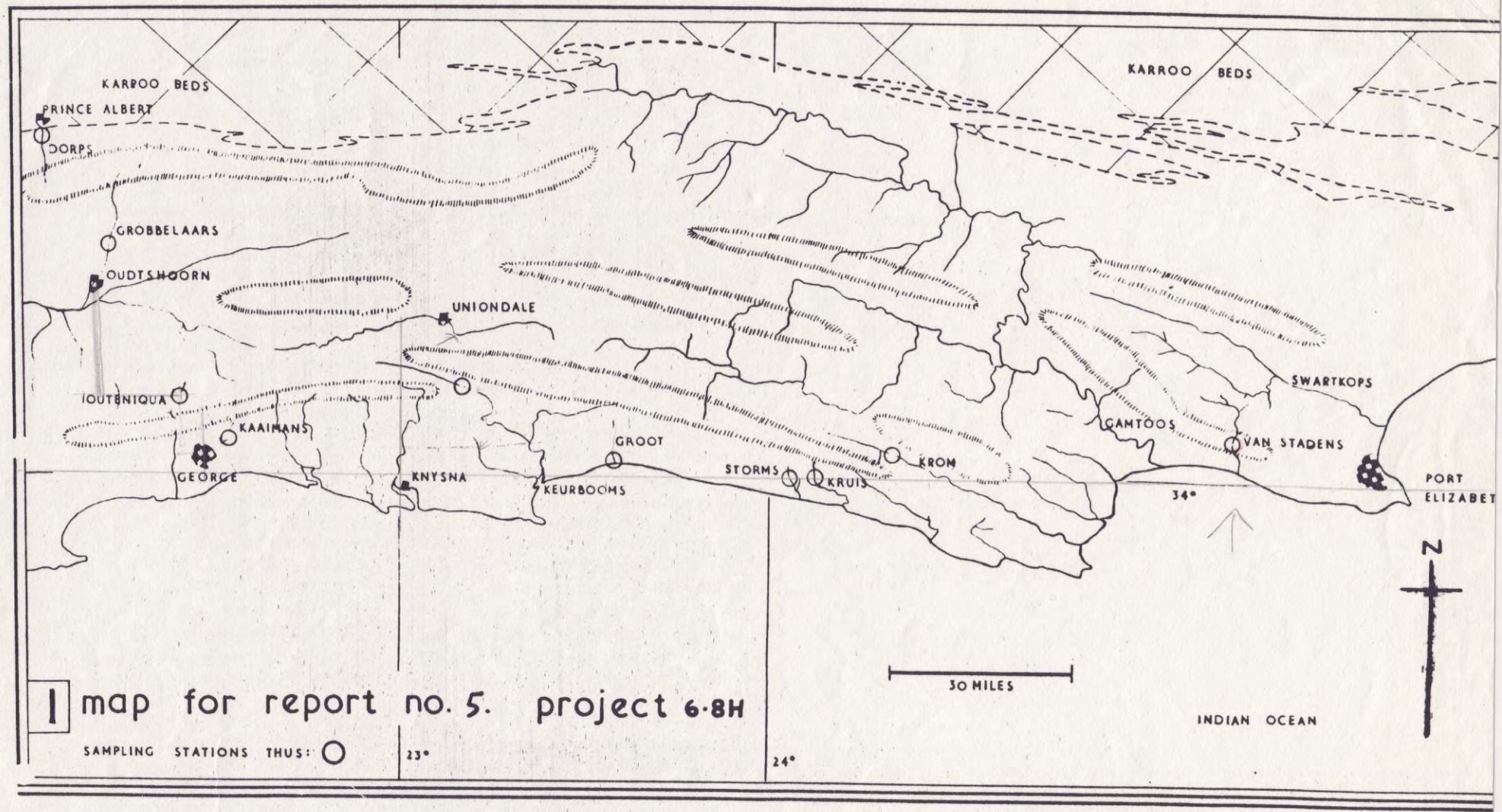
Simuliidae

Simulium medusaeforme
" impukane (U)
" unicornutum (U)
" nigritarsis (U)

Simulium harrisoni
Simulium merops
" adersi (U)

NOTE

The following groups have not been considered in these appendices: all Crustacea below Decapoda, all Heteroptera, all Dytiscidae, Hydrophyllidae and Hydraenidae, all Odonata. Chironomidae are only known from the Western Cape Province and from the Swartkops River, near Port Elizabeth and not from the rest of the region.



1 map for report no. 5. project 6·8H

SAMPLING STATIONS THUS: ○

TABLE 1.

SAMPLING STATIONS

REGION.	STATION.	REMARKS.	RIVER TYPE.
B	Nutsie SWC1	Pools in small trickle from coastal hills. Abundant aquatic vegetation with Chara, Rivularia, Borzia, Schizothrix, Oedogonium, Cladophora.	Alkaline water with high T.D.S. and high chlorides pH = 7.4
A	Kruis River SWC2	Fast current connecting deep pools. Stony bottoms with growths of Wardia hygrometrica. Marginal Prionium serratum	Acid (pH = 5.0 - 5.9), unbuffered water with low T.D.S. content peat-stained.
A	Kaaimans River SWC3	Stony runs, and quieter pools with sand bottoms containing leaves and stones.	
A	Outeniqua Pass SWC4	Small mountain trickle with Wardia hygrometrica and other moss.	
A	Storms River SWC5	Similar to Kruis River above. Marginal Scirpus in deep pool.	
A	Groot River SWC6	Just above estuarine influence. Shallow stony run and marginal Scirpus fluitans.	
A	Dorps River SWC7	Mountain stream. Stony runs with moss and roots in interstices.	Slightly acid (pH = 6.0 - 6.9) clear water.
A	Krom River SWC8	Stony runs and marginal vegetation. Heavy gelatinous growths on both stones and vegetation, (Chlamydobotrys). Polluted?	
A	Assegaaibosch SWC9	Small shaded tributary of Krom above. Stones in current.	
A	van Staden SWC10	Stream at bottom of pass. Small stony runs and deeper quiet pools with marginal vegetation.	

REGION.	STATION.	REMARKS.	RIVER TYPE
A	Near Kaaimans SWC16	Small shaded stream entering Touw River. Shallow stony runs.	Slightly acid (pH = 6.0 - 6.9) clear water.
A	Keurbooms River SWC12	Foothill stream with shallow stony runs and vegetation.	
A	Buffelsnek SWC13	Mountain stream with shallow stony runs and vegetation in current.	
A	Between Avontuur & Uniondale. SWC14	Mountain stream - stones in current and marginal vegetation.	
A	Grobbelaars SWC15 Oudtshoorn	Broad open river with stony runs. Little marginal vegetation.	Alkaline (pH= 8.5) clear water.

SWC 17 - Forest lead stear

SWC 18 Buffels doe maden

cleal 10 11

TABLE 2

MINERAL ANALYSES.

	Storms River 5	Groot River Estuary 6	Nutsie 1
Total Dissolved solids, ppm.	68	3862	1396
Total Alkalinity ppm. $CaCO_3$	0	11.3	242
Total Acidity ppm. $CaCO_3$	13	0	0
Sulphate ppm. SO_4	4	268	50
Chloride ppm. Cl.	25	1850	571
Total Hardness ppm. $CaCO_3$	14	677	465
Ca-Hardness ppm. $CaCO_3$	5	91	282
Mg-Hardness ppm. $CaCO_3$	9	586	183
Sodium, ppm. Na	14	1104	336
Potassium, ppm. K	0.4	42	7.2

TABLE 3.

NUTSI : % COMPOSITION OF FAUNA,
SNAILS EXCLUDED.

SWC1 pool SWC1

	%	Remarks.
Nematoda	0.6	
Caenidae	0.6	Austrocaenis capensis ?
Cloëon cf. lacunosum	14.6	
Anax	1.2	
Crocothemis	0.6	
Notonectidae*	13.5	
Corixidae*	5.9	
Oxyethira	11.1	(= Argyrobothrus)
Leptoceridae	0.6	
Dytiscidae	7.0	including larvae
Hydraenidae	3.5	
Hydrophilidae	1.8	Paracymus and Amphiops
Chironomus	10.5	
other Chironomidae	14.1	Orthoclads, Pentaneura, Tanytarsini
Burmupia	2.3	
Anuran larvae	11.7	
	99.6%	

* Identified Notonectidae: Anisops gracilis, Enithares sobria

Identified Corixidae: Sigara sjöstedti

Snails: Extremely plentiful : Tommichia cf. ventricosa.

Dore Cape!

TABLE 4.

% ANALYSIS OF FAUNA OF STONES IN CURRENT (acid, peat stained rivers).

		Outeniqua Pass	Kruis River	Kaaimans	Storms	Groot	Remarks
		%	%	%	%	%	
Nemouridae	Aphanicercopsis (type)	38.8	15.4	18.9	13.0	7.4	Not classifiable to spp.
	Aphanicercella (type)	-	0.8	2.1	-	3.8	Not classifiable to spp.
Baëtidae	Baëtis harrisoni	-	-	-	17.7	3.8	
	Pseudocloëon vinosum	-	11.8	19.9	1.5	1.3	
Leptophlebiidae	Aprionyx peterseni	0.9	-	-	-	-	
	Castanophlebia calida	4.4	9.3	1.2	1.2	5.1	
Ephemerellidae	Lithogloea penicillata	-	6.3	1.5	0.4	5.8	
Megaloptera	Chlorionella	-	0.5	0.5	0.2	0.3	
	Platychauliodes	-	0.6	-	P	-	
	Taeniochauliodes	0.6	-	-	-	-	
Sericostomatidae	Barbarochthon cf. brunneum	-	2.1	0.6	0.6	-	Species determination difficult.
	Dyschimus sp.	0.6	-	-	-	-	
	Petroplax sp.	-	-	-	-	P	
	Sinion cf. hageni	1.2	-	-	-	-	
Leptoceridae	Athripsodes spp.	-	1.7	0.3	1.4	19.6	
	Leptocerus spp.	4.7	-	-	-	-	
Hydropsychidae	Sciadorus cf. obtusus	4.4	-	-	-	-	
	Cheumatopsyche maculata	-	-	-	0.8	-	
	Cheumatopsyche zuluensis	-	-	-	1.4	-	
Polycentropodidae	Protodipseudopsis	0.3	0.2	-	-	-	
Philopotamidae	Chimarrha	-	1.2	8.8	14.3	2.6	Not classifiable to spp.
Rhyacophilidae	Hyspoleo agilis	-	-	1.4	1.8	0.3	
Elmidae	Total Elmids	23.0	25.7	2.6	14.9	16.3	Mostly Stenelmis, Limnius and larvae.
Ptilodactylidae		-	1.8	-	P	-	
Helodidae	sp. A	-	-	17.5	P	-	
	sp. B	-	1.1	P	P	0.1	
Simuliidae	Simulium larvae	-	-	5.6	9.9	2.6	
Total Chironomidae		9.8	7.5	10.4	3.5	27.9	
Rhagionidae	Atherix	-	1.5	1.2	-	1.6	
Anura	Heleophryne	P	P	-	P	-	
	Total	88.7	87.5	92.5	82.6	98.5	

Additional Notes:

Outeniqua Pass: Allocnemis leucosticta, Strina, Procladius.

Kruis River:

Kaaimans River: Allocnemis, Rheotanytarsus

Storms: Monospilus dispar, Gammarus

Groot: Allocnemis, Rheotanytarsus

TABLE 5.

% ANALYSIS, MARGINAL VEGETATION FAUNA.
(acid, peat stained rivers).

		SWC2 Kruis	SWC3 Kaaimans	SWC5 Storms	SWC6 Groot
		%	%	%	%
Nemouridae	Aphanicercopsis (type)	-	5.4	-	-
	Aphanicercella (type)	3.2	0.9	0.8	P
Baëtidae	Austrocloëon cf. africanum	-	-	-	59.4
	Pseudocloeoen vinosum	40.2	-	2.3	-
Caenidae	Caenidae	-	0.9	-	P
Ephemerellidae	Lithogloea harrisoni	4.4	P	1.5	-
	Lithogloea penicillata	3.7	-	-	-
Odonata	Total Anisoptera	0.2	7.2	3.1	-
	Total Zygoptera	0.7	6.3	-	-
Leptoceridae	Athripsodes spp.Ø near bergensis	19.7	39.9	41.7	1.4
	Leptocerus spp.	-	1.8	-	-
Sericostomatidae	Barbarochthon brunneum (Athripsodes)	0.7	6.3	6.8	-
Elmidae	Total (incl. larvae)	1.8	-	4.5	2.8
Ptilodactylidae	Larvae	0.1	1.8	1.5	-
Helodidae	sp. A	-	0.9	-	-
	sp. B	3.0	-	-	-
Chironomidae	Total	17.6	9.9	33.4*	33.8
		92.3%	81.3%	95.6%	97.4%

* Mostly Chironomus larvae. Ø Mostly near bergensis Scott

TABLES 8 AND 9 : THE FAUNA OF GROBBELAARS RIVER (% distribution)

TABLE 8 STONES IN CURRENT	%
Planaria	1.8
Nematoda	1.6
Lumbricidae	0.2
Potamon cf. sidneyi	0.4
Hydrachnellae	10.9
Baëtis harrisoni	28.3
Pseudocloëon maculosum	7.7
Caenidae	1.6
Adenophlebia peringueyella	0.8
Euthraulus elegans	7.1
Afronurus harrisoni	4.4
Aeschna	0.2
Ecnomus	0.2
Cheumatopsyche maculata	0.6
Cheumatopsyche zuluensis	9.1
Orthotrichia	3.3
Psephenidae (Eubrianax)	2.2
Simulium larvae	1.8
Orthocladiinae	8.9
Other chironomidae	6.5
Tabanidae	1.6
Burnupia	0.2
	99.9

TABLE 9 MARGINAL VEGETATION	%
Prostoma	1.3
Nematoda	3.9
Lumbricidae	4.1
Hydrachnellae	1.3
Caenidae	1.9
Austrocloeon sp.	4.9
Baëtis bellus	1.1
Centroptilum excisum	1.1
Centroptilum indusii	0.2
Centroptilum pulchrum	0.2
Baetid juveniles	32.1
Euthraulus elegans	0.1
Micronecta piccanin	1.3
Micronecta juvs.	43.7
Strina	0.1
Psephenidae (Eubrianax)	0.1
Corynoneura	1.9
Pisidium	0.7
	100.0

TABLE 6. % ANALYSIS - STONES IN CURRENT FAUNA. CLEAR, SLIGHTLY ACID RIVERS

		DORPS	KROM	ASSEGAAIBOSCH	BUFFELSNEK	NEAR TOUW R.	AFTER * AVONTUUR	KEURBOOMS*	V.ST
		%	%	%	%	%	%	%	%
Perlidae	Neoperla spio	-	-	-	0.3	-	-	-	-
Nemouridae	Aphanicercopsis (type)	9.5	3.3	-	-	16.3	-	-	-
	Aphanicercella (type)	2.0	-	2.0	-	-	-	-	-
Baëtidae	Acentrella cf. capensis	0.2	-	-	-	0.2	-	-	-
	Baëtis harrisoni	0.8	0.7	8.1	2.1	-	P	P	-
	Centroptilum südafricanum	14.1	-	25.2	10.1	8.2	P	P	4.7
	Centroptiloides bifasciatum	-	2.3	-	-	-	-	-	-
	Pseudocloeon maculosum	-	15.4	-	-	-	-	P	-
	Pseudocloeon vinosum	-	4.6	-	1.5	-	-	-	0.1
Leptophlebiidae	Adenophlebia peringueyella	0.7	-	6.6	1.6	4.0	P	P	0.1
	Castanophlebia calida	2.5	-	-	-	0.4	-	-	-
Ephemerellidae	Lithogloea penicillata	-	-	5.6	0.3	-	-	-	-
Tricorythidae	Neurocaenis discolor	9.5	-	-	2.1	-	-	-	-
Leptoceridae	Athripsodes spp.	0.7	-	P	-	P	-	-	-
Hydropsychidae	Cheumatopsyche maculata	3.5	11.8	2.0	4.2	2.7	P	P	0.8
	Cheumatopsyche zuluensis	-	-	-	2.4	-	-	-	-
	Macronema	-	10.2	0.5	-	-	-	-	0.1
Philopotamidae	Chimarrha	8.5	-	-	1.3	5.5	-	-	-
Hydroptilidae	Hydroptila sp.	P	-	-	-	-	-	P	-
Elmidae	Total Elmids (incl. larvae)	7.7	7.3	11.6	15.3	9.3	-	P	-
Helodidae	Helodid sp A	0.8	2.6	-	-	4.6	-	-	-
	Helodid sp B	0.8	0.3	-	-	-	-	-	-
Simuliidae	Simulium larvae	7.6	3.0	P	11.3	26.2	P	P	73.1
Chironomidae	Total Chironomidae	8.9	34.4	21.6	19.5	14.4	P	P	9.4
Rhagionidae	Atherix type	1.0	-	2.0	-	-	-	-	-
		78.8	95.9	85.2	72.0	91.8	-	-	88.3

* N.B. At these two stations, % analyses are not available. P indicates presence, (not necessarily in small numbers in these two columns)

Dore Cape!

TABLE 7.

% ANALYSIS - MARGINAL VEGETATION FAUNA
CLEAR, SLIGHTLY ACID RIVERS.

		Krom	Buffelsnek	Near * Aventuur	Keurbooms*	v. Stadens
		%	%	%	%	%
Nematoda	Nematodes	-	31.1	P	P	8.5
Nemertea	Prostoma	6.3	6.4	P	P	5.3
Baëtidae	Baëtis bellus	10.6	-	P	-	-
	Centroptilum excisum	-	0.3	P	-	-
	Centroptilum südafricanum	4.3	0.4	P	P	-
	Pseudocloeon vinosum	8.5	3.6	-	-	-
Coenagriidae	Pseudagrion sp.	6.3	3.4	P	P	-
Hydroptilidae	Oxyethira (=Argyrobothrus)	6.3	3.4	-	P	11.2
	Hydroptila	P	-	-	P	-
Simuliidae	Simulium larvae	10.6	13.8	P	P	1.8
Chironomidae	Total	14.9	26.4	P	P	34.0
Mollusca	Burnupia	2.1	2.3	P	P	-
		69.9	91.1	-	-	60.8

* % figures not available.

P indicates presence, not necessarily in small numbers, in these two columns.