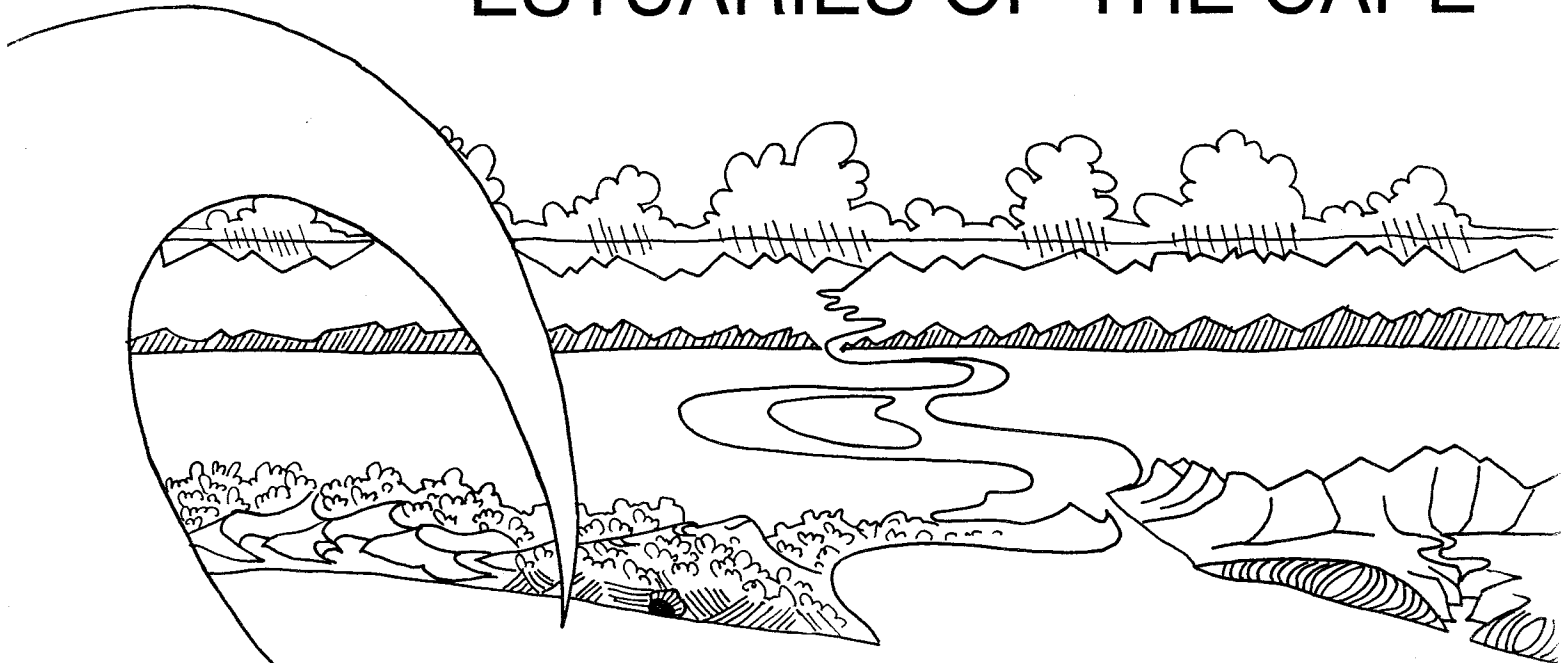


COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH
NATIONAL RESEARCH INSTITUTE FOR OCEANOLOGY
ESTUARINE AND COASTAL RESEARCH UNIT – ECRU



ESTUARIES OF THE CAPE



PART II

SYNOPSIS OF AVAILABLE INFORMATION
ON INDIVIDUAL SYSTEMS

EDITORS: A E F HEYDORN
J R GRINDLEY

REPORT NO. 4

SWARTLINTJIES (CW4)

ESTUARIES OF THE CAPE

PART II: SYNOPSES OF AVAILABLE INFORMATION ON INDIVIDUAL SYSTEMS

REPORT NO. 4: SWARTLINTJIES (CW4)

(CW4 – CSIR Estuary Index Number)



FRONTISPIECE: SWARTLINTJIES ESTUARY – ALT. 150 m, ECRU 79-08-14

COMPILED BY : T J E HEINECKEN

ECRU SURVEY : 16 OCTOBER 1980
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COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH

ISBN 0 7988 1812 3 (Set)
ISBN 0 7988 1813 1 (Part 2)
ISBN 0 7988 1827 1 (Rep. No. 4))

Published in 1981 by :

National Research Institute for Oceanology
Council for Scientific and Industrial Research
P.O. Box 320, Stellenbosch. 7600

Printed by :

CREDA PRESS, CAPE TOWN

Preface :

The Estuarine and Coastal Research Unit (ECRU) was established by the National Research Institute for Oceanology of the CSIR in 1979 with the following aims :

- to contribute information relevant to the development of a cohesive management policy for the South African coastline;
- to compile syntheses of all available knowledge on the 167 estuaries of the Cape between the Kei and the Orange rivers;
- to identify gaps in information and to stimulate research at Universities, Museums and other institutions to fill these.

The Unit was established at the request of the Government and the Department of Water Affairs, Forestry and Environmental Conservation contributes substantially to the running costs.

In 1980 the Unit published its first report under the title "The Estuaries of the Cape, Part I - Synopsis of the Cape Coast, Natural Features, Dynamics and Utilization" (by Heydorn and Tinley) . As the name of the report implies, it is an overview of the Cape Coast dealing with aspects such as climate, geology, soils, catchments, run-off, vegetation, oceanography and of course, estuaries. At the specific request of the Government, the report includes preliminary management recommendations.

The present report is one of a series on Cape Estuaries being published under the general title "The Estuaries of the Cape, Part II." In these reports all available information on individual estuaries is summarized and presented in a format similar to that used in a report on Natal estuaries which was published by the Natal Town and Regional Planning Commission in 1978. It was found however, that much information is dated or inadequate and that the compilation of Part II reports is therefore not possible without brief prior surveys by the ECRU. These surveys are usually carried out in collaboration with the Botanical Research Institute and frequently with individual scientists who have special interests in the systems concerned. One of these is Prof J R Grindley of the University of Cape Town who is co-editor of the Part II series.

These surveys are however not adequate to provide complete understanding of the functioning of estuarine systems under the variable conditions prevalent along the South African coastline. The ECRU therefore liaises closely with Universities and other research institutes and encourages them to carry out longer-term research in selected estuarine systems. In this way a far greater range of expertise is involved in the programme and it is hoped that the needs of those responsible for coastal zone management at Local-, Provincial- and Central Government levels can be met within a reasonable period of time.

Finally, it has been attempted to write the Part II reports in language understandable to the layman. However it has been impossible to avoid technical terms altogether. A glossary explaining these is therefore included in each report.



F P Anderson
DIRECTOR

National Research Institute for Oceanology
CSIR

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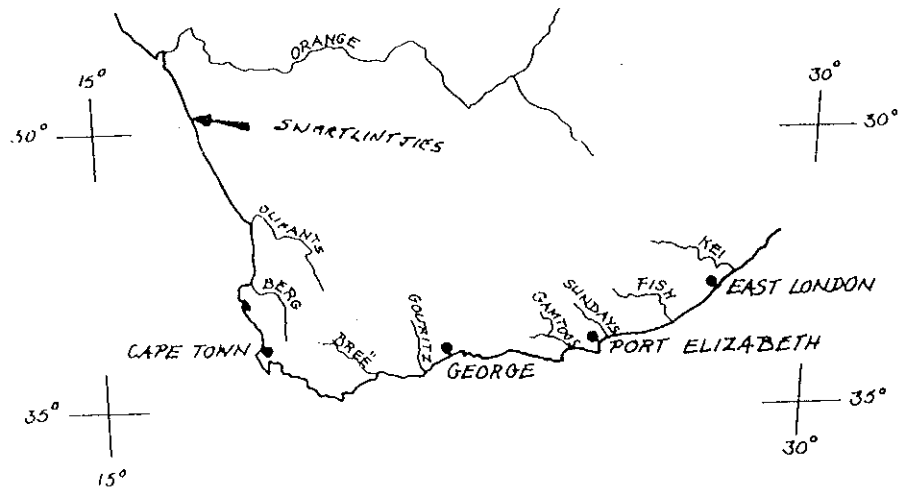
SWARTLINTJIES

1. SYNONYMS AND DERIVATIONS

Zwart Lintjies Rivier is the name given to the original farms on which the estuary is situated (1:50 000 Sheet 3017 AD).

2. LOCATION

30° 16' S , 17° 16' E



The mouth of the estuary lies 176 km south of the Orange River mouth and 6 km to the north of Hondeklipbaai (1:250 000 Topographical Sheet 3017).

2.1 Accessibility :

This estuary falls within a strict security area of the Koingnaas mining concession of De Beers Consolidated Diamond Mines (DBCDM). Due to the active mining operations in the immediate vicinity of the estuary, security clearance is required by anyone entering the area and visitors are accompanied by a security guard at all times.

Road access to the estuary is via a 7,5 km gravel road from Koingnaas and the coastal fishing village of Hondeklipbaai lies 16 km by road from Koingnaas.

3. ABIOTIC CHARACTERISTICS

3.1 Catchment :

Area

The catchment area is given as 1 687 km² by Heydorn and Tinley (1980), whereas Memoranda from Agricultural Technical Services (1975) record the catchment as being 104 000 ha (1 040 km²) in extent. The river

drains the edge of the Namaqua-Bushmanland escarpment with a network of smaller unnamed tributaries on the coastal plain (1:250 000 Topographical Sheet 3017).

River length

The Swartlintjies is approximately 30 km long from the mouth up to where it splits into a number of unnamed tributaries. The total length of the system is 65 km (1:250 000 Topographical Sheet 3017).

Mean annual run-off

No published data could be traced.

3.2

Flow :

At the time of the ECRU survey on 16 October 1980 the riverbed was dry, except for a few standing pools approximately 10 km from the mouth. Two small excavated trenches and a waterhole on the edge of the dry riverbed at Grid Ref. 1710 (See Fig. 1 with overlay) contained water at approximately 0,75 m below the surrounding ground level. Two large excavated trenches just north of the mouth contained water which is pumped up to the Koingnaas mine. Seawater and subterranean water from the riverbed seeps into these water supply trenches at their southern end (See Plate I). After rains in the catchment water flowed in the upper reaches of the river during Aug/Sept. of 1980 but no water reached the mouth (Mr. C. Sweet pers. comm.).

Flood history and level fluctuations

A deeply incised riverbed in the upper catchment, the presence of layers of silt and organic "sludge" and the braided channels evident in aerial photographs of 1942 and 1980, indicate that strong flow and erosion occurs when the river comes down in flood. The river catchment falls within an episodic rainfall area and floods can therefore be expected (Heydorn and Tinley 1980). According to Mr Sweet, DBCDM opened the mouth with bulldozers to allow seawater into the estuary in August 1978 and again in December 1978. In both cases the mouth closed shortly after being opened. A further attempt at artificial opening was made during early 1980 and the estuary then contained water for approximately 6 months.

3.3

Obstructions :

(a) In the catchment

A number of minor gravel roads and tracks cross the river in the upper catchment, these are normally low level drifts of <1 m high (1:250 000 Topographical Sheet 3017).

(b) Near the mouth

A solid embankment, approximately 2 m high crosses the dry riverbed 1 km from the mouth and another two embankments cross the river 2 and 2,2 km from the mouth respectively. None of these embankments have any culverts to allow for the passage of floodwaters and the middle embankment carries a major road which is used to transport gravel from the open cast excavations on the southern side of the river to the Koingnaas mine (See Fig. 1).

3.4 Siltation :

The lower part of the estuary consists of a flat, wide sandy riverbed which indicates that substantial flooding and concomitant silt deposition takes place at times. According to a memorandum from Agricultural Technical Services, the Swartlintjies and other West coast rivers are "young" rivers which are fast flowing when in flood and as the flow seldom reaches the sea the silt load is deposited along the upper reaches of these rivers.

At the time of the ECRU survey the flat riverbed in the lower reaches of the Swartlintjies was covered with a thin layer of sand overlying a layer of dried-out organic sediment which displayed pronounced cracking.

3.5 Land ownership/use :

(a) Catchment

The catchment consists of privately owned farms which are used principally for extensive sheep and goat farming. All the farms adjoining the coast have been bought by DBCDM and the grazing rights of these farms are leased to private farmers.

(b) Around the estuary

The land around the Swartlintjies Estuary and the estuary itself are owned by DBCDM and are subject to very strict security control. Intensive open cast mining for diamonds is carried out on either side of the estuary (See Fig. 1 and FRONTISPIECE).

Two large trenches 850 m x 5 m and approximately 10 m deep have been excavated just above the High Water Mark to the north of the rivermouth (Plate I). Seawater and sub-terranean water which seeps into these trenches is pumped 8 km via 2 pipes of 25 cm diameter to the Koingnaas mine for washing diamond bearing gravels.

3.6 Local Authority :

The estuary falls within the Namaqualand Divisional Council area but due to security control, DBCDM exercises all rights of access to the estuary.

3.7 Estuary uses :

No obvious uses are made of the estuary as it normally contains no water and right of access is strictly controlled by DBCDM.

3.8 Morphometry of the estuary :

Area

The area of the dry riverbed up to 1,1 km from the mouth as shown in the 1:10 000 colour aerial photographs, Job No. 326 is approximately 8 ha. The area of the main floodplain (See Fig. 1) and as shown by the 1:20 000 black and white aerial photographs Job No. 348 is approximately 110 ha.

Shape (Fig. 1 and FRONTISPIECE)

The 1:20 000 aerial photograph shows that in the lower reaches the riverbed forms two extended meanders before widening out into a

floodplain approximately 1,8 km long by 400 m wide. The riverbed then narrows into a channel, widening slightly towards the mouth which opens northwards into a small bay. An extensive network of braided flood channels are evident on the floodplain. The flat riverbed is flanked by low-lying, sparsely vegetated dunes.

Bathymetry

At the time of the ECRU survey there was no water in the riverbed, but two small excavated trenches next to the main river course (Grid Ref. 1710) contained water to a depth of 20 cm. The water level in these hollows was approximately 1,25 m below the level of the dry riverbed, indicating a relatively high water table.

3.9

Geomorphology :

Geology

A detailed description of the geological formations found on the Koingnaas group of farms (Fig. 2) which includes the Swartlintjies Estuary is given in a guidebook prepared for a visit by the Geological Society of South Africa (GSSA) to Namaqualand in November 1979. According to the guidebook the sediments in the area are known locally as the Koingnaas Complex. The Basement rock falls within the Namaqualand-Natal belt of metamorphism and granitization and this is overlain by a number of sedimentary sequences (See Fig. 3).

This entire geological sequence is overlain by scrub covered, loose, aeolian sand and several quartzitic dune-fields.

The 1:10 000 colour, aerial photographs (Job No. 326) show three distinct bands of surface soil formations. A triangle of unvegetated barchanoid dunes lies to the north of the rivermouth adjacent to the coast, with reddish sand present in the dune slacks. This is followed by a band of vegetated white dunes approximately 400 m wide, followed by vegetated red sands with darker termitaria "heuweltjies" extending inland.

Nature of bottom materials

The dry riverbed consists of a surface layer of light-grey fine sand, which shows pronounced cracking due to the drying of the underlying sediment. A core sample to a depth of 50 cms. taken in the middle of the riverbed at Grid Ref. 1810 showed a layered pattern of sediments (Fig. 4).

The black organic "sludge" found in the core had a greaselike consistency and was odourless (Plate II). A cursory microscopic examination of a sample of this sediment revealed that it contained various types of pollen (Prof. H Deacon, pers. comm.) but no signs of animals remains (Dr D De Decker, pers. comm.). The intrusion of marine sediment at the mouth is evident from the aerial photographs, probably caused by the artificial opening of the mouth to the sea (See section 3.1).

Sandbar characteristics

A flat sandbar with low hummock dunes on the south and an embankment of material from the excavated trenches on the north, occurs at the mouth of the dry riverbed.

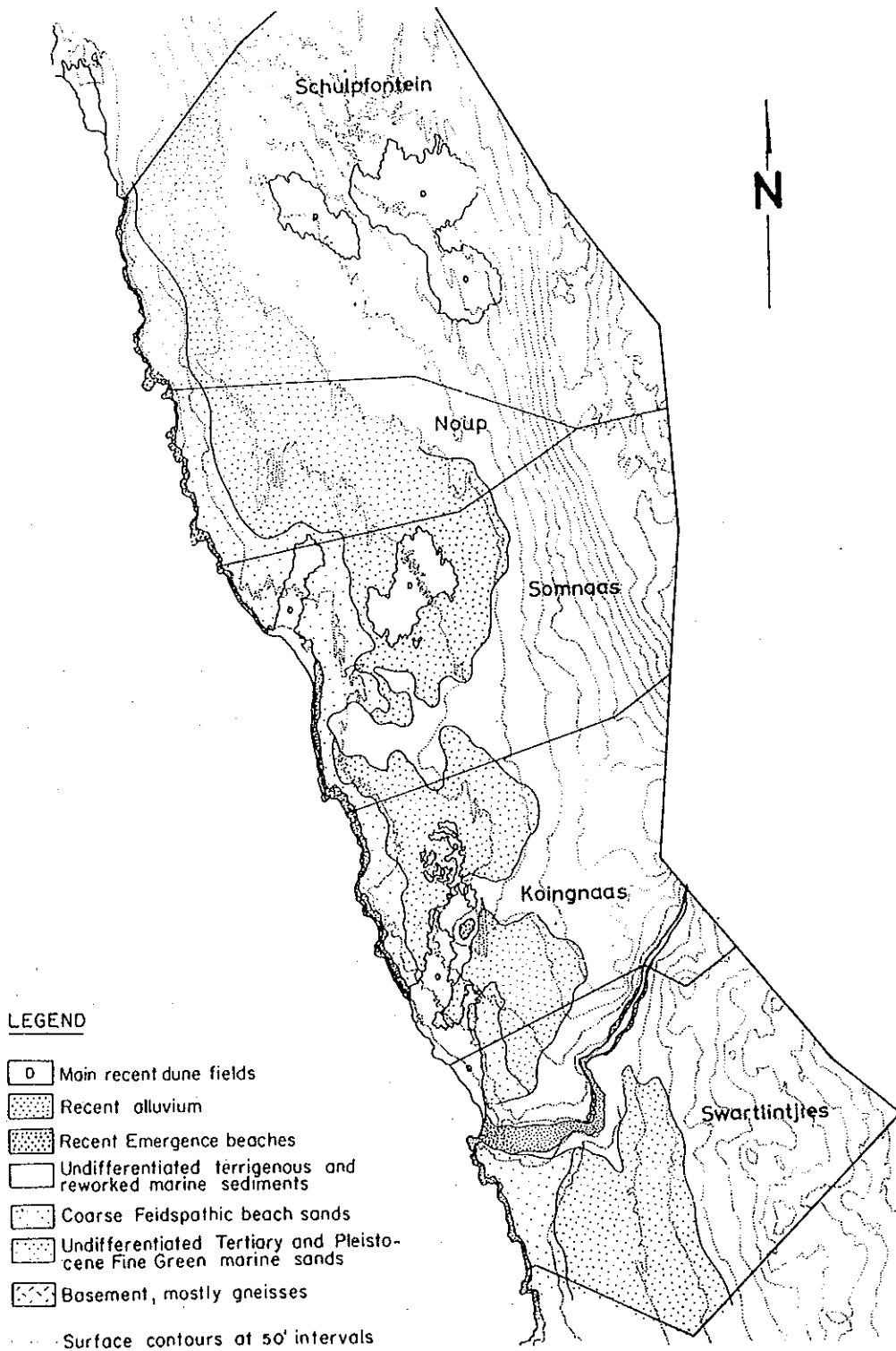


FIG. 2 Geological sketch map of the Koningnaas Complex farms (De Beers 1979).

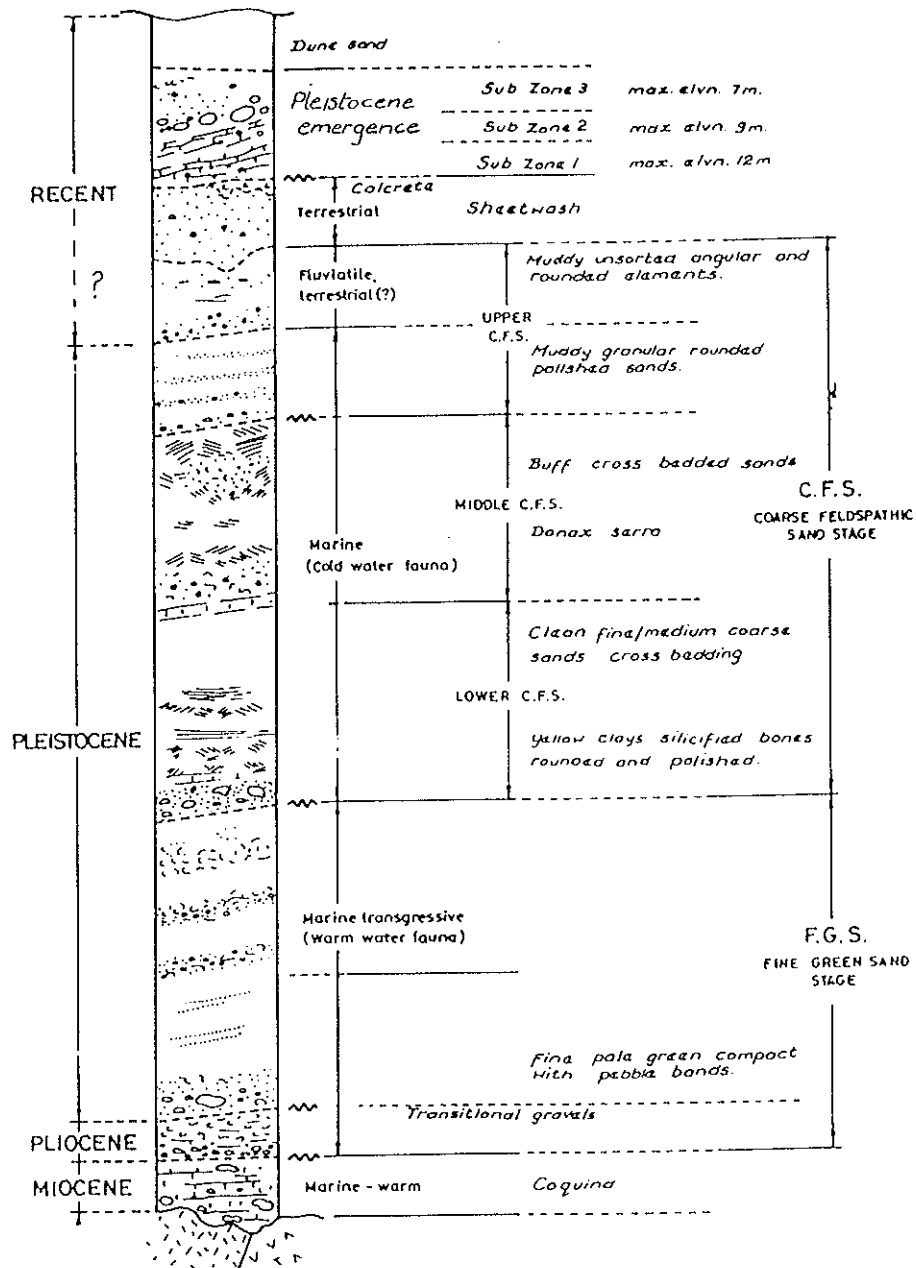


FIG. 3 Koinaas geological column (De Beers 1979).

Evidence of artificial breaching of the bar is shown on the 1:10 000 aerial photographs of 11 May 1979 and 1:20 000 aerial photographs of 1 April 1980.

The presence of dried kelp 500 m upstream from the mouth, indicated that water had pushed that far up into the estuary after the mouth had been opened.

The slope of the beach from the crest of the sandbar to the sea is 1 in 39. The top of the sandbar was 0,50 m above Mean High Water Spring tide level at the time of the ECRU survey.

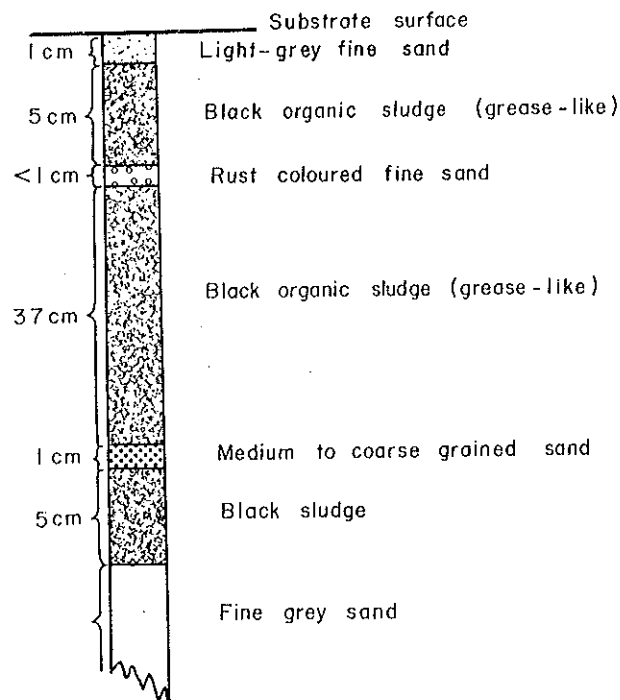


FIG. 4 : Core sample taken in the dry riverbed of the Swartlintjies Estuary (ECRU survey).

Configuration of the adjacent shore

The rivermouth is situated close to a rocky promontory in a north-facing bay. A triangular dunefield of bare transverse barchanoid dunes fan out northwards from the rivermouth for a distance of approximately 1,6 km. Another less prominent rocky point is found at the northern end of the bay 1,8 km from the rivermouth.

The dune-plume to the north of the Swartlintjies mouth and its present configuration has been attributed to changes in sea-level and subsequent movements of the river mouth sediment source (Fig. 5 Tankard and Rogers 1978).

The shoreline along the bay consists of a steeply shelving terraced beach, the slope of which is accentuated near the mouth by the embankments of the two excavated trenches running parallel to the shore.

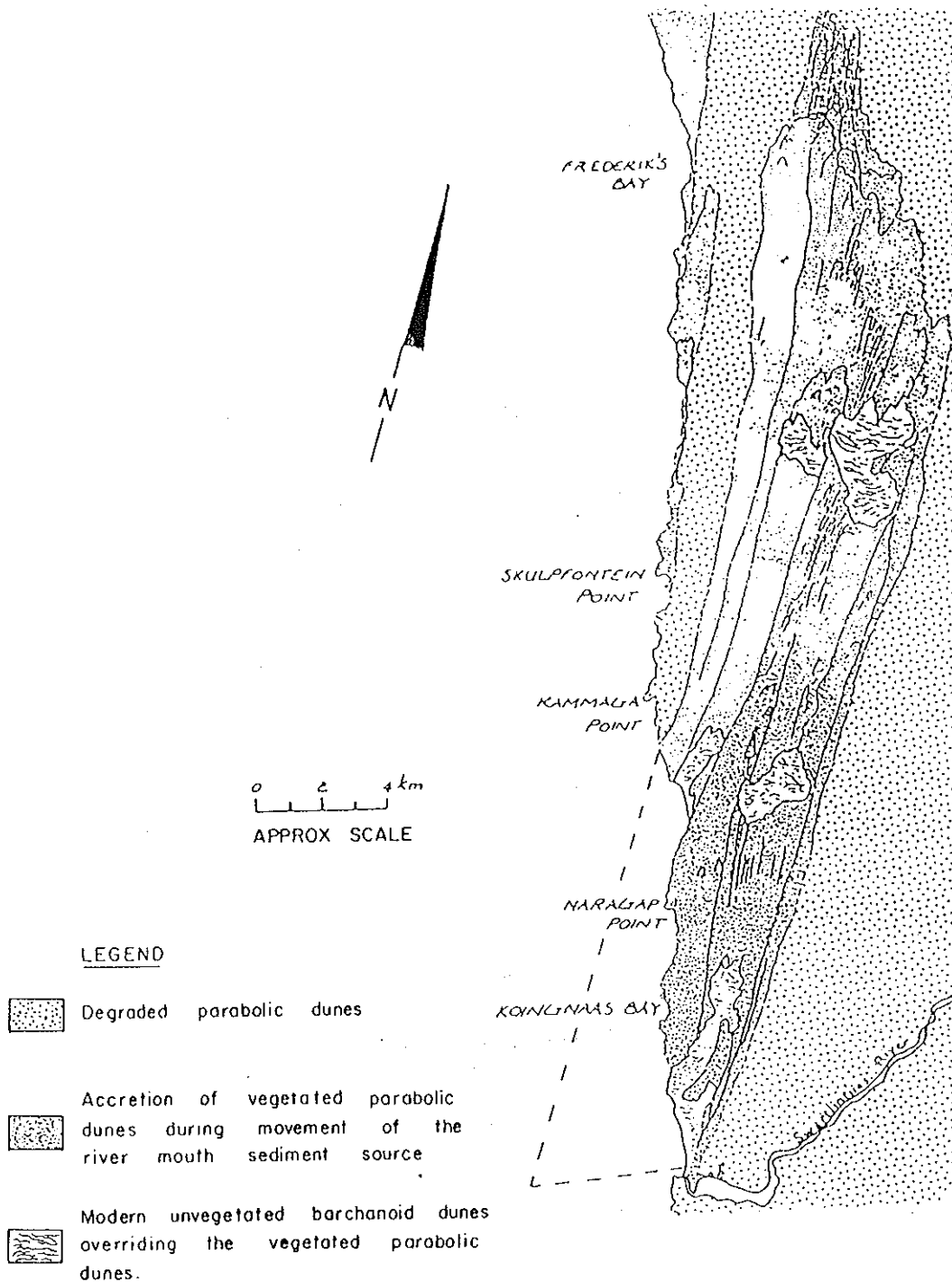


FIG. 5 : Quaternary dunes north of Swartlintjies River (from Tankard and Rogers 1978).

3.10 Oceanography :

Major currents

The northward flowing Benguella current is the major current along the Namaqualand coast. Offshore winds, mainly during summer cause the inshore surface waters to move away from the coast increasing the upwelling of cold nutrient-rich water (Heydorn and Tinley 1980).

Waves

Waves strike the coastline mainly from the SW and SSW. According to J. Rossouw (pers. comm.) wave heights of 1,6 m are reached for 50 percent of the time at Oranjemund which is approximately 170 km north of the Swartlintjies Estuary. The wave frequency has been recorded as 10 - 15 seconds at Buchu Bay, approximately 150 km north of Swartlintjies by Ashby et. al. (1973).

Surf zone currents

A series of outward flowing rip currents 100 to 200 m apart extending northwards along the bay indicated nearshore "cell" circulation, with a nett northward flowing longshore current at the time of the ECRU survey.

Tides

The ECRU survey took place one day before Neap tide and the tidal range between Mean High Water Spring and Mean Low Water Spring at Port Nolloth is recorded as being 1,57 m. (S.A. Tide Tables 1980).

3.11 Physico-chemical characteristics :

No previous data was available on physico-chemical characteristics. A few readings were taken during the ECRU survey at 2 localities and these are presented in Table 1.

Nutrients

No published data could be traced on nutrient concentrations, however the presence of filamentous algae and the opaque green colour of the water in the excavated trenches adjacent to the estuary suggests high nutrient levels.

Other nutrients

No data available.

3.12 Pollution :

Due to the isolated situation of the estuary it is unlikely that pollution from sewage, pesticides or herbicides occurs. Chemical, oil and metal pollution could occur as a result of the diamond mining activity in the immediate vicinity of the estuary.

Other forms of pollution

No data available.

3.13 Public health aspects :

No data available.

TABLE 1 : Physico-chemical data collected at the Swartlintjies Estuary during the ECRU survey.

(See Fig. 1 with overlay for grid references)

Date		80-10-16	80-10-16
Time		15h50	18h00
State of mouth		CLOSED	Sub-terranean water seeping into trench from southern end
State of tide		rising	rising
ECRU Grid Ref.		1710	1707
Position of Sampling site		Excavated trench on North bank of dry estuary	Excavated trench, parallel to coast
Depth (m) at Sampling site		0,20	0,75
Width (m)		Dry estuary, 110	c. 40
Diss. O ₂ (mg/l)	Top	-	-
	Bottom	-	-
Salinity (‰)	Top	85	38
	Bottom	-	-
Temp. (°C)	Top	28,8	19,2
	Bottom	-	19,1
pH		8	-
Secchi disc transparency (m)		clear to bottom	0,5
Water colour		Light green	Olive green
Substrate		(a) anoxic organic matter & fine sand (in excavated trench) (b) See Section 3,7 Nature of bottom materials (from dry estuary bed)	Fine to medium sand

* Estuary/River width at sampling site

4. BIOTIC CHARACTERISTICS

4.1 Flora :

Phytoplankton/diatoms

The green colour of the water in the excavated trenches adjacent to the estuary was apparently due to the presence of phytoplankton (See Table 1).

(a) Estuary

Fragments of filamentous algae were present in a water sample collected from the small pool at Grid Ref. 1710. The northernmost trench situated parallel to the shoreline had dense mats

of filamentous algae floating on its surface at the time of the ECRU survey (Plate III).

(b) Adjacent shoreline

Algae present in the inter-tidal zone off the Swartlintjies Estuary included :

Ecklonia maxima

Ulva sp.

Cladophora capensis

Porphyra capensis

Caulacanthus divaricatus

Chaetangium ovale

Champia lumbricalis

Semi-aquatic vegetation

The only species found at the Swartlintjies Estuary which could be considered as semi-aquatic when water is present in the system are the saltmarsh plants such as Sarcocornia natalense, Sarcocornia pillansii (see section 4.1 Terrestrial vegetation) and Eragrostis sabulosa which is also present along the coast just above High Spring tide level.

Terrestrial vegetation

(This section is contributed by Miss R Parsons of the Botanical Research Institute and Miss A Le Roux of the Cape Department of Nature and Environmental Conservation.)

This area falls into Acocks's Veld Type 34 (b), Strandveld proper, which is an open semi-succulent scrub (Acocks, 1975).

Six main vegetation mapping units were identified and their structure, species composition and area are given in Appendix I and their spatial distribution in Fig. 6. The Sarcocornia natalense/pillansii Salt-marsh has the highest cover (100 percent) and the lowest species diversity (2 species), while the Eragrostis cyperoides/Eragrostis sabulosa Grassland has the highest species diversity (18 species) and the Drosanthumum sp. (Le Roux and Parsons 4)* Dwarf Shrubland the lowest cover (25 percent). The height ranges from 0,75 m (Eragrostis cyperoides Dune Grassland) to 0,15 m of the Lampranthus sp. (Le Roux and Parsons 29) Dwarf Shrubland.

The six mapping units were consolidated into three main plant formations of Grassland, Dwarf Shrubland and Saltmarsh. Of these the Grassland was the most extensive covering an area of approximately (19,22 ha) followed by the Dwarf Shrubland (6,50 ha) and Saltmarsh (2,84 ha) of the total of 42,16 ha studied.










There were no open water surfaces at the time of the visit, only a large dry riverbed with no vegetation. Along the sides of the riverbed Salicornia natalense was dying out. This species tends to die back during dry periods.

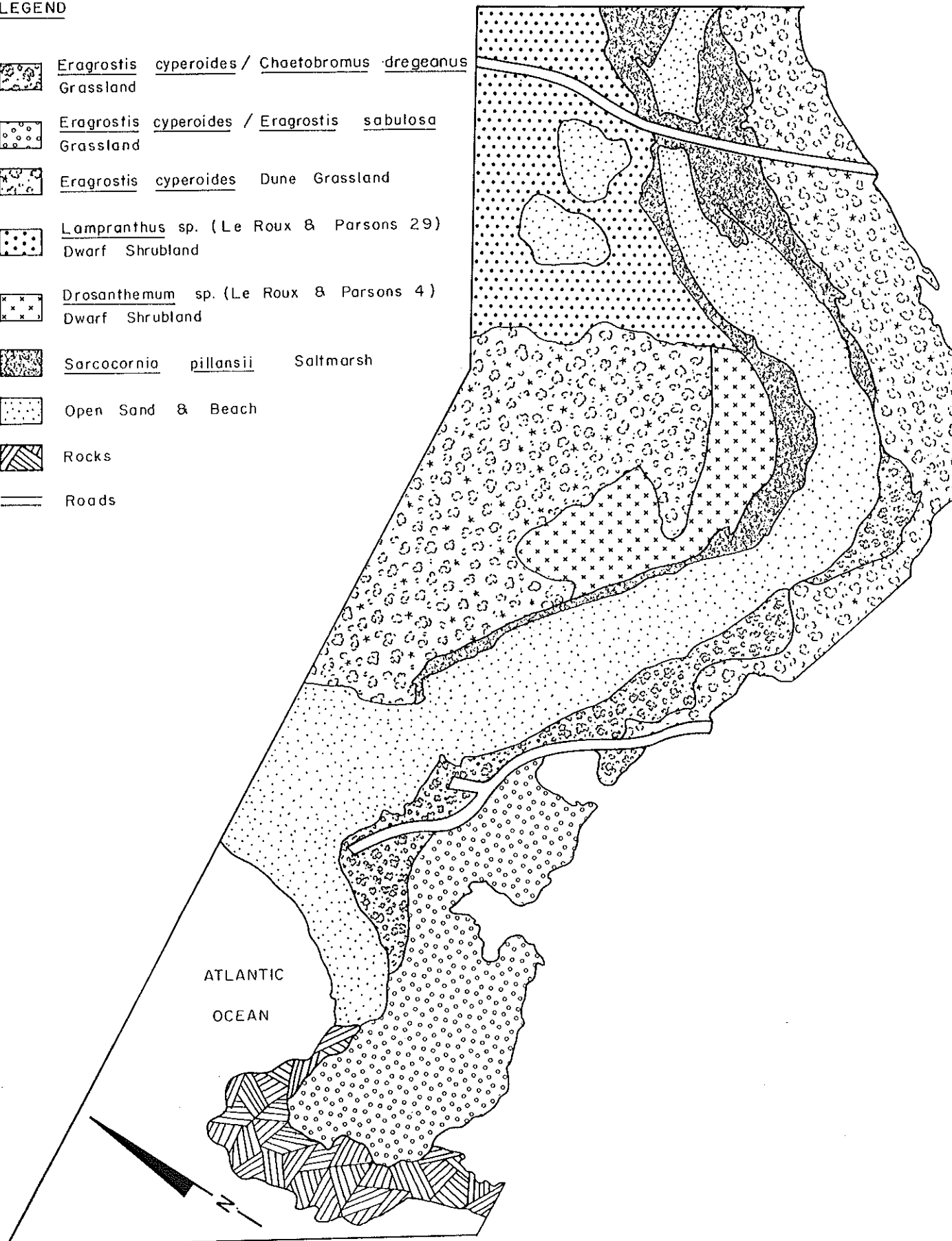
North of the trench adjoining the sea a strip of wind blown sand dunes stabilized by Salsola sp. cf. tuberculata are found. This is similar to the situation found at the Buffels and Holgat Rivers. Eragrostis cyperoides is found to the south of the mouth.

* Le Roux and Parsons species No's e.g. (Le Roux and Parsons 4) refers to species unidentified by the B.R.I. at the time of writing.

FIG. 6 : Vegetation mapping units of the Swartlintjies Estuary
 Approximate scale — 1:5 000

LEGEND

-  *Eragrostis cyperoides* / *Chaetobromus dregeanus*
Grassland
-  *Eragrostis cyperoides* / *Eragrostis sabulosa*
Grassland
-  *Eragrostis cyperoides* Dune Grassland
-  *Lampranthus* sp. (Le Roux & Parsons 29)
Dwarf Shrubland
-  *Drosanthemum* sp. (Le Roux & Parsons 4)
Dwarf Shrubland
-  *Sarcocornia pillansii* Saltmarsh
-  Open Sand & Beach
-  Rocks
-  Roads



The vegetation in the immediate vicinity of the river is in good condition, however mining trenches, and the many roads could endanger the vegetation which may result in sand blows developing.

4.2

Fauna :

Zooplankton

Two species of Harpacticoid copepods (an orange and a white sp.) as well as some small larval forms, were present in a sample collected at Grid Ref. 1707.

Fauna on

(a) hard substrates

The following species were collected from the rocks in the intertidal zone in front of the Swartlintjies Estuary.

Limpets

Patella granularis
P. granitina
P. cochlear
P. compressa
P. argenvillei

Marine Snails

Burnupena delalandii
Turitella capensis
Oxystele variegata
Argobuccinum argus

Black mussels

Aulacomya ater
Choromytilis meridionalis

Cape reef worm

Gunnarea capensis

(b) soft substrates

The isopod Tylos granulatus was present on the beach and numerous dried out shells were found around the edges of the dry estuary bed.

(c) vegetation

No data available.

Insects

A Hydrophilid beetle (Berosus spretus) and beetle larvae identified as Berosus sp. were sampled from the small saline pools at Grid Ref. 1710. In addition to these a bladder grasshopper (Pneumoridae), and a tenebrionid beetle were collected in the vicinity of the estuary.

Other invertebrates

Casts of the crabs Plagusid chabrus and Ovalis punctatus were found at the edges of the dry estuary bed as well as a dead millipede and terrestrial snail shells. The "cuttle bones" of the cuttlefish Sepia officinalis were found washed up on the beach.

Fish

Mullet were present in the excavated trenches north of the mouth. These fish are netted occasionally by the DBCDM staff (Mr C Sweet pers. comm.).

Reptiles and Amphibians

The barking Gecko (Ptenopus garrulus) was heard towards sunset at a road crossing approximately 8 km upstream from the mouth.

Birds

The species recorded at the time of the ECRU survey are as follows :

At estuary and excavated trenches

<u>Roberts No.</u>	<u>Species</u>	<u>No. seen</u>
90	South African Shelduck	2 (+ 4 juvenile)
255	Sanderling	12
269	Avocet	1
212	Red-knobbed Coot	10
235	White-fronted Sandplover	19
251	Curlew Sandpiper	23
509	African Sand Martin	2
270	Stilt	2
245	Blacksmith Plover	4
686	Cape Wagtail	6

In bush :

576	Stone Chat	2
522	Pied Crow	1

Up river :

238	Three-banded Sandplover	2
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Mammals

During the ECRU survey a Steenbok (Raphicerus campestris) was seen, the skulls of a Dassie, (Procavia capensis) and a Grey Duiker (Sylvicapra grimmia) were collected and the tracks of the following species noted :

Porcupine	<u>Hystrix</u> sp.
Watermongoose	<u>Atilax paludinosus</u>

In addition the tracks of a medium sized antelope were seen at Grid Ref. 1511 and it was later established from a security guard accompanying the survey team, that Springbuck, (Antidorcas marsupialis) are present in the area.

The following species have been recorded for the area covered by the 1:50 000 Topocadastral map of Hondeklipbaai.

Brant's Karoo Rat
South African Pygmy Gerbil
Bush Karoo Rat
and the Bat

Parotomys brantsi
Gerbillurus paeba
Otomys unisulcatus
Eidolon helvum

(Stuart et al 1980).

5. SYNTHESIS :

Historical knowledge of the Swartlintjies is poor and the system cannot really be considered as an estuary in the true sense of the word. After heavy rains in the catchment the river would flow strongly and accumulated sediments would probably be flushed from the lower reaches. After such floods the system could function as an estuary until such time as the mouth becomes closed by marine sediment. Judging from the algal production in the excavated trenches to the north of the mouth, a prolific algal growth would be produced when the Swartlintjies estuary contains standing water. This algae would die as the water evaporated and could explain the presence of the fine black organic "sludge" found in the core samples.

When containing water, the Swartlintjies Estuary probably acts as an important area for waders, waterfowl and coastal birds along the arid West Coast.

The embankments, that have been built across the floodplain to carry access roads for the diamond mining industry, would cause an impediment to the flushing of the system during times of flood. Under extreme conditions these embankments could be washed away and the material from which they have been constructed, deposited in the estuarine area.

Although the vegetation in the immediate vicinity of the riverbed is considered to be in relatively good condition, the extensive open cast mining together with numerous tracks and roads through the fragile "Strandveld" vegetation could have serious ecological consequences.

Future options for the utilization of this area must be considered when the economic viability of mining operations is weighed against the manner in which mining is conducted and to what level rehabilitation is to be carried out once the mineral assests of the area have been exhausted.

6. ACKNOWLEDGEMENTS

Sincere thanks are due to all the officials of DBCDM who made the survey possible and co-operated in full measure. In particular the manager of the Koingnaas mine, Mr C Sweet is thanked for his hospitality during the ECRU survey and all the local information he supplied.

Thanks are also due to Dr A J Prins of the S.A. Museum for identifying insect specimens, Mr C T Stuart of the Cape Department of Nature and Environmental Conservation for the identification of mammal specimens and Mrs S Armbruster for typing and Mrs H Heydorn for proof-reading the report.

The report cover is based on the one designed by Dr K L Tinley for Part I of the Cape Estuaries series.

The survey was carried out at the request and with the financial support of the Dept. of Water Affairs, Forestry and Environmental Conservation. The encouragement of this Department, the Cape Estuaries Steering Committee and the S.A. National Committee for Oceanographic Research are gratefully acknowledged.

- abiotic: non-living (characteristics).
- aeolian (deposits): materials transported and laid down on the earth's surface by wind.
- alien: plants or animals introduced from one environment to another, where they had not occurred previously.
- alluvium: unconsolidated fragmental material laid down by a river or stream as a cone or fan, in its bed, on its floodplain and in lakes or estuaries, usually comprised of silt, sand or gravel.
- anaerobic: lacking or devoid of oxygen.
- anoxic: the condition of not having enough oxygen.
- aquatic: growing or living in or upon water.
- arcuate: curved symmetrically like a bow.
- barchanoid (dune): crescent-shaped and moving forward continually, the horns of the crescent pointing downwind.
- bathymetry: measurement of depth of a water body.
- benthic: bottom-living.
- berm: a natural or artificially constructed narrow terrace, shelf or ledge of sediment.
- bimodal: having two peaks.
- biogenic: originating from living organisms.
- biomass: a quantitative estimation of the total weight of living material found in a particular area or volume.
- biome: major ecological regions (life zones) identified by the type of vegetation in a landscape.
- biotic: living (characteristics).
- breaching: making a gap or breaking through (a sandbar).
- calcareous: containing an appreciable proportion of calcium carbonate.
- calcrete: a sedimentary deposit derived from coarse fragments of other rocks cemented by calcium carbonate.
- Chart Datum: This is the datum of soundings on the latest edition of the largest scale navigational chart of the area. It is -0,900 m relative to land levelling datum which is commonly called Mean Sea Level by most land surveyors.
- coliforms: members of a particularly large, widespread group of bacteria normally present in the gastro-intestinal tract.
- community: a well defined assemblage of plant/or animals clearly distinguishable from other such assemblages.
- conglomerate: a rock composed of rounded, waterworn pebbles 'cemented' in a matrix of calcium carbonate, silica or iron oxide.
- cusp: a sand spit or beach ridge usually at right angles to the beach formed by sets of constructive waves.
- "D" net: a small net attached to a "D" shaped frame riding on skids and pulled along the bottom of the estuary, used for sampling animals on or near the bottom.
- detritus: organic debris from decomposing plants and animals.
- diatoms: a class of algae with distinct (brown) pigments and siliceous cell walls. They are important components of phytoplankton.
- dynamic: relating to ongoing and natural change.
- ecology: the study of the structure and functions of ecosystems, particularly the dynamic co-evolutionary relationships of organisms, communities and habitats.
- ecosystem: an interacting and interdependent natural system of organisms biotic communities and their habitats.
- eddies: a movement of a fluid substance, particularly air and water, within a larger body of that substance.
- endemic: confined to and evolved under the unique conditions of a particular region or site and found nowhere else in the world.
- enon: most striking formation in the Cape. Crammed with pebbles and boulders, phenomenally embedded and massive, yellow or brilliantly red in colour, producing remarkable hills. Curiously carved into crags and hollows.

epifauna: animal life found on the surface of any substrate such as plants, rocks or even other animals.

epiphyte: a plant living on the surface of another plant without deriving water or nourishment from it.

episodic: sporadic and tending to be extreme.

estuary: a partially enclosed coastal body of water which is either permanently or periodically open to the sea and within which there is a measurable variation of salinity due to the mixture of sea water with fresh water derived from land drainage (Day 1981).

eutrophication: the process by which a body of water is greatly enriched by the natural or artificial addition of nutrients. This may result in both beneficial (increased productivity) and adverse effects (smothering by dominant plant types).

flocculation (as used in these reports): the settlement or coagulation of river borne silt particles when they come in contact with sea water.

fluvial (deposits): originating from rivers.

food web: a chain of organisms through which energy is transferred. Each "link" in a chain feeds on and obtains energy from the preceding one.

fynbos: literally fine-leaved heath-shrub. Heathlands of the south and south-western Cape of Africa.

geomorphology: the study of land form or topography.

gill net: a vertically placed net left in the water into which fish swim and become enmeshed, usually behind the gills.

habitat: area or natural environment in which the requirements of a specific animal or plant are met.

halophytes: plants which can tolerate salty conditions.

HAT (Highest Astronomical Tide) and LAT (Lowest Astronomical Tide): HAT and LAT are the highest and lowest levels respectively, which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions; these levels will not be reached every year. HAT and LAT are not the extreme levels which can be reached, as storm surges may cause considerably higher and lower levels to occur (South African Tide Tables 1980).

hummock (dune): a low rounded hillock or mound of sand.

hydrography: the description, surveying and charting of oceans, seas and coastlines together with the study of water masses. (flow, floods, tides etc.).

hydrology: the study of water, including its physical characteristics, distribution and movement.

indigenous: belonging to the locality; not imported.

intertidal: generally the area which is inundated during high tides and exposed during low tides.

isohyets: lines on maps connecting points having equal amounts of rainfall.

isotherms: lines on maps joining places having the same temperature at a particular instant, or having the same average, extremes or ranges of temperature over a certain period.

lagoon: an expanse of sheltered, tranquil water. (Thus Langebaan lagoon is a sheltered arm of the sea with a normal marine salinity; Knysna lagoon is an expanded part of a normal estuary and Hermanus lagoon is a temporarily closed estuary (Day 1981)).

limpid: clear or transparent.

longshore drift: a drift of material along a beach as a result of waves breaking at an angle.

littoral: applied generally to the seashore. Used more specifically it is the zone between high- and low-water marks.

macrophyte: any large plant as opposed to small ones. Aquatic macrophytes may float at the surface or be submerged and/or rooted on the bottom.

marls: crumbly mixture of clay, sand and limestone, usually with shell fragments.

matrix: medium in which a structure is embedded.

meiofauna: microscopic or semi-microscopic animals that inhabit sediments but live quite independently of the macrofauna, or benthos.

metamorphic: changes brought about in rocks within the earth's crust by the agencies of heat, pressure and chemically active substances.

MHWS (Mean High Water Springs) and MLWS (Mean Low Water Springs): the height of MHWS is the average, throughout a year when the average maximum declination of the moon is 23°, of the height of two successive high waters during those periods of 24 hours (approximately once a fortnight) when the range of the tide is greatest. The height of MLWS is the average height obtained by the two successive low waters during the same periods (South African Tide Tables 1980).

morphometry: physical dimensions such as shape, depth, width, length etc.

osmoregulation: the regulation in animals of the osmotic pressure in the body by controlling the amount of water and/or salts in the body.

pathogenic: disease producing.

photosynthesis: the synthesis of carbohydrates in green plants from carbon dioxide and water, using sunlight energy.

phytoplankton: plant components of plankton.

piscivorous: fish eating.

plankton: microscopic animals and plants which float or drift passively in the water.

quartzite: rock composed almost entirely of quartz recemented by silicon. Quartzite is hard, resistant and impermeable.

riparian: living on the banks of rivers or streams.

rip current: the return flow of water which has been piled up on the shore by waves, especially when they break obliquely across a longshore current.

salinity: the proportion of salts in pure water, in parts per thousand by mass. The mean figure for the sea is 34,5 parts per thousand, written 34,5 ‰.

secchi disc: a simple instrument used to measure the transparency of water.

sheet flow: water flowing in thin continuous sheets rather than concentrated into individual channels.

slipface: the sheltered leeward side of a sand-dune, steeper than the windward side.

teleost: modern day bony fishes (as distinct from cartilagenous fishes).

trophic level: a division of a food chain defined by the method of obtaining food either as primary producers, or as primary, secondary or tertiary consumers.

trough: a crescent shaped section of beach between two cusps.

wetlands: areas that are inundated or saturated by surface or ground water frequently enough to support vegetation adapted to life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.

zooplankton: animal components of plankton.

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PLATE I :

Excavated trenches north of rivermouth showing sub-terranean water seeping into the trenches in the middle extreme right of the photograph

(ECRU Oct. 1980)

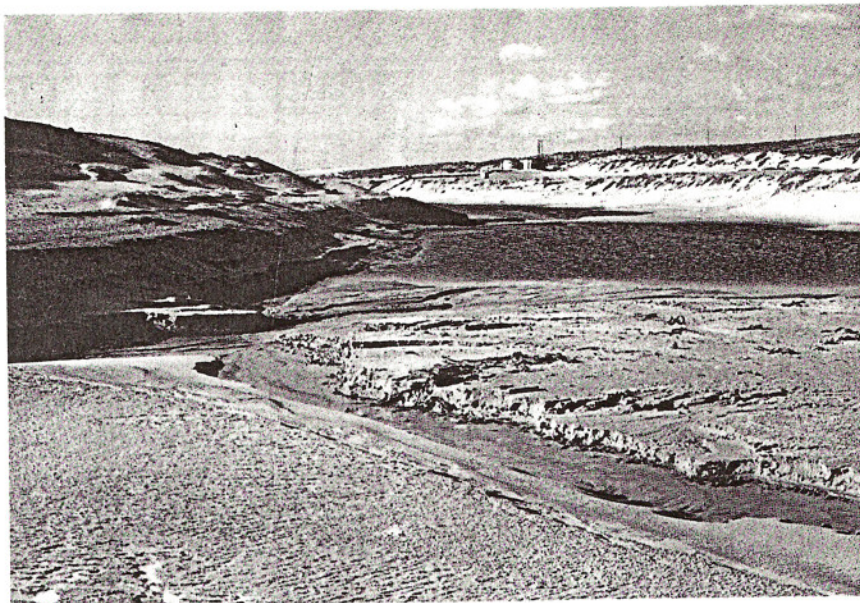


PLATE II :

Black "grease-like sludge" from a core sample taken in the Swartlintjies Estuary

(ECRU Oct. 1980)



PLATE III :

Dense mats of filamentous algae in one of the excavated trenches north of the estuary mouth

(ECRU Oct. 1980)

