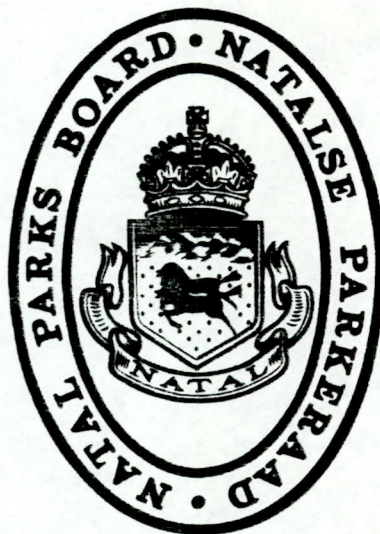


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BENTHIC STUDIES : PART 1
RESULTS OF GRAB SAMPLING

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History of past research

Benthic research in the St Lucia system has been minimal. The University of Cape Town surveys (Day, Millard & Broekhuysen, 1954; Millard & Broekhuysen, 1970) provided some basic information on benthic species but the first detailed studies were those of Bolt (1975) who carried out a grab programme during January 1972, July 1972 and January 1973, covering the entire lake and one area in the upper Narrows. In July 1973 a study was commenced which aimed at taking samples at monthly intervals at 6 sites - two in South Lake, two in North Lake and two in False Bay. A single set of five samples was taken along a transect across the Narrows south of the Forks in July 1973. In all cases samples were taken using a Van Veen grab covering an area of $0,0225m^2$.

At the time of the death of Dr Bolt analysis of samples taken up until February 1974 inclusive had been carried out. The results of this more intensive study were reviewed by Hill and presented at the St Lucia Scientific Advisory Council Workshop Meeting at Charter's Creek in 1976.

Synthesis of Results

Bolt (1975) identified 17 species and also obtained one genus of chironomid as well as unidentified Nemertines, Platyhelminthes, Harpacticoid copepods, Cumacea, Ostracoda, Polychaeta and anemones. The most wide-spread and dominant members of the fauna in the lake were the gastropod Assiminea bifasciata, Harpacticoid copepods and nematodes. A. bifasciata typically made the major contribution to the biomass in all samples despite a preference for sandy substrates. Many samples contained more than 1 000 animals and on one occasion 11 000 were obtained.

Distribution and abundance were influenced by salinity. Most species were found in salinities up to 55ppt. but at higher salinities only chironomids and ostracods occurred. There was rapid recolonisation of areas denuded by high salinities once the salinity had dropped to 30-40ppt., particularly by those species with short life cycles and planktonic larvae. These planktonic larvae were derived from the main reservoir of benthic fauna in South Lake and

were dispersed by wind induced water movements. False Bay being the furthest from South Lake was the slowest to recover.

The monthly sampling carried out from July 1973 to February 1974 confirmed the dominance although patchy distribution of A. bifasciata. During this period there was a change over from a reversed salinity gradient with salinities of about 50ppt. in False Bay to a normal gradient with salinities of about 20ppt. in False Bay. This could not be related to any particular changes in the benthos although there were marked fluctuations in the non-A. bifasciata component of the benthos during this period. Relatively low biomass figures in July were followed by two to four-fold increases in September/October 1973 followed again by low figures in November/December. The September/October increase included groups such as polychaetes, copepods and nematodes and appeared to follow a bloom of foraminifera and diatoms in August (Johnson, 1976).

Mean benthic biomasses (dry mass) for South Lake in January 1972 and for the whole lake in July 1972 and January 1973 varied from 1,08 - 3,26gm⁻² on sand, and from 0,013 - 0,235gm⁻² on mud. Bolt (1975) compared his St Lucia figures with those obtained from some northern hemisphere temperate lakes and concluded that while his figures for sandy areas were comparable the standing stock overall was low and the biomass recovered from St Lucia mud was particularly low. The validity of comparisons of lakes on the basis of benthic biomass is doubtful as the relationship between biomass and production is complex. Benthic production in the St Lucia system is essentially unknown. Bolt (1975) made some estimates based on standing stocks found in areas which had been previously denuded by high salinities. The minimum production of A. bifasciata on sand over the lake as a whole for the period January 1972 to July 1972 was 3,26 g shell-free dry massm⁻². The highest value obtained was 10,48gm⁻² at station 44 immediately to the west of Bird Island in North Lake. Minimal production of the other benthos in North Lake and False Bay was 0,1 - 0,2gm⁻². These figures would be under-estimates as they take no account of mortality nor predation during this period and consequently cannot be strictly compared with other systems.

Grab programmes have been concentrated in the lake. Single samples were taken from the Narrows south of the Forks in July 1972 and again in January 1973 in salinities approaching sea water. A further set of five samples was taken in July 1973 along a transect across the Narrows in the same area at a salinity of 38ppt.

The results of the July 1973 samples were described in an

unpublished report (Boltt 1974). The major species found in all Narrows samples also occurred in the lake but there were notable absences and differences in relative numbers. A. bifasciata was not recorded. The numbers of the polychaete Capitella capitata in the samples varied from 97-380 against a maximum in the lake of 51 in one instance and less than 24 in all other samples. The crab Tylodiplax blephariskios and the amphipod Eriopisa chilkaensis occurred in all the samples (mean catch 11 and 9 respectively). In the lake T. blephariskois was recorded at 6 stations in South Lake only (maximum 3) while E. chilkaensis was recorded twice at the southernmost lake stations (catch 8 and 14).

The samples taken in the Narrows in July 1972 and January 1973 resembled those taken in the July 1973 transect rather than those from the lake. There are no biomass figures for July 1972 nor July 1973 but values for January 1973 show that the biomass at the Narrows sampling station was about 100 times greater than the general lake average for muddy substrates at the same time. This would require further confirmation.

Knowledge gaps and possible lines of research

It is generally agreed that the benthos is a critical component in the functioning of all shallow water ecosystems. To date benthic research has been greatly neglected despite the benthic feeding habits of a large proportion of the St Lucia fish fauna (Blaber, 1978) and the penaeid prawns (Joubert & Davies, 1966). The available information covers periods of high (>35ppt.) to intermediate (10-20ppt.) salinities but there are no data for low (<5ppt.) salinities and no real measures of seasonal fluctuations nor production figures. There is also very little information from the Narrows which is the major area exploited in the lake prawn fishery.

In his review and recommendations at Charter's Creek Hill (1976a) adequately described the gaps and proposals for benthic research in the St Lucia system. These can be summarised as follows:

- 1) A long term monitoring programme possibly at the six sites selected in July 1973, but also including sites in the Narrows. This would provide information on normal seasonal fluctuations, the changes occurring during rising or falling salinities and also the reponse of the benthos to stable (in the St Lucia context) salinities.
- 2) Once the benthos has been characterised attention would have to be given to production and turn-over times, the significance of different areas of the lake and Narrows

in overall production and the possible effects of different or changing salinity regimes on productivity.

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