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Title REPORT ON WEED GROWTH IN THE UPPER REACHES OF ST. LUCIA ESTUARY

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REPORT ON WEED GROWTH IN THE UPPER REACHES OF ST. LUCIA ESTUARY.

INTRODUCTION.

ST. LUCIA LAKE COMMISSION OF INQUIRY.
ST. LUCIA-MEER KOMMISSIE VAN ONDERSOEK.

In a letter dated 26th May 1962, the Director of Building Services and the Water Engineer informed the Secretary of the Natal Parks, Game and Fish Preservation Board that the Reclamation Advisory Committee had been advised that "weed growth in the St. Lucia Estuary, mainly in the channels to the south of Brodie's Crossing was acting as a silt trap and obstructing the flow of water into the lakes".

Further information given was that the matter had been investigated in situ and that "while the weed growth in the area was considerable, it did not appear to be trapping any of the silt".

Although it was decided at the (then) last meeting of the Advisory Committee that this problem could not be regarded as coming into the sphere of present reclamation activities, "concern was expressed that the continued growth of the weed could have deleterious effects on the flow of water in the Estuary". Therefore a report was called for regarding "(a) the nature of the weed (b) the conditions which promote its growth (c) likelihood of conditions getting worse and (d) possible methods of eradicating the weed".

Two field trips have been made to study the problem and to collect specimens. One day was spent in the southern lake and in the Brodie's Crossing area, while another was taken up in examining the upper end of the Narrows, the southern and south-eastern part of the Shallows and that general environment. The salinity of the water in several different localities was recorded - the determinations being made using the Specific Gravity method. Relative depths of water were also noted.

Subsequent to this, the writer had the good fortune to be able to make an aerial reconnaissance of the whole system. This not only showed three localities in bays in the Narrows where there is little aquatic plant growth, missed during the boat trip, but, more particularly, was of extreme value in showing the overall distribution and density of growth throughout the system.

AQUATIC PLANTS.

Three specimens of flowering plants occur in the area under discussion: Zostera capensis, Ruppia maritima and Potamogeton pectinatus.

Zostera has a branched creeping stem, rooted at the nodes; short side branches (most seen were less than 1" in length) extend upwards and bear narrow ribbon-like leaves which may reach over 50" in length. The flowers are borne on longer upright branches and are always submerged. During these investigations the depth of water in which Zostera was found varied from 5" to 33".

Ruppia and Potamogeton while also producing horizontal creeping stems, have their greater development in their upright stems which are much branched, especially in the finer Ruppia. In both species the flowers open on the surface of the water and are pollinated by floating pollen (generally wind-blown). Ruppia was found in water varying from 6" to 36" in depth but was not as well developed in the shallower waters, i.e. those less than 12" to 15". Living mature Potamogeton occurred in water 24" to 36" in depth, with one isolated patch in approximately 5½ft of water.

In addition to these angiosperms a few green algae were collected: at least two species of branched filamentous forms

and another with a thallus in the form of an expanded sheet. Literature and equipment available are such that specific identifications were not possible, although it may be that the last mentioned is an Enteromorpha sp.

DISTRIBUTION AND SPREAD OF PLANTS:

The accompanying sketch-map shows the general distribution and relative density of weed in the St. Lucia System at the present time. As may be seen, the development is best in the southern lake, particularly in the vicinity of Brodie's Crossing.

1. Algae.

Although the algae may help to entrap fine silt and interfere with the passage of fish and other animals, it is felt that their effect, at this stage, is secondary in importance to that of the higher plants. However, one species of filamentous green alga which has formed extensive, fairly thick, felt-like blankets, incorporating leaves of Zostera, will be kept under observation for its spread, rate of development and effect on other plants and animals.

2. Flowering plants.

Potamogeton pectinatus favours a certain amount of salinity and seems to be tolerant of quite an amount, but it less halophilic than the other two angiosperms.

Prior to the opening of the mouth of the Estuary (when the salinity of the lake was low), this species established itself over much of the area under present discussion. In 1957, for example, the writer noted that it was very common in the Brodie's Crossing area.

Since the opening of the mouth, changes in conditions which may be correlated with increase in salinity have had a deleterious effect on the P. pectinatus population. It has now disappeared from much of the area previously occupied and, in other places, it is represented merely by leafless, apparently dying, stalks. However, towards the Eastern Shores, where the salinity is lower due to a local freshwater influx, there is still quite an amount of it in mature stages of development, although it appears to be giving way to Ruppia maritima.

Recent changes in conditions, while adverse to the development of Potamogeton pectinatus in the lower part of the southern lake, have been favourable for the development of Ruppia maritima and Zostera capensis.

There is considerable overlap in habitat but, taken in all, Ruppia appears to tolerate a lower salinity and a sandy substrate whereas Zostera not only seems to tolerate a higher salinity but prefers it as it does a mud or sandy mud bottom.

At the present time Zostera has a more southerly distribution (it occurs into the northern end of the Narrows) and is dominant south and to the north and north-west of Brodie's Crossing.

In the central part of Brodie's Crossing area, Ruppia is very common and becomes dominant from there northwards round Eastern Shores to the extensive sandy shallows north-east of Charter's Creek.

Unless the mouth of the Estuary becomes blocked for any length of time, it is unlikely that Potamogeton pectinatus will re-establish itself in the Brodie's Crossing area. With continued increase in the salinity of the lake, this species will disappear over a much larger area. On the other hand, whatever changes

may occur further up the lake, Zostera is likely to remain in the area from the upper Narrows to north of Brodie's Crossing and beyond; also it may even spread southwards where there are shallow banks of suitable soil. Likewise, Ruppia, irrespective of what may happen as a result of foreseeable changes in salinity further north, is likely to remain in the eastern and southern section of the southern lake, i.e. Catalina Bay - Shallows area.

SILTATION AND THE EFFECT OF WEED GROWTH.

The topography of the lake and its bottom is such that, in time, the Shallows will become shallower and will extend slowly northwards. The spread in this direction is particularly so since the diversion of the Umfolozi River which not only supplied much of the former silt but also, through floods, transported the material up the Narrows into the South Lake.

At present silt comes mainly from the bottom of the lake, stirred up by wave action; therefore, unless this is being replaced from external sources which do not seem to play an important part nowadays, shallowing in one place will be met by compensatory deepening elsewhere. The main effect of the weeds is the stabilization of these banks; thus they help to maintain the depth of the lake.

On the other hand there is little doubt that weed growth, particularly Potamogeton pectinatus, must have held up quite an amount of silt as the lake level dropped immediately after the mouth was opened and so hastened natural siltation in the region of the Shallows. The effect of the weed in that case would have been one of obstructing flow to a certain degree resulting in a deposition of silt through a reduction in the carrying capacity of the water.

The present situation is somewhat different, not only is there a considerable increase in the amount of the aquatic vegetation but there is also a reduction in lake level with a corresponding reduction in major water flow. However, the wind effect is possibly greater now, owing to the increase in shallowness, with the result that wave action is likely to stir up the substrate more readily and deposition will be rather along-or off-shore in the form of swash-banks which will become stabilized by the submerged aquatic plants. Such a development is particularly noticeable along the southern end of the lake.

Furthermore, large quantities of weed, particularly Zostera which tends to produce such long leaves that their ends float along the surface of the water, will have the effect of reducing very considerably the wave action. Therefore, where the fields are of some considerable size (as in the area under discussion), there will be a deposition of silt and other debris at the periphery, especially when the water level is relatively low. This means that, under the present circumstances, natural siltation of Brodie's Crossing and the area southwards has been slowed down considerably.

However beneficial this may appear from this aspect, it must be pointed out that, at the same time, the density of weed growth in the Shallows is nearing a stage where it may have a most serious effect on migrations of fish - a factor which could ruin the fishing potential of the lake - and perhaps, although to a lesser degree, even a deleterious effect on the flow of water from the estuary, especially while the lake level is low and when southerly winds are blowing.

Zostera and Ruppia are both important in their effect but Ruppia has an additional nuisance value in that its branches break off readily by wave action. These, often aggregated into dense

tangles, remain in the upper layers of the water where they are subjected to movement by wind action and are capable of moving over considerable distances. Roots are produced on these broken branches and, if the fragments or bundles reach some suitable habitat, growth takes place rapidly. Even if conditions are not suitable for the establishment of these vegetative shoots, it would appear that they remain alive for a considerable period and the bunches may become entangled in other Ruppia or Zostera and so increase the deleterious effect on free movement within the water. This is especially the case in shallow parts, particularly if there is only a little current. This fragmentation of Ruppia is likely to become progressively worse as the salinity increases beyond the optimum for that species.

At the moment there appears to be sufficient freedom of movement of water, but it was noted that large mullet appeared to be hampered in their movements through the Shallows south of Brodie's Crossing.

As is no doubt appreciated by all, it is essential that there is free movement of water and fishlife through this section of the lake. There is likely to be a certain amount of relief in the rainy season but, because of increased utilization and control of waters which flow into the lake, the effect will be less than in the past.

CONTROL OF WEED.

It is firmly believed that eradication (the word used when calling for this report) is not possible, nor would it be desirable because, amongst other ecological factors, the weed beds form a most valuable habitat for numerous aquatic animals and associated birds.

Changes in salinity, the nature of the substrate or the depth of water (any of which may be associated with other limiting factors), added to which may be the amount and type of silt in suspension are among the more important natural means of control of these aquatic plants in Lake St. Lucia. Floods were probably the greatest single natural means of control since all of the factors just mentioned could have been altered within a very short period by flooding.

Through the increased control and utilization of waters which previously flowed into the lake such changes in environment are likely to be far less drastic, and less frequent, than in the past, particularly where the mass movement of mud and sand is concerned as also the flushing out of saline water after a dry period.

More reliance than ever will have to be placed on local rains for dilution of the lake water and, unless there are exceptionally heavy falls of rain, the lake will become progressively more saline each dry season. This will have considerable effects on the aquatic flora and fauna in the upper parts of the lake and in False Bay. Amongst other effects, it is likely to kill off much of the weed at present in the upper lake and have a deleterious effect on Ruppia even to as low as the fields north-east of Charter's Creek. However, this is unlikely to solve the present problem because, with movement of water from the sea via the estuary, Zostera and Ruppia, as already mentioned, are likely to remain in the Brodie's Crossing area unless some considerable change in the environment takes place.

It is considered that such a change in environment may be brought about artificially through the dredging of a channel 6ft deep (width to depend upon the engineers" northwards through the Shallows into the southern portion of the south lake. It would be preferable, if such a project was to be undertaken, that the

excavated soil be built up into an island which could then be stabilized by planting with natural grasses (and reeds) or, if firm enough, it might even be left to natural colonization.

Such a channel would be too deep for successful colonization by Zostera and Ruppia and too saline for Potamogeton pectinatus. It would serve to allow free movement of water and the aquatic fauna while the rest of the area, so important to the fish-life and birds, may be left to undergo the changes that would have taken place anyway. Thus all aspects of Conservation, including the wants of the fisherman, are likely to be satisfied.

The channel that already exists, immediately south of the western end of Brodie's Crossing and is more or less at the northern end of a channel leading from the main Narrows, deserves investigation in this regard. Both ends and particularly the southern one are shallow, but it should not be too difficult to rectify this; the soil could be dumped on to the already existing reed beds where it would be consolidated.

FURTHER INVESTIGATION.

Further and more detailed investigation into the whole problem is highly desirable; particularly in regard to water flow and depths of water in the Brodie's Crossing area under different weather conditions and also in regard to the development and effect of the plants, including certain algae. When this has been effected another report will be submitted.

However, it is felt that, in the interim, the feasibility of dredging as suggested should be investigated by personnel from the Reclamation Department, preferably during the dry season.

C. J. Ward.

ECOLOGIST.

SKETCH
of
LAKE ST. LUCIA

Showing distribution of
submerged aquatic plants
(dotted) - June 1962

