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Title ST. LUCIA AND SALINITY

Source 1968 UNIVERSITY OF NATAL WILDLIFE SOCIETY NEWSLETTER

Keywords SALINITIES*BIRDS*

ST. LUCIA AND SALINITY.

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A trip was made to Lake St. Lucia over the period 13th to 22nd November last year. The primary interest was in the ornithology of the area with the emphasis on the species of the aquatic habitat - a habitat which is of special interest on the Lake due to its abnormally high salinity.

It was decided to investigate any possible correlation between the salinity of the water and the birds present, and to see whether indeed, this salinity had become a limiting factor to any species.

It was postulated that salinity could become limiting in three ways; (1) It could have a direct antagonistic effect on the bird itself; (2) It could give rise to a fauna and flora unacceptable to the bird as a food source; (3) It could give rise to a shoreline vegetation unsuitable to the bird as a breeding and/or resting habitat.

That salinity could perhaps be limiting to those birds found in on fresh waters is suggested by two points;

- (i) They are represented most frequently in fresh water habitats and have almost certainly evolved in this habitat;
- (ii) Although the seashore presents a vast, permanent aquatic habitat few species turned to exploiting it extensively.

At St. Lucia we have an ideal situation for investigating this possibility, as we have a large lake with all the superficial characteristics of a fresh water habitat but having really a very high salinity. Also there is a wide range of salinities available so we could suppose the birds to have selected a point where the salinity suited them. With this in mind samples of the water were taken at points around the lake and the birds occurring at these points were recorded. Later these samples were analysed for the amount of chloride present and the salinity of the sample was expressed in terms of Chloride concentration. This is not exactly accurate as not only Sodium is present the Chloride.

A total of 30 samples were made at points around the lake (unfortunately False Bay was not covered). This number is insufficient for any form of statistical analysis and none has been attempted.

salinity, St. L., effect of;
birds, St. L.;

What has been obtained however is some definite values for salinity tolerated by some of our 'fresh-water' birds values which in some cases are in direct contradiction to the established ideas on the species' salinity tolerance.

The sampled waters can be split into three categories:

- (1) Fresh water habitats - 3 counts on a small pan near the lake and 1 on a marsh near the Estuary - were done for comparison and to show that certain species were present in the area. Chlorinity 0.1238 1.916 gms/
- (2) Saline habitats having salinity less than an equal to standard sea salinity.
10 counts on the lake,
Chlorinity 6.969 19.4
- (3) Saline habitats having salinity greater than sea salinity.
18 counts on the lake.
Chlorinity 19.4 23.86

A list of the aquatic species encountered in these counts is given below. Each species has six figures after it. First = % frequency of occurrence in fresh water counts.

Second = average no. of birds per fresh water count that they were present in.

The third and fourth are those of salinity less than sea salinity.

The fifth and Sixth are those of salinity greater than sea salinity.

Aquatic species List.

White Pelican (0,0/50,122/22,9.7) - a bird universally adapted to salt water habitats.

Rosy Pelican (0,0/10,5/17,11.6) - only in the Fancies Island area - much less common than the White Pelican.

White-breasted Cormorant (0,0/0,0/5.5, 4) This species rarity on the lake is very puzzling.

Reed Cormorant: (50, 1/0, 0/0, 0) - Another enigma.

Grey Heron - (25, 2/10, 1/11, 1.5) - seen on a morning's boating covering about 30 miles of shoreline

Goliath Heron - 0, 0/50, 1.6/39, 1) 21 seen on the above trip; a bird well adapted to the lake, feeding often a long way from shore on submerged sandbars.

Purple Heron - (25, 1/10, 2/5.5, 1) - 2 seen on trip.

not common on the lake, the percentage frequencies showing a tendency to less saline habitats.

Great White Heron (25, 1/40, 1.5/23, 2.6) ÷ 14 seen on trip.

Yellowbill Egret - (75, 2.3/30, 1.6/11, 1.5) - 14 seen on trip. This bird shows a tendency towards a fresh water preference.

Little Egret (0, 0/40, 1.5/22, 4) 11 seen on trip.

A subjective assessment would lead me to say that this is the most common of the herons at St. Lucia and especially at the Estuary. Here is a bird that definitely thrives in saline water - all its records far above sea salinity lying in the 20.4 23.86

Squacco Heron (0, 0/10, 1/00) - non on the lakes

Black Heron (0, 0/10, 1/00) - none on the lakes only seen once at the Estuary.

Hamerkop (25, 1/0, 0, /0, 0) - not present at all on the lake although a lot of suitable looking habitat is present - salinity a limiting factor?

Saddlebill Stork (25, 1/0, 0/0, 0) met once in a marsh on the estuary side.

Wood Ibis (0, 0/20, 2/16, 2.6)

Glossy Ibis (25, 20/0, 0/11, 2) - actually seen feeding in some saline water in the Celes Lakes.

Spoonbill (0, 0/20, 4.5/28, 6) Shows preference for saline waters.

Greater Flamingo (0, 0/0, 0/5.5, 1) one lone flamingo seen twice on Faries Island.

Spurwing Goose (25, 5/10, 1/0, 0) - a fresh water bird - its only saline record being a lone bird loafing on a sandbank in the estuary mouth.

Clancey records this as a freshwater species.

Egyptian Goose (0, 0/70, 24/78, 19.8) - a bird completely unaffected by high salinities - and consequently widespread on the lake.

Middleruss (1961) states "adapted to coastal life. frequently feeding among rock pools" and Uys and Macleod writing on the birds of the DE HOOP VLEI (C. Vol XXXVIII P 233) note it as common on this stretch of saline water also.

Clancey however records this as a freshwater species.

Dwarf Goose: (25, 2/0, 0/0, 0). Only recorded once, on a little freshwater pond with water lilies and aquatic vegetation. This species is most probably not represented on the lake on account of the complete (as far as was seen) absence of this vegetation in the saline lake.

Clancey states "the distribution of this small duck seems to be very largely governed by the presence of water lilies and such like aquatic plants."

Cape Shoveler (0,0/0,0/5.5,2). Rare on the lake. Only observed once - in very saline water. Siegfried in his paper on the species (Ostrich Vol XXXVI p 155) states.... "It is essentially a bird of fresh water and has not been recorded on the open sea but does tolerate a degree of saltiness..." He has since recorded the species feeding in an intertidal rock pool.

Cape Wigeon (0,0/0,0/33,23). These are highly significant showing, if anything, a preference of this species for highly saline water.

These findings concur with the observations of other authors i.e. Rawlins in Kenya writes of the saline Lake Nakura. "Wigeon... do not appear to be deterred by the salinity on this lake.."

On the saline Makarikari Smithers and Paterson found that Wigeon occurred in substantial numbers. Stead notes that this species is found in the intertidal zone of the Cape Peninsula (Ostrich XXXVII pg 10). Yellowbill Duck (75,16.6/40,6.5/72,50). Once again a bird apparently unaffected by salinity, perhaps with a bias in favour of high salinities. Just the fact that this was the most widespread duck on the lake, goes to strengthen this assumption.

Rawlins writes of this bird "... seems to visit only those parts where the water is reasonably fresh...." Rowan in "The Yellowbill Duck" (Ostrich Supplements), states: "All available information suggests that Yellowbill are less tolerant of saline conditions than most other African waterfowl...." and "... the Yellowbill appears to be sensitive to the concentration of common salt...."

Stead however notes of the Cape Peninsula - "Die Mond is a favourite place for Yellowbill even when very saline..." He also notes breeding in the intertidal zone and a sight record of yellowbill swimming in the sea.

Redbill Teal (0,0/10,4/5.5,170) uncommon on the lake - seen twice both near the Mkusi river mouth.

In the literature generally accepted as a freshwater species. Rawlins however says "...Redbilled Teal do not appear to be deterred by the salinity on this lake".

Uys and Macleod on the De Hoop Vlei say of this species
 " immediately past - inundation small flocks occurred
 on the relatively fresh water, but these became fewer with
 increasing salinity and after a few years were not seen.."
 The indications are then, that this species is "salinity-
 sensitive."

Hottentot Teal (25,2/0,0/0,0). Once again Rawlins says
 that this species is not deterred by salinity, but generally
 it appears to be a species of freshwater where vegetation is
 present. No conclusions can be drawn however.

White-faced Duck. (75,55/30,47/50,32). Its distribution
 unaffected by salinity, the white face was the second most
 widespread duck on the lake. This species seems to be
 universally classified as a 'freshwater' bird; I venture
 to say that perhaps this strict classification is unwarranted.

Whistling Duck (0,0/0,0/5.5,4) seen once on the lake.

The result is inconclusive.

Table Showing Range of Salinities over which the
 anitads were recorded

x = 19.4 - Universal sea water standard.

	Gm Cl/l	0	X	25
SAUWING GOOSE				
EGYPTIAN GOOSE				
D ARF GOOSE				
CAPE SHOVELLER				
YELLOWBILL DUCK				
REDBILL TEAL				
CAPE PIGEON				
HOTTENTOT TEAL				
WHITE-FACE DUCK				
WHISTLING DUCK				

In terms of salinity ; parts NaCl/l a Chlorinity
 of 23.35 gm/l = 59.35 parts/1000.

Interesting absentees from the Lake.

These are all birds included on the Natal Parks Board check list for the lake.

African Darter
Southern Fochard
White-backed Duck
Black Crake
Purple Golleniele
Moornhen
Red-knobbed Coat.
Dabchick

Jacana - although present on the freshwater pond - perhaps absent from the lake for the same reason as the Dwarf Goose.

These are all birds which should have been recorded in 10 days of birdwatching. In conversation with the Lake Ranger, I learnt that the Coat had previously been present in large "rafts". Perhaps this and others have moved off the lake in response to the increasing salinity.

In conclusion I would say that a lot more work should be done on the effects of salinity on water birds.

My thanks to the Natal Parks Board for the help which they gave me in my project.

References:

Clancey - P.A. Clancey's book "Gamebirds of Southern Africa."

ALL OTHER REFERENCES ARE QUOTED IN THE TEXT.