SALT LOSS AND GAIN IN TWO SPECIES OF FRESH WATER TURTLES OF TAMIL NADU.

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Introduction

Dunson (1979 a,b) found that only certain highly specialized reptiles have the capability of living in estuaries of high salinity. He also opined that all marine reptiles have in common a salt gland and an integument virtually impermeable to sodium and a very low rate of sodium influx (Dunson, 1976, 78, 79a). Nevertheless there are several reports of fresh water turtles being sighted in estuaries and seas especially after rains probably being carried away by the floods. To find out whether fresh water turtles can tolerate salinity, the present study was conducted on two species of fresh water turtles namely *Lissemys punctata punctata* and *Melanochelys trijuga trijuga*.

Materials and Methods

Five male and female turtles of both the species were put into troughs containing 100% sea water for three weeks. The salt gained by the animals was calculated by estimating the salinity of the medium before and after the experiment by following the Mohr's titration method (Sunderesan, 1979). Subsequently, five male and female turtles of both the species were put into media containing double distilled water and the amount of salt lost by the animal was estimated after three weeks by following the same method.

Results

The results of the study on the salt gained by both the turtles are presented in Tables 1 and 2. As seen from the Table, the salt gain in individual male *Lissemys* turtles varied from 0.083664 to 0.2980152 mg/g body wt/ 21 days, the average net gain after three weeks was found to be 0.1847462 +/- 0.070 mg/g body wt/21 days and the average salt gained per day was 0.00879 mg/g body wt. As for the female turtles, the salt gained oscillated from 0.196056 to 0.377169 mg/g body wt/21 days. The average net gain after 21 days was found to be 0.28334+/-0.0659 mg/ g body wt/ 21 days and the average salt gain per day was 0.01349 mg/ g body wt.

In *Melanochelys*, the salt gain in the males was found to vary from 0.00151 to 0.0779 mg/ g body wt/ 21 days with the average being 0.0252 mg/ g body wt/ 21 days and the average net gain per day to be 0.0012 mg/g body wt. For females, the salt gain varied between 0.0773 and 0.1136 mg/ g body wt/ 21 days, the average net gain after 21 days was 0.1003 +/- 0.0123 mg/ g body wt and the average salt increase per day, 0.0047 mg/ g body wt.

The salt lost by both the turtle species are provided in Tables 3 and 4. In *Lissemys*, the individual salt loss by the male turtles during the 21 day study varied from 0.1426 to 0.2842 mg/g body wt, the average being 0.1979 +/- 0.0488 mg/ g body wt/ 21 days and for a day, 0.0094 mg/ g body wt. In the case of females, the salt loss during the period of study was found to vary from 0.1978 to 0.3448 mg/ g body wt/ 21 days with the average being 0.2695 +/- 0.054 mg/ g body wt/ 21 days and the net loss per day, 0.0128mg/ g body wt. For *Melanochelys*, the individual salt loss by the male turtle was found to vary from 0.0329 to 0.0842 mg/ g body wt/ 21 days with an average of 0.0631 +/- 0.0172 mg/ g body wt/ 21days and the salt loss per day being 0.003 mg/ g body wt. For the females, the individual salt loss was found to be from 0.0643 to 0.1024 mg/ g body wt/ 21 days with an average of 0.0895 +/ - 0.0145 mg/g body wt/ 21 days and the average salt loss per day, 0.0042 mg/g body wt.

Discussion

From the above data it is clear that males of both the species showed a lesser amount of salt loss and salt gain when compared to their counterparts and that *Melanochelys* had a higher capacity to withstand hypotonic medium than *Lissemys*. When the animals were placed in 100% sea water, the males showed only a lesser amount of intake from the hypertonic medium then the females. Here again, the *Melanochelys* species appeared to be better adapted to sea water than *Lissemys*.

Dunson and Moll (1980), while studying the osmoregulation in sea water of hatchling emydid turtle *C. borneoensis*, found sodium influx and efflux at 100% sea water to be about 1.6% and 0.3% of the body sodium content/ day respectively. Cowan (1981), while studying the effects of salt loading in *M. terrapin*, found that at 100% salinity, sodium concentration after 4hr was found to be 4.3 µmo1/ 100g/ hr. Dantzler and Holmes (1974) opine that glomerular filtration rate (GFR) of reptiles tend to decrease with hydration or salt loading. They further opined that there are differences in sensitivity of the glomerular responses which appear related to habitat as well as to tubular and bladder or cloacal function. Dantzler and Schmidt-Nielsen (1966) found that *P. scripta* ceased producing urine when the plasma osmality was increased 200 moSm by dehydration or salt loading. Komadina and Solomon (1970) found that a 5% NaCl intravenous administration increased the glomerular filtration rate markedly in desert tortoises. Dantzler (1968) reports that fresh water turtles responded to an acute 1M salt load by decreasing the GFR. Cowan (1981) opines that when a load is administered to *M. terrapin* the load is equilibrated across a space larger than the normal inulin extracellular space and also found sodium entering into the cells. He also opines that when *Malaclemmys* was kept in fresh water, the bladder urine was very hypotonic but when transferred to sea water it carries with it a store of virtually free water to be used at a variable rate depending on the condition met. Dantzler and Holmes (1974) opine that the extra renal excretion of sodium in the salt loaded turtle is influenced by adrenocortical hormones.

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n the present study as *Lissemys* is a soft shelled turtle, the chances of ions entering into it are greater when compared to *Melanochelys* which has a hard shell and a thick skin. However, Dunson (1980) opine that little is known about the special physiological features an aquatic reptile must possess to survive long term immersion in sea water. Not withstanding the mechanism of ionic regulation, the point which emerges out of this experiment is the adaptability of these two species of fresh water turtles to both hypo as well as hypertonic media.

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Table 1. Salt gained by the male and female* Melanochelys *turtles.

S.No	Sex	Weight of the animal (g)	Salt gained by the animal after three weeks (mg/g body wt)
1.	Male	644.3	0.0001
2.		627.1	0.0023
3.		680.3	0.0779
4.		652.7	0.0045
5.		648.2	0.0184
1.	Female	579.2	0.1136
2.		613.8	0.0998
3.		648.4	0.0773
4.		593.1	0.1071
5.		626.2	0.1035

Table 3. Salt lost by the male and female* Lissemys *turtles.

S.No	Sex	Weight of the animal (g)	Salt lost by the animal after three weeks (mg/g body wt)
1.	Male	633.9	0.2842
2.		641.4	0.1793
3.		580.3	0.1426
4.		619.7	0.2138
5.		662.1	0.1694
1.	Female	598.7	0.3124
2.		623.4	0.2693
3.		641.9	0.3446
4.		693.7	0.1978
5.		626.2	0.2234

Table 1. Salt gained by the male and female* Lissemys *turtles

S.No	Sex	Weight of the animal (g)	Salt gained by the animal after three weeks (mg/g body wt)
1.	Male	598.1	0.2980
2		623.4	0.0083
3		648.7	0.1894
4.		631.6	0.2039
5.		628.3	0.0014
1.	Female	583.6	0.3318
2.		601.4	0.2827
3.		626.9	0.0196
4.		640.3	0.2288
5.		591.7	0.3771

Table 4 Salt lost by the male and female* Melanochelys *turtles.

S.No	Sex	Weight of the animal (g)	Salt lost by the animal after three weeks (mg/g body wt)
1.	Male	642.7	0.0743
2.		659.2	0.0616
3.		671.3	0.0329
4.		692.1	0.0842
5.		661.4	0.0623
1.	Female	588.7	0.1024
2.		604.3	0.0983
3.		683.6	0.0643
4.		641.3	0.1004
5.		621.4	0.0823