PROCEEDINGS OF THE SYMPOSIUM ON COASTAL AQUACULTURE

Held at Cochin

From January 12 to 18, 1980

PART 4: CULTURE OF OTHER ORGANISMS, ENVIRONMENTAL STUDIES, TRAINING, EXTENSION AND LEGAL ASPECTS

(Issued in December 1986)

MARINE BIOLOGICAL ASSOCIATION OF INDIA

POST BOX NO. 1023, COCHIN-682 031, INDIA

Price : Rs. 400.00

SYMPOSIUM SERIES 6

Abbreviation

Proc. Symp. Coastal Aquaculture, Pt. 4.

PRINTED IN INDIA BY A. D. THOMAS STEPHEN AT THE DIOCESAN PRESS, MADRAS 7 AND PUBLISHED BY E. G. SILAS ON BEHALF OF THE MARINE BIOLOGICAL ASSOCIATION OF INDIA, COCHIN-682 031

Proc. Symp. Coastal Aquaculture, 1986, 4 : 1295-1298

OXYGEN CONSUMPTION OF THE YOUNG RIDLEY TURTLE *LEPIDOCHELYS OLIVACEA* (ESCHSCHOLTZ)

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ABSTRACT

The metabolic rates (oxygen consumption) and corresponding activity were studied in young turtle of the species *Lepidochelys olivacea* (Eschscholtz). Experiments were also conducted to study the influence of ambient oxygen on activity and oxygen consumption. The turtles of the size group between 67 and 95 mm in carapace length (curved) were acclimated and tested at an average temperature of 30°C and 30.37‰ salinity.

Immediately after handling, the metabolic rates and corresponding activity were found to be high as 1110.13 mg/kg/hour and 24 L/15 min. The asphyxial oxygen level ranged between 4.15 and 4.84 mg/l.

INTRODUCTION

THOUGH the physiology dealing with several aspects such as metabolism, metabolic adaptations, temperature tolerance and resistance, influence of various environmental factors has been extensively studied in the case of fishes, prawns and intertidal mollsucs, no information on the metabolism of young ridley turtles is available. In the present study, experiments have been conducted in the same manner described earlier (Ameer Hamsa and Kutty, 1972) on the oxygen consumption and corresponding activity of young ridley turtle of the species *Lepidochelys olivacea*. The influence of ambient oxygen on activity and oxygen consumption has also been investigated.

Authors record with pleasure their thanks to Dr. E. G. Silas, Director, Central Marine Fisheries Research Institute for his interest and encouragement and to Shri G. Venkataraman for his help and advice.,

MATERIAL AND METHODS

During the course of conducting surveys to locate the turtle nests around the Islands in the Gulf of Mannar region, a total of 572 eggs of *Lepidochelys olivacea* were collected from four nests along the shore near Hare Island during October-November, 1977. The eggs were buried in the sand beyond the shoreline and the area was enclosed by wooden reepers in order to keep the eggs safe. Only 91 baby turtles (42-47 mm in carapace length) had come out from the enclosed nest after 58 to 64 days. Though the hatching was poor (15.9%), the hatched ones were healthy in aquarium conditions. The young turtles were kept in running sea-water in circular polycraft pools (diameter : 90 cm ; depth ; 60 cm) and were acclimatized to the laboratory conditions (Pl. I A). They were daily fed with minced fish meat and fragments of fresh seaweed (*Gracilaria* spp.). They attained the mean size of 80 mm in carapace length (curved)

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after 5 months and specimens measuring between 67 and 95 mm in carapace length are used in this study (Pl. I B). Temperature of the water in the acclimation tanks was about 30°C and salinity about 30.37‰. Dissolved oxygen at 80-96% air saturation. The experiments were conducted at acclimation conditions.

The experiments were conducted using a 'metabolism chamber' (Pl. I C) (Ameer Hamsa and Kutty, 1972) inside which Fry's annular respirometer (Fry and Hart, 1948; Ameer Hamsa and Kutty, 1972) of transparent hard plastic (outer diameter: 30 cm; inner diameter: 11 cm; height: 20 cm; capacity: 12.5 litres) was kept.

The experimental turtle was separated from the stock and kept in a circular polythene trough (diameter: 60 cm; depth: 26 cm) in running sea-water without giving food. After 24 hours, the live turtle was taken out and noted the carapace length and weight were noted, and then transferred immediately to the Fry's respirometer for experiment (Pl. I D). Three measurements of metabolism were made within one and quarter hours after introducing the turtle in the respirometer. Initial water sample was drawn out from the respirometer and the first measurement (run) was made by closing the respirometer for the first quarter hour. The turtle was allowed to consume the dissolved oxygen content available in the water inside the respirometer. At the end of first quarter water sample was taken for oxygen determination. This was followed by a flushing interval of 15 minutes. Then a second set of water samples were collected at the beginning as well as the end of third quarter hour. The flow through the respirometer was resumed again. This sampling procedure was continued till the completion of third measurement. The lid of the metabolism chamber was partially kept open (Pl. I C). During the runs, visual counts of the number of times the turtle went round in the annular chamber were made in alternate period of 3 minutes. From these values an estimation of spontaneous activity during the sampling period of 15 minutes (run) was obtained. The metabolic rate of the turtle was also estimated from the values of dissolved oxygen concentrations of the initial and final samples of each measurement. The turtle was weighed again at the end of the experiment.

In the experiments where the influence of ambient oxygen was studied, the turtle starved for 24 hours was directly transferred from the circular polythene trough to the respirometer after noting its carapace length and weight. The turtle was allowed to reduce the dissolved oxygen content in the respirometer and during the experiment water samples were drawn out from the respirometer at the interwal of every quarter hour (run) until the turtle attained the critical stage (asphyxial level). In this case the flushing through the respirometer was stopped between each measurement of metabolism. Metabolic rate was calculated from the dissolved oxygen concentrations in the water; simultaneously corresponding activity was also estimated for each measurement. Dissolved oxygen concentrations were measured by using standard Winkler's method.

Results and Discussion

The results obtained from five experiments on turtles of similar size are presented in Table 1. The values of initial (first measurement) oxygen consumption and activity are the rates of metabolism and spontaneous activity obtained immediately after handling. The initial rates of metabolism and activity are invariably higher than that of the subsequent rates. In all the experiments oxygen consumption decreased with a decrease in the corresponding activity after the first measurement. It has been observed that in all the cases where the metabolic rates immediately after handling were high the activity rates were also high

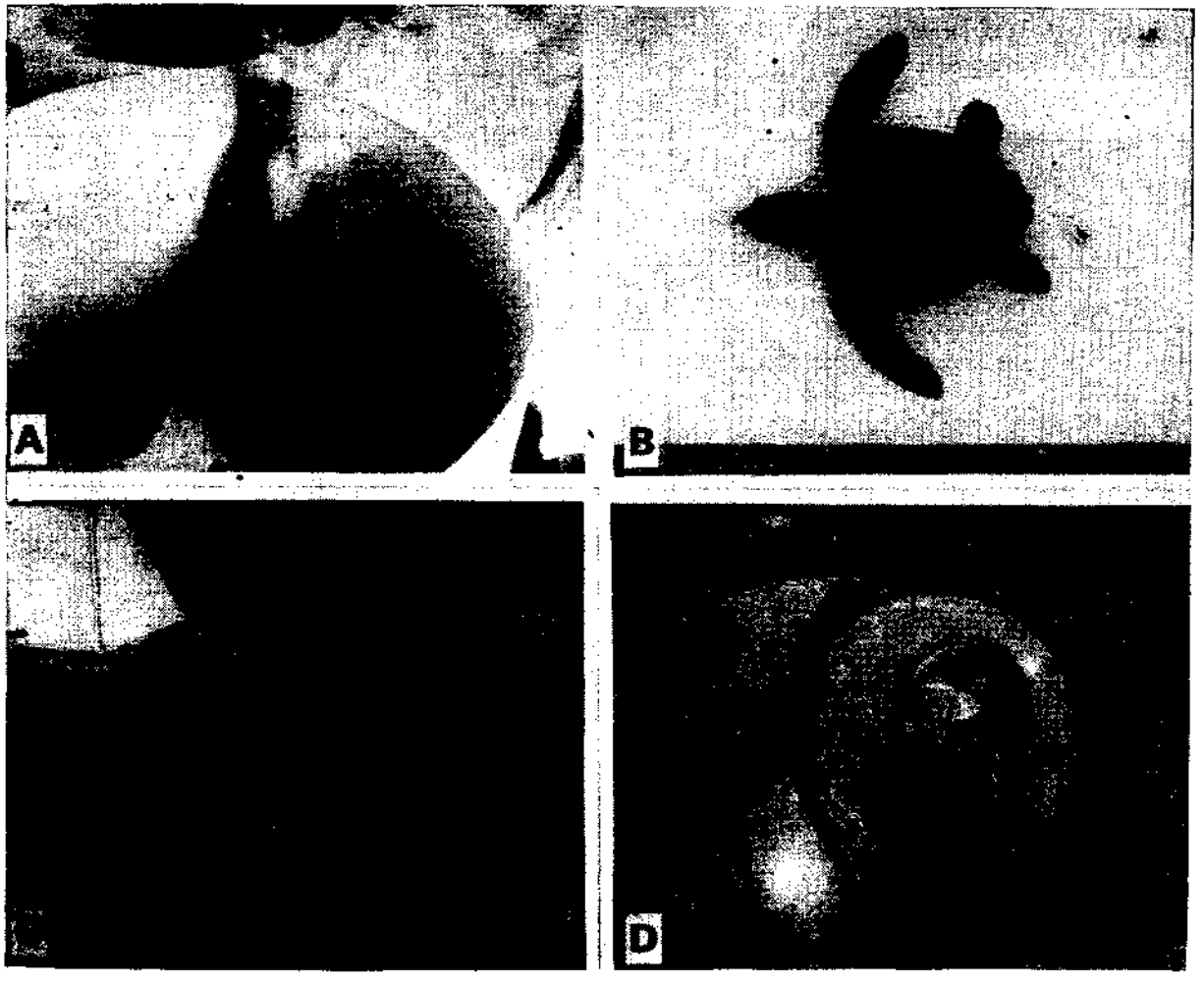

PLATE I A. Baby turtles of *Lepidochelys olivacea* in the acclimation tanks ; B. Close-up view of a baby turtle ; C. View of wooden metabolism chamber with lid in partially open condition and D. View of Fry's respirometer kept inside the wooden metabolism chamber under water. Note a turtle in the respiration chamber.

TABLE 1. *Oxygen consumption and corresponding activity of ridley turtle* Lepidochelys olivacea, *(The turtles were acclimated and tested in seawater at an average temperature of* 30°C *and* 30.37‰ *S)*

		Experiments				
		1	2	3	4	5
Carapace length (Curved mm)	..	77	67	76	73	77
Weight (g)	.. .	74	51	73	69	73
Oxygen consumption	..	1110.13	339.02	355.27	626.54	118.42
(mg/kg/hr)		1051.35	339.02	355.27	501.44	118.42
Mean in parentheses	..	116.82	169.51	236.85	387.25	0.00
		(759.43)	(282.51)	(315.79)	(505.04)	(78.94)
Spontaneous activity —	..	3.475	24.00	6.99	4.763	8.405
L/15 min.		1.379	Nil	3.521	1.099	Nil
Mean in parantheses	..	0.350	2.019	0.699	0.370	Nil
		(1.401)	(8.650)	(3.736)	(2.077)	(2.801)

The first value in each experiment is considered as the value obtained immediately after handling.

TABLE 2. *Ambient and asphyxial level of oxygen in the experiments conducted with young ridley turtle* Lepidochelys olivacea, *(The turtles were held and tested in seawater at* 30°C *and* 30.37‰ *S)*

Experiments	Activity (L/15 min.)	Oxygen consumption (mg/l)		Ambient Oxygen (mg/l)	Carapace length (mm) (and weight in g) of turtle tested
		Initial	Final (Asphyxial level)		
1	13.850	4.812	4.322	4.567	83
	4.539	4.322	4.322	4.322	(99.5)
	5.493	4.322	4.322	4.322	
	3.549	4.322	4.322	4.322	
2	Nil	4.495	4.322	4.408	87
	9.548	4.322	4.322	4.322	(101.5)
	2.443	4.332	4.322	4.322	
	0.31	4.322	4.322	4.322	
3	Nil	4.322	4.1498	4.2359	83
	4.841	4.1498	4.1498	4.1498	(88.5)
	8.380	4.1498	4.1498	4.1498	
	1.279	4.1498	4.1498	4.1498	
4	6.202	5.0143	4.841	4.9276	95
	13.015	4.841	4.841	4.841	(122.5)
	1.424	4.841	4.841	4.841	
	0.38	4.841	4.841	4.841	

(Ameer Hamsa and Kutty, 1972). From Table 1 it is clear that there is a direct correlation between activity and metabolic rate inspite of the high variability between animals.

The values of ambient and asphyxial level of oxygen are given in Table 2. In all the experiments oxygen consumption was observed only during the first measurement of metabolism (1st 15 minutes run) and the turtles did not consume oxygen afterwards. The consumption of oxygen was also less (0.173 mg/1) in 3 out of 4 experiments eventhough the ambient oxygen level was sufficiently high. The asphyxial level of oxygen ranged between 4.15 and 4.84 mg/1 and this level seemed to be high when compared to the values (0.62-1.50 mg/l) obtained for fishes.

Although the data is limited, the available information on the oxygen consumption and activity of turtles may be the first of its kind from Indian waters and may also be of much use to those who are in this field of study.

References

Ameer Hamsa, K. M. S. and M. N. Kutty 1972. Oxygen consumption in relation to spontaneous activity and ambient oxygen in five marine teleosts. *Indian J. Fish.*, **19** : 76-85.

Fry, F. E. J. and J. S. Hart 1948. Cruising speed of Goldfish in relation to water temperature. *J. Fish. Res. Bd. Canada*, **7**(4) : 169-175.