Richardson + McGillivary (1991)

POST-HATCHLING LOGGERHEAD TURTLES EAT INSECTS IN SARGASSUM COMMUNITY

On 22 August 1981 at 1900 h, the *R/V Cape Florida* stopped to make a hydrographic station at the west wall of the Gulf Stream (29°55'N, 30°00'W), 93 km east of St. Augustine, Florida. Water depth was 100 m. A convergence along the front, extending over the horizon in both directions, had concentrated rafts of Sargasssum weed into patches 5-50 m^2 in size. More than half of the patches contained one to three or more post-hatchling stage loggerhead sea turtles (Caretta caretta). As the vessel drifted through about 30 such patches, we observed at least 20 small loggerheads. The turtles were resting quietly on the floating Sargassum with their heads near the surface of the water. When approached by the vessel, they dived beneath the Sargassum and swam vigorously. Because we were able to examine only a small area (< 5000 m^2 of the frontal convergence), we cannot speculate on the extent of this population of young turtles. However, along the Gulf Stream front between Florida and the Carolines there is the equivalent of several km^2 of this Sargassum habitat.

Two dead turtles (45 and 47 mm carapace length) were collected floating in the Sargassum. Both had bites around the neck and eyes, probably from the orange file fish (Aluterus schopfi), but there was no obvious cause of death. Their guts contained four categories of material (Table 1). Macroalgae and marine invertebrates associated with the Gulf Stream and the Sargassum rafts accounted for roughly half of the items. A third major category consisted of terrestrial insects and the fourth of indigestible items, including string fibers, a feather, and tar balls. The predominate size of ingested food items (1-5 mm) indicates a preference and lower limit for prey size selection by neonate loggerheads. A yolk about 10 mm diameter was present in both animals.

There has been speculation about what food is available to post-hatchling turtles in the open ocean (Carr 1967; Frick 1976) and the ability of the turtle to reach food after it leaves its natal beach (Kraemer and Bennett 1981). Both turtles reported here contained a substantial reserve of yolk while actively feeding in the open ocean. The presence of insects in the gut suggests a source of food not previously considered. Insects are regularly collected in the air at heights up to 5,000 m, and insects like those ingested by the turtles have been caught in flight far out to sea, carried there passively by moving air masses such as high pressure systems (Johnson 1969).

Sargassum rafts, while providing camouflage and refuge, contain potential food in greater abundance than does the surrounding water. The affinity of post-hatchling turtles for convergence lines, both here and elsewhere (Carr and Meylan 1980; Carr 1987), may indicate a requirement by these animals to capitalize on food sources in addition to what is produced by the Sargassum community (Carr 1986). Aerial insect plankton, settling on the ocean's surface, would accumulate in convergencies and supplement the food in the Sargassum. Furthermore, the planktonic community beneath the Sargassum in the region of the Gulf Stream front is substantially more productive than that of either the core of the Gulf Stream or the water of the outer continental shelf. This higher planktonic productivity results from intrusions of nitrate-rich North Atlantic Central water from the west wall of the Gulf Stream up to within 50 m or less of the surface along the edge of the continental shelf (Atkinson 1977; Yoder et al. 1981). August is usually a period of prevailing southerly winds which enhance the upward and westward movement of the nutrient-rich water from the west wall of the Gulf Stream by creating an Ekman effect. August is also a period of more consistently enhanced planktonic productivity on the outer continental shelf of northern Florida (Atkinson et al. 1978). These conditions increase the amount and diversity of food available to turtles floating in the Sargassum.

Table 1. Identifiable items removed from the gut of two post-hatchling loggerhead sea turtles collected 93 km east of St. Augustine, Florida. Particle sizes were measured to the nearest 0.5 mm. S = found in stomach; I = found in intestine; P = "present". Size refers to particle size and/or body length of prey; number in parentheses indicates sample.

Common Name	Classification	S^1	I^1	S^2	I^2	Size
TERRESTRIAL INSECTS						
1. ant species #1 (winged sexual)	Formicidae	1	--	--	--	4mm
2. ant species #2 (winged sexual)	Formicidae	--	1	--	--	3.5mm
3. fly head capsule	Diptera	1	--	--	--	1mm
4. aphid sp.#1 (winged sexual)	Aphidoidea	2	--	--	--	2mm, 1mm
5. leafhopper sp.#1	Cicadellidae	--	2	--	--	5mm, 4.5mm
6. leafhopper sp.#2	Cicadellidae	--	1	--	--	4mm
7. planthopper sp.#1	Fulgoroidea	--	--	1	--	4mm
8. planthopper (leg fragment)	Fulgoroidea	1	--	--	--	--
9. beetle sp.#1	Coleoptera	--	2	--	--	4mm, 5mm
10. beetle sp.#2	Coleoptera	--	--	1	--	2mm
11. insect thorax fragments	--	2	1	--	--	1mm, 2mm, 3mm
MARINE FAUNA						
12. hydrozoan colonies (branch fragments)	Hydrozoa	P	--	P	--	--
13. goose barnacles	Lepadomorpha	2	--	--	--	3mm, 2mm
14. acorn barnacles	Balanomorpha	--	--	2	--	1mm, 1.5 mm
15. amphipods	Amphipoda	5	--	--	--	1mm(2), 2mm(2), 1.5mm
16. crab zoea	Decapoda	1	--	--	--	1mm
17. shrimp eye capsules (pair)	Decapoda	1	--	--	--	0.5mm per eye capsule
18. fish eggs (planktonic)	Osteichthyes	4	--	--	--	1mm(3), 1.5mm
19. muscle tissue fragments	--	--	--	1	1	--
20. chitinous element (squid pen?)	--	1	1	--	--	8x1mm, 10x1mm
21. chitinous exoskeleton fragment	--	--	--	--	1	5x4mm

Common Name	Classification	S[1]	I[1]	S[2]	I[2]	Size
MARINE FLORA						
22. sargassum leaf fragments	Sargassum sp.	12	14	1	4	2x6mm, 1mm(6), 3x3mm(5), etc.
23. sargassum bladders	Sargassum sp.	--	2	--	2	2mm(2), 4x2.5mm, 2x1.5mm
24. algal fragments	--	3	14	1	--	2-5mm(15), 6mm, 10mm, 12mm
INDIGESTIBLE MATERIALS						
25. tar balls (soluble in chloroform)		3	1	3	4	5x3mm, 1-2mmx 1-2mm(10)
26. feather		--	1	--	--	17mm
27. grey accretions (insoluble in chloroform)		--	2	--	--	1mm, 2mm
28. string fibers in bundle		--	1	--	--	12mm

[1] Turtle No. 1
[2] Turtle No. 2

The presence of tar balls in the gut of both dead loggerheads is a reason for concern, although there was no compaction from tar balls in the intestine, and the fragments removed were coated in a mucus sheath. Tar balls have become ubiquitous in the ocean surface and are concentrated in convergence lines. The similarity of the smaller tar fragments to the pigmented retinas of the ingested amphipods and decapods and to the insects suggests that tar balls of this size may be mistaken for prey.

Atkinson, L. P. 1977. Modes of Gulf Stream intrusion into the South Atlantic Bight waters. Geophys. Res. Lett. 4:583.

Atkinson, L. P., G. A. Paffenhöfer, W. M. Dunstan. 1978. The chemical and biological effect of a Gulf Stream intrusion off St. Augustine, Florida. Bull. Mar. Sci. 28:667.

Carr, A. 1967. The Sea Turtle: So Excellent a Fishe. Univ. Texas Press, Austin.

Carr, A. 1986. Rips, FADs, and little loggerheads. BioScience 36(2):92-100.

Carr, A. 1987. New perspectives on the pelagic stage of sea turtle development. Cons. Biol. 1(2):103-121.

Carr, A. and A. B. Meylan. 1980. Evidence of passive migration of green turtle hatchlings in Sargassum. Copeia 1980:366-368.

Frick, J. 1976. Orientation and behaviour of hatchling green turtles (Chelonia mydas) in the sea. Anim. Behav. 24:849-857.

Kraemer, J. E. and S. H. Bennett. 1981. Utilization of post-hatching yolk in loggerhead sea turtles, Caretta caretta. Copeia 1981:406-411.

Johnson, C. G. 1969. Migration and Dispersal of Insects by Flight. Methuen Publ., London.

Yoder, J. A., L. P. Atkinson, J. O. Blanton, D. R. Deibel, D. W. Menzel, G. A. Paffenhöfer. 1981. Plankton productivity and the distribution of fishes on the southeastern U. S. continental shelf. Science 214:352.

JAMES I. RICHARDSON, Institute of Ecology, University of Georgia, Athens, Georgia 30602 USA and PHIL McGILLIVARY, NOAA, NOS Ocean Applications Group, Monterey, California 93942-5005 USA.

Marine Turtle Newsletter

Number 55 October 1991