

**DIEL FORAGING ACTIVITY OF
AMERICAN EELS,
ANGUILLA ROSTRATA (LESUEUR),
IN A RHODE ISLAND ESTUARY**

Although the American eel, *Anguilla rostrata* (LeSueur), is abundant and commercially exploited along the entire Atlantic coast of North America, its basic biology is not well understood (Tesch 1977; Fahay 1978; Helfman et al. 1984). Foraging activity has not been studied. Helfman et al. (1983) examined daily movement patterns in an estuary and found, as had laboratory studies (Bohun and Winn 1966; Edel 1976; van Veen et al. 1976; Westin and Nyman 1979), that American eel locomotor activity is nocturnal and suggested that American eel foraging activity is also nocturnal. This study sought to describe the diel foraging patterns of wild estuarine American eels by monitoring capture rates in baited eel traps on a 24-h basis.

Eight eel traps were set 10 m apart along a transect in a tidal portion of the Pettaquamscutt River estuary, R.I. The water was turbid (the bottom could not be seen at midday in areas <1 m deep) and the salinity ranged from 20 to 30‰, depending on the tide. Cylindrical traps are commercially constructed of 0.64 cm² wire mesh and are 78 cm long and 20 cm in diameter with two single funnel openings of 5 cm in diameter. The traps were baited with 500-700 g pieces of freshly killed horseshoe crab, *Limulus polyphemus*, an effective eel bait (Bianchini et al. 1981).

Capture rates probably reflected contemporaneous foraging because the traps were thought to have a high escape rate. A high escape rate was suspected for two reasons: 1) When we changed from checking the traps once every afternoon to once every 3 h, the daily capture rate increased nearly 50 fold; and 2) when 40 eels were placed into 4 unbaited traps in the river, only 1 eel remained 24 h later. Feeding activity in the traps was evidenced by several factors: an examination of the gut content of 10 captured eels found 6 to contain horseshoe crab and the rest to be empty, anesthetized animals frequently regurgitated bait, eels were often found burrowing in the bait, and unbaited traps rarely caught anything.

Starting at 1200 e.d.t., traps were checked and rebaited at 3-h intervals for six 24-h periods evenly spaced over a 15-d span in early September 1982. This design removed any possible tidal influence because the lunar tidal period is 14.8 d. Within 10 min of their capture, eels were released 10 m to one side of the transect's center point. Traps were

rebaited every 6 h or whenever the bait was found to have been consumed (which rarely occurred). Baiting schedules were designed so that every other trap was rebaited at each 3-h check, and all portions of the crabs (heads and tails of both males and females) were equally distributed with respect to time and location. A total of 322 American eels were captured (some were probably recaptures): 178 (55% of the total) were caught just after sunset at 2000 e.d.t., 140 (44%) were caught during the remainder of the night, and 4 (1%) were caught during daylight (Fig. 1). Although daily capture rates were variable and ranged from 113 to 22, all exhibited this pattern.

To determine when foraging activity commenced, the traps were checked and rebaited at 30-min intervals between 1715 e.d.t. (40 min before sunset) and 2015 e.d.t. for 6 evenings during a 15-d period in early October. Eels were consistently first captured just after sunset, with captures peaking 1 h after sunset and declining thereafter (Fig. 2). Daily capture totals varied considerably but all exhibited this

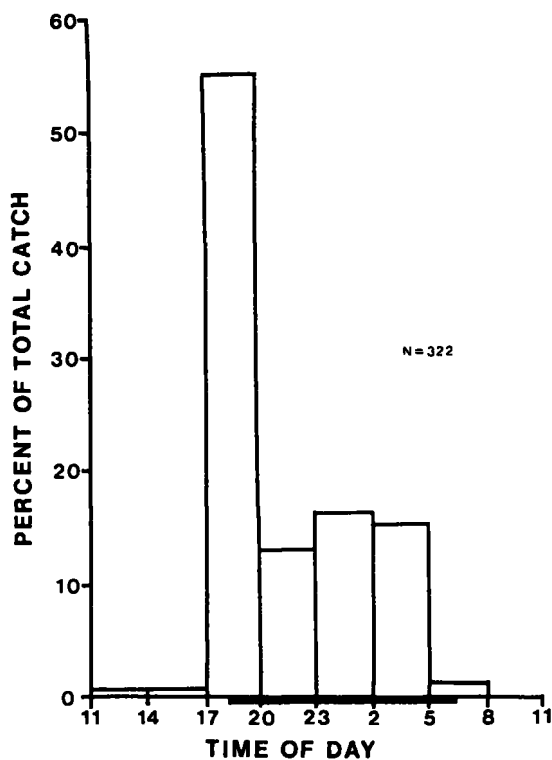


FIGURE 1.—Percentage of total catch of American eels by time of day for the 24-h experiment. The histograms cover the time between checks; i.e., their right boundaries mark the times when traps were checked. The bold section of the x-axis denotes the period between sunset and sunrise.

pattern. A total of 588 American eels were captured, 83% more than in the 24-h experiment, possibly reflecting the intensity of foraging activity just after sunset. To characterize the population, eels caught on the third evening were measured. They had an average total length of 30.7 cm (SD = 5.4, $n = 121$), and 10 of the 121 animals caught had the silvered pigmentation pattern which characterizes maturing individuals (Tesch 1977).

These data show that the foraging activity of estuarine American eels in late summer through autumn is nocturnal and peaks sharply at nightfall. Whether the subsequent decline in captures was caused by a decrease in foraging because of satiation or by an unrelated decline in locomotor activity cannot be determined. The swimming activity of unfed eels in the laboratory often exhibits a dramatic peak at lights-off (Bohun and Winn 1966; Edel 1976; van Veen et al. 1976). Spring and autumn captures of wild short-finned New Zealand eels, *Anguilla australis schmidti*, in baited traps displayed the nocturnal activity pattern described here (Ryan 1984). However, capture patterns in the latter study changed with the season, as did the locomotor patterns of the yellow European eel, *Anguilla anguilla*, studied by Westin and Nyman (1979). Further research is required to understand the relationship between foraging and locomotor activity patterns

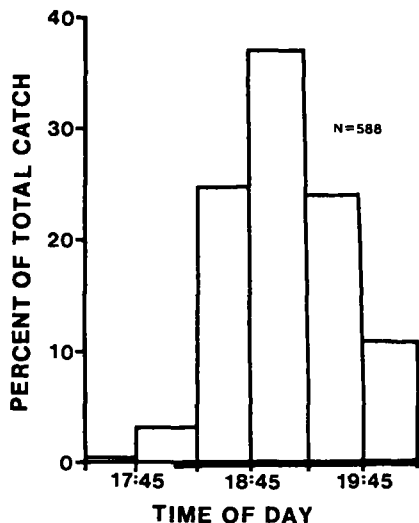


FIGURE 2.—Percentage of total catch of American eels by time of day for the evening experiment. The histograms cover the time between checks; i.e., right boundaries mark the times when traps were checked. The bold section of the x-axis denotes the period after sunset.

and how environmental and physiological factors might influence them.

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