



BRIEF COMMUNICATION

Behaviour of a sharptail mola in the Gulf of Mexico

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A sharptail mola *Masturus lanceolatus* was tagged and released with a pop-up satellite archival tag in the Gulf of Mexico and tracked for 61 days. The fish travelled a horizontal distance of 594 km while generally staying in water <200 m depth and >20° C. Occasionally the sharptail mola dived to depths >700 m and experienced water colder than 6° C.

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The sharptail mola *Masturus lanceolatus* (Liénard) is a cosmopolitan, warm and temperate water fish found mainly in oceanic waters (Bigelow & Schroeder, 1953). As it is rarely encountered, biological data have been difficult to obtain for this species and primarily concerns parasite associations, size and morphometric relationships based on dead specimens (Paulin *et al.*, 1982; Schwartz & Lindquist, 1987; Balart *et al.*, 2000). Little information exists regarding the geographic range of the fish and almost no biological data exist concerning its movement, or its depth and temperature preferences. In the Gulf of Mexico, it has been found in deep waters off south Texas (Hoese & Moore, 1998).

Qualitative sub-surface observations of one sharptail mola were made by Harbison & Janssen (1987) while diving in a submersible off the Bahamas at a depth of 670 m. Their report suggests that sharptail molas are probably more meso-pelagic than epi-pelagic (Nybakken, 2001) and the authors further consider classifying sharptail molas as permanent residents of the meso-pelagic based on extremely uncommon surface sightings. After examining a rare basking sharptail mola, Schwartz & Lindquist (1987) surmised that the sharptail mola's basking behaviour is found only in sick and dying fish brought on by heavy parasite loads.

Pop-up satellite archival tags (PSAT) (Wildlife Computers, Redmond, WA, U.S.A.) have been used to examine movement, depth and thermal preferences of large pelagic fishes such as tunas (Block *et al.*, 2001; Gunn & Block, 2001) and sharks (Boustany *et al.*, 2002). The basic design, function and insertion technique of PSAT are described by Block *et al.* (1998) and Gunn & Block (2001). In this study, the PSAT sampled pressure and ambient temperature every 2 min. The data were 'binned' into 2 h histograms and transmitted to ARGOS satellites after the tag was released from the fish. The endpoint position of the tag was determined from radio transmissions to the ARGOS satellites.

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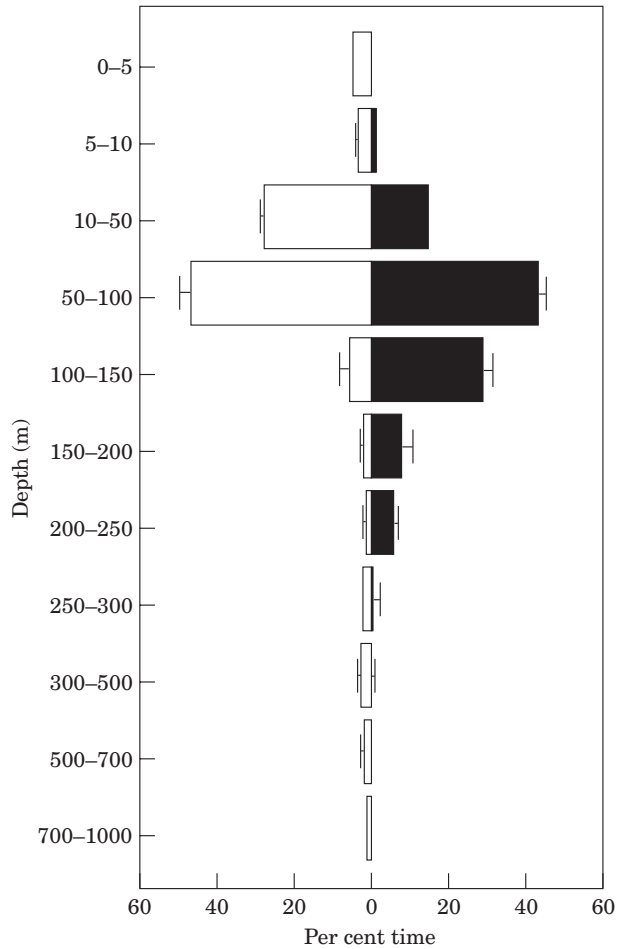


FIG. 1(a).

A sharptail mola (*c.* 1 m total length, L_T and *c.* 70 kg) was captured at 0021 hours on 28 April 2000 using a longline in the Gulf of Mexico at 25°98" N; 91°36" W. The fish was caught in the corner of the jaw using a squid-baited circle hook at a depth of 85 m (surface temperature 23.9° C). The fish was in excellent condition and very lively when pulled to the boat. While at the surface beside the boat, a PSAT was attached at the base of the dorsal fin. The monofilament fishing line was cut next to the fish's mouth, leaving the hook in the jaw with *c.* 5 cm of line still attached. The fish did not appear to be injured from the process of capture, tagging and release.

The PSAT released from the fish as programmed on 27 June 2000 at 24°36" N; 96°95" W. In 61 days at large, the fish travelled a straight-line distance of 594.5 km averaging a minimum velocity of 9.7 km day⁻¹. The fish spent 92.5% of the time above 200 m, 91.7% during the day and 93.6% during the night [Fig. 1(a)]. The depth distribution of the sharptail mola was narrower during the night than the day. The sharptail mola spent roughly the same amount of time between 50 and 100 m during both day and night. During the day, however, it showed a tendency to visit both shallower (0–50 m) and deeper waters (250–1000 m) than during the night when it spent most of its

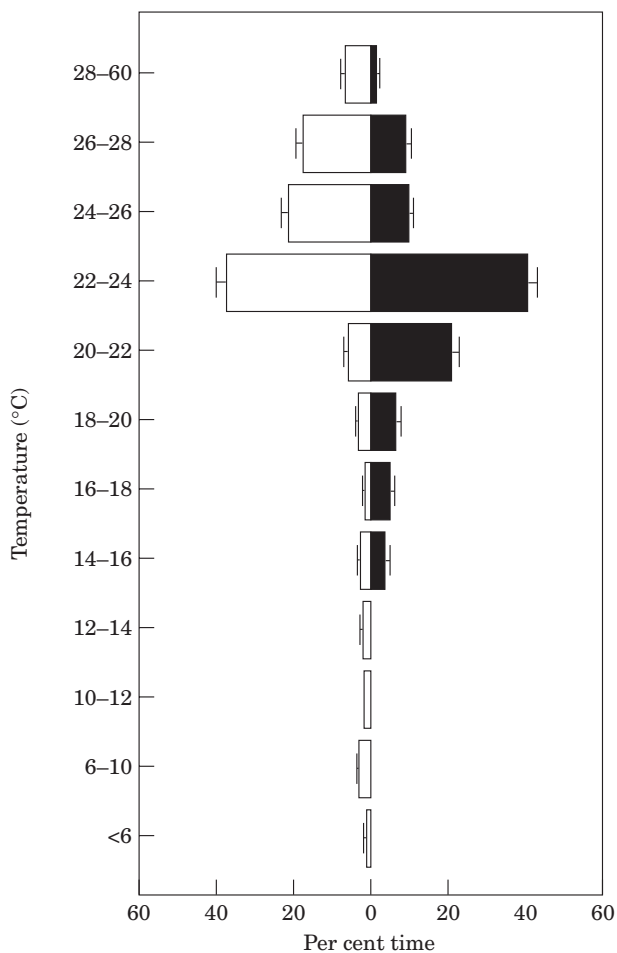


FIG. 1(b).

time between 100–250 m. At night, the fish rarely visited the top 10 m of the water column or depths >300 m.

The fish spent 85.8% of its time in water $\geq 20^{\circ}\text{C}$ [Fig. 1(b)]. Twenty-degree water corresponds roughly with 200 m depth, based on temperature–depth profiles collected by the PSAT [Fig. 1(c)]. The fish experienced cooler temperatures during repeated deep dives to at least 700 m where minimum temperatures were $<6^{\circ}\text{C}$. The sharptail mola possibly swam to depths >1000 m as the tag recorded occupancy in the 700–1000 m bin (Fig. 2), and the PSAT used does not record depths >1000 m.

This study provides the first quantitative biological information on the behaviour of this species, indicating that the sharptail mola is primarily an epi-pelagic fish. The sharptail mola spent the majority of its time (92.5%) in the top 200 m of the water column and preferred waters $>20^{\circ}\text{C}$ as it spent 85.8% of its time in that range. The depth distribution of the sharptail mola is probably associated with ambient water temperature preferences of this fish, as has been shown for other pelagic fish species in a variety of electronic tagging studies (Brill & Lutcavage, 2001; Gunn & Block, 2001). The colder waters ($<6^{\circ}\text{C}$) encountered by the fish were on deeper dives probably while foraging in the deep scattering layer or perhaps avoiding predators. This apparently healthy

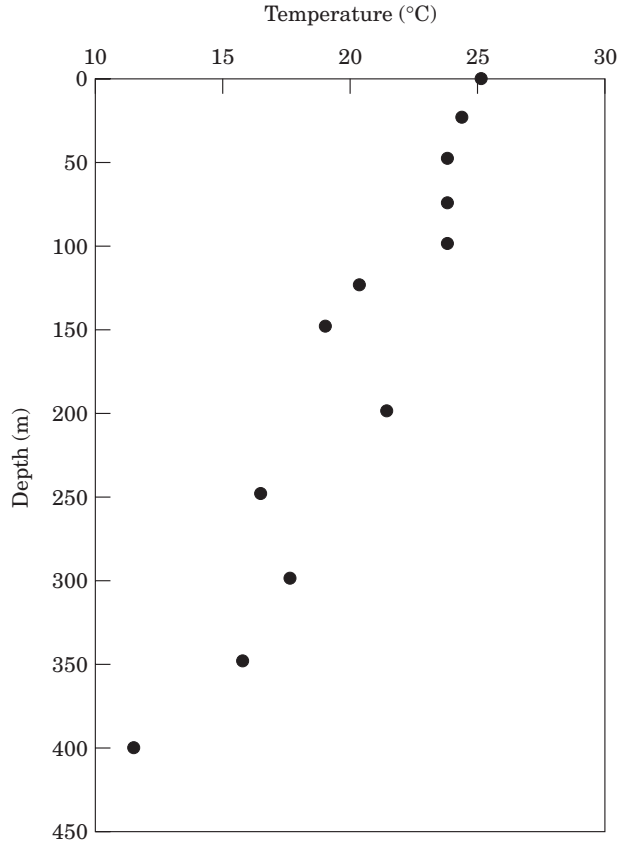


FIG. 1(c).

FIG. 1 Frequency distribution of depth and temperature for a sharptail mola in the Gulf of Mexico from PSAT data. Mean frequency time (± 1 S.E.) spent at different depths (a) and temperature (b). ■, night (2000–0559 hours); □, day (0600–1959 hours). A vertical profile of the water column for 30 April 2000 sampled by the PSAT tag is also given (c).

sharptail mola was a rare visitor to surface waters as it spent only 2.7% of its time in the top 5 m of the water column. These data support the hypothesis suggested by [Schwartz & Lindquist \(1987\)](#) that sharptail molas infrequently occupy surface waters to bask in the sun.

The depth preference of this sharptail mola in the Gulf of Mexico differs from that hypothesized by [Harbison & Janssen \(1987\)](#) based on a single sighting of one individual from a submersible off the Bahamas. Given that the present study recorded depth and temperature over a 61 day period, and that [Harbison & Janssen \(1987\)](#) observed an individual only briefly, it is likely that the PSAT record provides a more complete description of the species' behaviour. This study presents only a single individual in one region during the summer season, so more research is needed into the lifestyle of this cosmopolitan member of the pelagic fish community.

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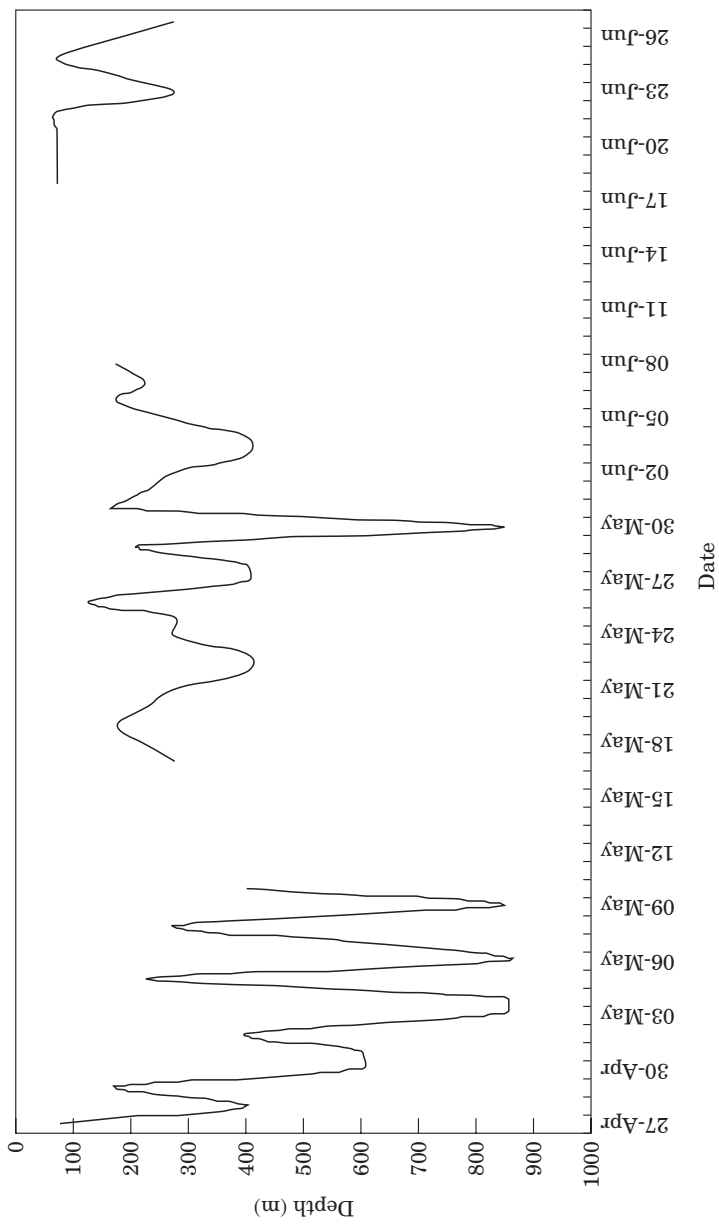


FIG. 2. Maximum daily depth of the sharp-tail mola from PAT tag data during April to June 2000. The maximum depth is the average of the limits of the deepest bin occupied by the fish for each day. Depths for which information is not shown is the result of incomplete transmission of the entire record to the ARGOS system.

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References

- Balart, E. F., Castro-Aguirre, J. L. & Amador-Silva, E. (2000). The first eastern Pacific report of the sharptail mola, *Mola lanceolata*, (Tetraodontiformes: Molidae). *California Fish and Game* **86**, 156–158.
- Bigelow, H. B. & Schroeder, W. C. (1953). Fishes of the Gulf of Maine. *Fisheries Bulletin* **53**, 531–532.
- Block, B., Dewar, H., Farwell, C. & Prince, E. (1998). A new satellite technology for tracking the movements of Atlantic bluefin tuna. *Proceedings of the National Academy of Sciences* **95**, 9384–9389.
- Block, B. A., Dewar, H., Blackwell, S. B., Williams, T. D., Prince, E. D., Farwell, C. J., Boustany, A., Teo, S. L. H., Seitz, A., Walli, A. & Fudge, D. (2001). Migratory movements, depth preferences and thermal biology of Atlantic bluefin tuna. *Science* **293**, 1310–1314.
- Boustany, A., Davis, S., Pyle, P., Anderson, S., LeBoeuf, B. & Block, B. (2002). Expanded niche for white sharks. *Nature* **415**, 35–36.
- Brill, R. W. & Lutcavage, M. E. (2001). Understanding environmental influences on movements and depth distributions of tunas and billfishes can significantly improve population assessments. *American Fisheries Society Symposium* **25**, 179–198.
- Gunn, J. & Block, B. A. (2001). Advances in acoustic, archival and satellite tagging of tunas. In *Tunas: Physiology, Ecology and Evolution* (Block, B. & Stevens, E. D., eds), pp. 167–224. San Diego: Academic Press.
- Harbison, G. R. & Janssen, J. (1987). Encounters with a swordfish (*Xiphius gladius*) and sharptail mola (*Masturus lanceolatus*) at depths greater than 600 meters. *Copeia* **1987**, 511–513.
- Hoese, H. D. & Moore, R. H. (1998). *Fishes of the Gulf of Mexico, Texas, Louisiana and Adjacent Waters*. College Station: Texas A&M University Press.
- Nybakken, J. W. (2001). *Marine Biology: an Ecological Approach*. San Francisco: Benjamin Cummings.
- Paulin, C. D., Habib, G., Carey, C. L., Swanson, P. M. & Voss, G. J. (1982). New records of *Mobula japonica* and *Masturus lanceolatus*, and further records of *Luaris imperialis* (Pisces: Mobulidae, Molidae, Louvaridae) from New Zealand. *New Zealand Journal of Marine and Freshwater Research* **16**, 11–17.
- Schwartz, F. J. & Lindquist, D. G. (1987). Observations on *Mola* basking behavior, parasites, echeneidid associations, and body-organ weight relationships. *Journal of the Elisha Mitchell Scientific Society* **103**, 14–20.