

## Observations on the Feeding Behavior of *Conus geographus* (Gastropoda:Toxoglossa)<sup>1</sup>

CLIFFORD RAY JOHNSON<sup>2</sup> and WILLIAM STABLUM<sup>2</sup>

THE FEEDING BEHAVIOR of various members of the genus *Conus* has been described (Kohn, 1956a, 1959, 1968; Kline, 1956; Nybakken, 1967). Piscivorous species of *Conus*, for which feeding behavior has been recorded, attack by extending their proboscises. From this extension a radular tooth used but once is injected into the prey, which is later swallowed. The feeding behavior of *Conus geographus* Linnaeus has not been previously described.

### METHODS

Twelve specimens of *C. geographus* ranging in length from 51 to 87 mm ( $\bar{x} = 70.1$  mm) and weight from 13.3 to 62.0 g ( $\bar{x} = 38.8$  g) were collected from the Great Barrier Reef early in 1969. The gastropods were maintained in aquaria at 22°–24°C for 1 week prior to experimentation. They were then offered fishes (*Microcanthus strigatus* and *Mugil* sp.) of varying sizes and weights (37 to 140 mm and 1.1 to 30.1 g) and three to four trials were made with each animal and the observations recorded.

### FEEDING BEHAVIOR

*Conus geographus* like most *Conus* feeds at night. Soon after a fish was placed in the aquarium the 12 molluscs became very active and attempted to locate the prey with their chemoreceptive powers (Kohn, 1956b). When the prey approached a *C. geographus*, the mollusc began to extend its funnel-shaped, dilated rhynchodaeum (rostrum) (Smith, 1967). If the fish approached closely to the extended rhynchodaeum, the mollusc would engulf the head and continue to extend the rhynchodaeum further over the body of the prey. This action appeared to be only muscular

and no pumping action of the rhynchodaeum could be detected when tested with the use of dyes around the rhynchostome at the time the animal was ingesting its prey. The prey upon being engulfed became very quiescent, possibly indicating that a narcotizing or relaxing agent was being released by the *C. geographus*. Only after *C. geographus* had extended its rhynchodaeum over most of the prey did the "stinging" actually take place (Fig. 1).

Preliminary investigation into the placement of the radula tooth and the point of possible venom injection into the prey indicates that these occur through the fish's gill aperture and into the pharynx. In one case a radula tooth was found between the gill filaments in the posterior portion of the pharynx, and, in five other instances, prey which were removed from the rhynchodaeum after being "stung" showed hemorrhaging among the gill filaments and internal branchial area.

After being "stung" the prey was usually completely engulfed by the rhynchodaeum. If the prey was small (30 to 50 mm long) the total time for ingestion ranged from 10 sec to 1 min (seven trials) and if larger (100 to 130 mm) the process took from 3 to 10 min (nine trials).

Largest prey (130 to 140 mm) were often rejected when the *C. geographus* found that it was impossible for its rhynchodaeum to engulf the prey completely, although a few of the larger *C. geographus* (80 to 87 mm in length) were able to ingest such large prey. Soon after the prey was successfully engulfed, the *C. geographus* would bend the fish's caudal peduncle and caudal fin and proceed to position the prey's head deep into the rhynchodaeum. Digestion then occurred. With prey such as a 78-mm (14.9 g) *Microcanthus strigatus*, complete digestion took approximately 19 hours; and for a 98-mm (18.1 g) long mullet, *Mugil* sp., digestion required about 21 hours. At this rate of digestion, *Conus geographus* could conceivably feed each night if small prey were taken, but

<sup>1</sup> Manuscript received June 4, 1970.

<sup>2</sup> Department of Zoology, University of Queensland, St. Lucia, Brisbane, Australia.

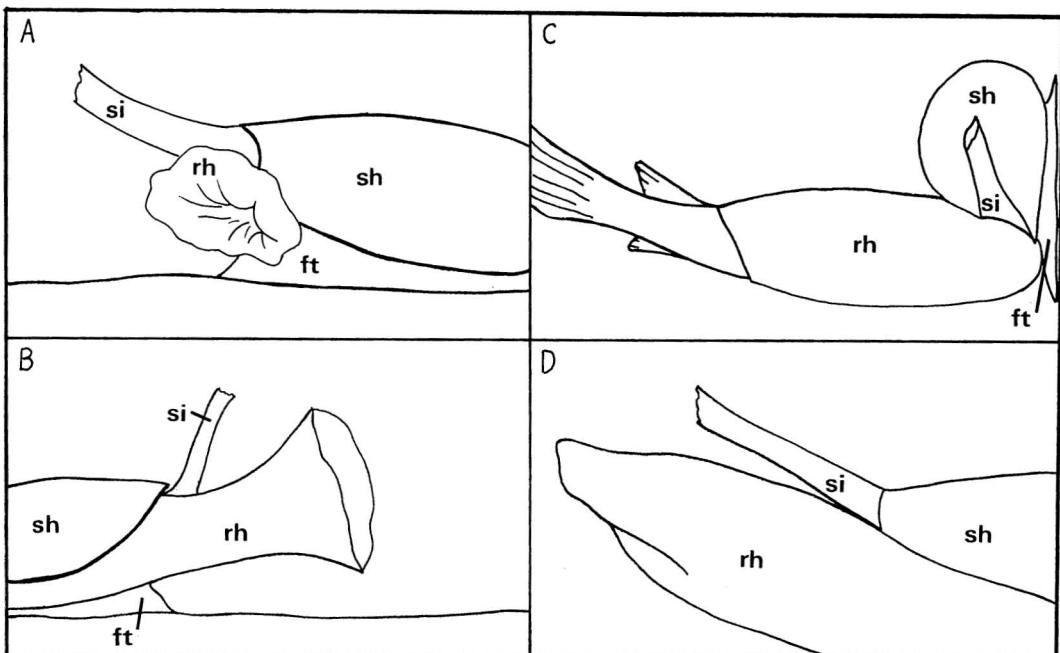


FIG. 1. Feeding behavior of *Conus geographus* (sh, shell; si, siphon; rh, rhynchodaeum; ft, foot). (A) Mollusc beginning to extend its rhynchodaeum. (B) Rhynchodaeum extended. (C) Most of the fish (*Mugil* sp.) ingested. "Stinging" usually occurred at this stage. (D) Fish completely engulfed by rhynchodaeum and digestion begun.

probably it feeds only on alternate nights when larger prey are captured. *C. geographus* in aquaria would usually refuse food when it had fed on large prey the previous night. The *C. geographus* also fed upon freshly killed whole and sectioned fish, employing the same feeding behavior as described above, although it was not observed whether "stinging" occurred. Nybakken (1967) reported similar findings with *C. purpurascens*.

Thus the feeding behavior of *Conus geographus* is considerably divergent from that described for other piscivorous *Conus*. *C. geographus* has the most toxic venom reported (Endean and Rudkin, 1965). This poses the interesting question of why a cone that has such a toxic venom should not use it for initially capturing its prey. When pressure was applied to the shell of *C. geographus* or if the shell was damaged, the animal immediately extended its proboscis, without extending the rhynchodaeum as described in feeding behavior, and moved it toward the damaged area. These observations suggest that the venom is used primarily for

defense rather than in capturing prey. Similar behavior was mentioned by Endean and Rudkin (1965) when pressure was exerted to the shells of *G. geographus*.

#### ACKNOWLEDGMENTS

The authors wish to thank Dr. John DeMartini, Humboldt State College, for his review of the manuscript. Colleen Nixon prepared the figure.

#### LITERATURE CITED

- ENDEAN, R., and C. RUDKIN. 1965. Further studies of the venoms of Conidae. *Toxicon*, vol. 2, pp. 225-249.
- KLINE, G. F. 1956. Notes on the stringing operation of *Conus*. *Nautilus*, vol. 69, no. 3, pp. 76-78.
- KOHN, A. J. 1956 a. Feeding in *Conus striatus* and *C. catus*. *Proceedings. Hawaiian Academy of Science*, vol. 31, p. 20.
- 1956 b. Piscivorous gastropods of the

- genus *Conus*. Proceedings of the National Academy of Sciences, vol. 42, pp. 168–171.
- 1959. The ecology of *Conus* in Hawaii. Ecological Monographs, vol. 29, pp. 47–90.
- 1968. Microhabitats, abundance and food of *Conus* on atoll reefs in the Maldives and Chagos islands. Ecology, vol. 49, no. 6, pp. 1046–1062.
- NYBAKKEN, J. 1967. Preliminary observations on the feeding behavior of *Conus purpurascens* Broderip 1833. Veliger, vol. 10, no. 1, pp. 55–57.
- SMITH, E. 1967. The proboscis and oesophagus of some British turrids. Transactions of the Royal Society of Edinburgh, vol. 67, pp. 1–22.