burrow of a large female and entered. On 22 July 1971 the burrow of a yearling was found dug into the collapsed entrance of a larger burrow. Juveniles are occasionally captured in live traps set for mammals at the Station, suggesting a tendency to enter unfamiliar tunnels.

It appears that hatchlings generally remain inside the burrows of adults or buried under sand or litter during their first winter of life, and first construct burrows of their own upon emergence in the spring. Opportunistic sheltering by juveniles through their third or fourth year of life is probably associated with higher risks of heat and water stress in smaller animals. Their tendency to take shelter under sand or litter nearly anywhere without constructing burrows probably accounts in large part for the low frequency with which they are encountered at this locality.

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METHODS OF OBTAINING STOMACH CONTENTS FROM LIVE CROCODILIANS (REPTILIA, CROCODILIDAE)

Information about feeding is frequently important in biological studies, yet where populations are small or declining, the killing of specimens for stomach contents analysis is often unjustified (Gans and Pooley, 1976). The present paper describes two methods for removing stomach contents from live *Crocodylus porosus* between 28 and 180 cm total length. In both methods the crocodile's jaws are opened and a rubber-coated metal cylinder tied in

position between them (Fig. 1). One or two people are required to hold the crocodile while another removes the contents. No anaesthetics are used.

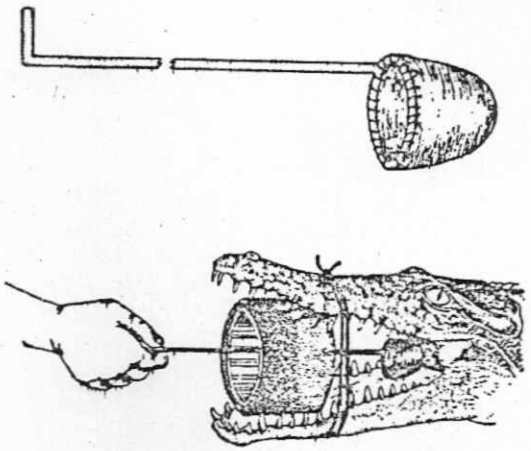

FIGURE 1. Scoop (upper) and method of insertion (lower).

Scoop.—The frame is of either spring steel or brass rod formed into a loop and handle (Fig. 1). The diameters of the required rod and loop are determined by crocodile size (Table 1). A soft rubber bag (finger or a section of a rubber glove) is sewn to the metal loop, and the apparatus lubricated with vegetable oil before use. The scoop is then passed through the metal cylinder until the loop reaches the palatal valve. The crocodile's head is raised to about 30° to the axis of the body, and the scoop pushed with a gentle turning motion until the loop enters the eosophagus. To pass the scoop through the region of the pectoral girdle and to enter the stomach it is again necessary to apply a little pressure combined with the twisting action.

Once in the stomach the loop and food mass can be felt through the body wall. By maneuvering the scoop, the loop is then positioned behind the food mass and gently withdrawn. The process is repeated until bulky items can no longer be felt in the stomach. The insertion and removal of the scoop is a delicate procedure and care must be taken to ease rather than force the scoop around obstructions.

TABLE 1. Dimensions (cms) of scoops, pumps and mouth cylinders used for different sized (cms) *Crocodylus porosus*. Diameters refer to external measurements.

Total length of crocodile	Mouth cylinder		Scoop			Pump	
	diam.	length	Loop diam.	Rod diam.	Length	Diam.	Length
28 - 35	3.0	2.0	—	—	—	1.0	40
35 - 50	4.5	2.5	—	—	—	1.0	40
50 - 120	5.0	3.0	2.0	0.2	40	1.5	60
120 - 130	5.0	3.0	3.0	0.4	60	1.5	60
130 - 140	9.5	5.0	3.0	0.4	60	2.0	80
140 - 180	9.5	5.0	4.0	0.4	80	2.0	80

Pump.—Pumps are made from lengths of clear PVC tubing of different diameter (Table 1); wall thickness should be at least 1 mm. One end is honed out making it soft, pliable and of greater internal diameter. This end is coated with vegetable oil and inserted into the stomach, as described above for the scoop. The crocodile is held with its head above stomach level and fresh water poured into the tubing. When the abdomen is visibly distended, it is squeezed and relaxed (pumped) by hand until a mixture of water and stomach contents surges in the tube (usually 4-6 squeezes). The abdomen is then held in, the free end of the tube inserted into a collecting bottle, and crocodile's head and sometimes its whole body held vertically (with head down), and the tube withdrawn. A mixture of food and water then flows into the bottle. The process is usually repeated twice until the flushing water is essentially free of food particles. If no surging occurs, the pump is either repositioned or withdrawn entirely and examined for blockages.

For *C. porosus* less than 50 cm total length the pump alone was sufficient. Five crocodiles in this size range were killed for other reasons, and dissected after being pumped and no food remained in their stomachs. For *C. porosus* over 50 cm total length both the scoop and pump were used. Four crocodiles in this size range were killed and dissected after their stomach contents were removed by a combination of the methods. In three that had been scooped and pumped, no food remained in their stomachs, while in the one that had been pumped only, approximately 20% of the stomach contents remained. As the killing of more *C. porosus* to

determine the relative efficiency of each method could not be justified, we suggest that both scoop and pump be used on crocodiles over 50 cm total length.

Both methods are non-injurious to the crocodile. Individuals kept for up to five days after having their stomach contents removed showed no ill-effects. Of the nine *C. porosus* killed and dissected after being pumped and/or scooped, none had obvious internal damage. Furthermore, 12 hatchlings (30-45 cm total length) pumped once (one individual twice) and released into the wild showed monthly growth rates (snout-vent length; 0.1 ± 0.01 cm/day) as high as those reported for other hatchlings in the same region (0.06 cm/day, standard error not given; Webb et al., 1977).

The two methods have been successfully used to sample the stomach contents of 361 live *C. porosus,* up to 180 cm total length, without apparent injury. The use of these techniques with other species could remove the justification, used by some researchers, to kill large samples of endangered species to determine diet.

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OBSERVATIONS ON THE COURTSHIP BEHAVIOR OF JUVENILE *CHRYSEMYS CONCINNA CONCINNA* AND *CHRYSEMYS FLORIDANA HOYI* (REPTILIA, TESTUDINES, EMYDIDAE)

Courtship behavior of adult emydid turtles follows two behavioral patterns as described in the literature. The first consists of a face-to-face encounter in which the male maneuvers to a position directly in front of and facing the female. In a single motion the palms are then turned outward, the forefeet are brought close together, the forelegs are extended, and the claws of the forefeet are rapidly vibrated toward the eyes and face of the female. The legs are then retracted and the process is repeated for varying lengths of time. These titillations act to immobilize the female at which point the male aligns himself above the female, clasps her carapace, and copulation ensues. Species which conform to this general pattern include: *Chrysemys picta* (Ernst, 1971; Taylor 1933), and *C. scripta elegans* (Cagle, 1950; Conant, 1938; Davis and Jackson, 1970; Grant, 1936; Jackson and Davis, 1972; Taylor, 1933).

The second pattern involves the approach of a male from above and behind a female. A male will pursue a female until they are anteriorly equal, at which point the male manipulates the forefeet toward the female's head and claws or titillates the head and neck of the female from above. Taxa which conform to this approach include *C. concinna suwanniensis* (Jackson and Davis, 1972; Marchland, 1944) and *C. concinna mobilensis* (Cagle, 1950).

During the breeding season males of all species follow highly regimented and stereotyped