

Fat stores may be mobilized to meet energetic needs as yolk declines (Werner, 1988). My results show that in combination yolk and other fat stores are sufficient to sustain the energy needs of resting *C. johnstoni* hatchlings for considerably longer than 4 wk, without obvious deterioration in condition.

These stores may serve energy needs prior to, as well as after emergence from the nest. Reptiles exploiting the intensely seasonal tropical environments of northern Australia may facultatively delay emergence from nests to coincide with favorable conditions, and that delay is associated with reduced growth rates and lower rates of energy usage (Webb et al., 1986; Whitehead, 1987). The declining \dot{V}_{O_2} of hatchlings continues a pre-pipping trend for falling metabolic rates (Whitehead, 1987). Hatching crocodilians do not expend energy in escaping the nest chamber, but await parental excavation (Lang, 1987). Thus rates of energy usage by these resting hatchlings kept in darkness are likely to be similar to those of embryos in pipped or unpipped eggs in the nest.

No data exist on field metabolic rates of crocodilians. Comparisons of allometric equations relating body mass to field metabolic rate of lizards (Nagy, 1983), and to resting rates (Bennett and Dawson, 1976), suggest that field rates in reptiles may be around twice the resting rates. Outside the nest the energy reserve may last half as long.

Hatching from wild *C. johnstoni* nests peaks during late Nov. and early Dec., near the beginning of the wet season in Australia's monsoonal north. However, the time of arrival of wet season rains is unpredictable (Taylor and Tulloch, 1985). Maternal provisioning of eggs includes a substantial energy surplus and nutritional buffer for hatchlings in the first few weeks of post-hatch life. Substantial energy reserves enable hatchlings to cope with delays in the onset of flooding rains and the improved food availability (chiefly insects) that accompanies them, whether they await favorable conditions within the nest or outside it.

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A FISHING TACTIC IN FLOATING PARAGUAYAN CAIMAN: THE CROSS-POSTURE.—*Caiman crocodilus yacare*, the Paraguayan caiman, sometimes ambushes fish while hunting on the bottom of ponds or floating at the surface (Schaller and Crawshaw, 1982). When sensing a fish, the caiman snaps sideways or lunges ahead with half-open mouth. Here we describe a posture used by the Paraguayan caiman while afloat, apparently related to surface activity of small fishes. We observed this be-

havior, termed the "cross-posture," in ponds at the Pantanal region near Poconé, Mato Grosso, western Brazil (ca. 16°30' S, 56°54' W), the same general area studied by Schaller and Crawshaw (1982). We conducted diurnal and nocturnal observations in the dry season, May 1985, and in Sept. 1987, 1988.

The cross-posture is characterized by the forelimbs fully stretched and away from the body (Fig. 1). The digits are spread and may be kept submerged or above the surface. While stationary, the animal usually keeps its hindlimbs and tail hanging and its mouth half-open. The caiman may stealthily approach fish while in the cross-posture (Fig. 1c). From time to time the caiman snaps sideways (Fig. 1d), sometimes sculling its forebody to raise one of the forelimbs opposite to the direction of the snap, or it lunges ahead or sideways, raising the body and plunging.

In Sept. 1988 the water in the ponds was turbid and we observed large numbers of fishes surfacing for air-breathing in early morning (0600-0930 h). Auchenipterids (*Trachycorystes* sp.), pimelodids (*Pimelodus* sp.), callichthyids (*Corydoras* sp. and *Hyostomus* sp.), and erythrinids (*Hoplias malabaricus*) were among the commonest fishes to display this behavior. Several adult (1.2-2.0 TL) caimans were seen displaying the cross-posture and attempting to catch the surfacing fishes, either by snapping sideways or lunging (Fig. 1d). The use of the cross-posture relative to other behaviors was difficult to assess, as in turbid water and at a distance we could only count those individuals which kept their digits above water. We conducted a focal sampling (Altmann, 1974) of caimans seen with their digits above surface, thus undoubtedly displaying the cross-posture, and recorded their fishing attempts and captures (Table 1). The fishing success was low (5.7%) when compared to the 15.9% reported by Schaller and Crawshaw (1982) for other fishing behaviors. Two focal individuals caught *Trachycorystes*, whereas others caught *Hoplias* and *Pimelodus*.

Only one caiman was observed displaying the cross-posture and fishing in May 1985. At this time, the water was still clear enough to observe that the caiman snapped at small fishes which approached and nipped at its digits. In 14 attempts (ca. 40 min) the caiman caught a small characin, *Tetragonopterus argenteus*. During our Sept. 1988 observations, we saw catfishes, *Pimelodus* sp., nipping at a caiman's digits at night (1924 h). This caiman displayed the cross-pos-

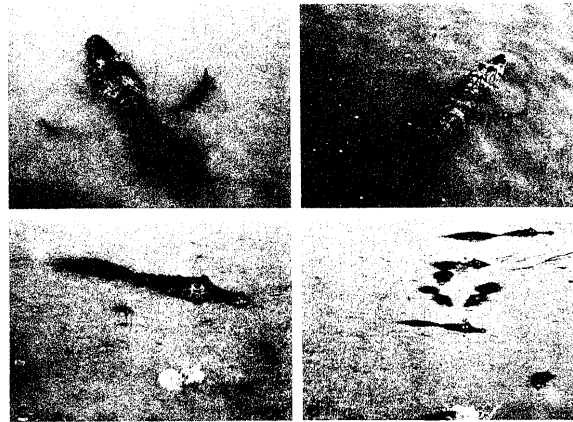


Fig. 1. The cross-posture in floating Paraguayan caiman, *Caiman crocodilus yacare*: a) dorsal view while stationary; note digits kept above the water surface; b) dorsal view while moving slowly; c) a caiman stealthily approaching a group of surface-breathing auchenipterid catfishes; d) a group of floating caimans (two in the cross-posture with digits above surface); in foreground, one caiman while snapping at fish.

ture and lunged sideways upon being touched by the fish.

In Sept. 1987 we observed some caimans displaying the cross-posture, although surfacing fishes were uncommon and water turbidity precluded observation of whether fishes approached and nipped at the caimans' digits; however, nipping fishes were commonly recorded underwater while skin diving (see below).

We tentatively regard the cross-posture as part of this caiman's predatory repertoire, probably restricted to certain conditions (see Schaller and Crawshaw, 1982 for additional fishing tactics). One such condition seems to be the occurrence of large numbers of surface-breathing, small to medium-sized fishes in the shrinking ponds during the dry season. Air-gulping fishes are a common phenomenon in seasonally flooded areas in the Neotropics (Kramer and McClure, 1982; Lowe-McConnell, 1987). The cross-posture seems particularly advantageous during the occasions of fish surfacing, because it enhances the detection and capture of air breathing fishes. Hunting by touch was suggested for the Paraguayan caiman by Schaller and Crawshaw (1982).

Another condition for fishing while afloat in the cross-posture may be the presence of small

and opportunistic schooling fishes which nip on substrates, including large animals, while foraging (Sazima, 1986). During skin diving activities in May 1985 and Sept. 1987 we noticed several characin species nipping at our fingers and toes. We believe this fish behavior may be taken in advantage by the floating caimans to attract and catch the fish, as these will approach and nip insistently at any floating body. It is probable that a floating caiman senses the approaching fish by touch rather than by sight,

TABLE 1. NUMBER OF FISHING ATTEMPTS AND PREY CAPTURES BY PARAGUAYAN CAIMANS DISPLAYING THE CROSS-POSTURE IN THE PANTANAL, MATO GROSSO, ON 4 AND 5 SEPT 1988.

Individual	Time under observation (min)	Number of attempts	Number of captures	Behavior while afloat
1	10	4	0	moving
2	38	9	1	moving
3	12	4	0	moving
4	4	1	0	stationary
5	6	1	0	stationary
6	10	8	0	moving
7	14	8	1	moving

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even in clear water (Schaller and Crawshaw, 1982).

The possibility remains that the floating, cross-posture is part of the thermoregulatory (Johnson, 1973; Fish and Cosgrove, 1987) or other, perhaps physiologically-related behaviors of the Paraguayan caiman. However, we observed this posture mainly when large numbers of fishes were surfacing for air, or when nipping by fishes was pronounced (as assessed by skin diving). Cross-posture was also recorded while in this posture indicates that it is most likely related to prey capture (Pooley and Gans, 1976; Schaller and Crawshaw, 1982). Nevertheless, even if the snapping while in the cross-posture is merely the response of a floating caiman at whatever happens to pass by, it does produce a catch.

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FEMALE TREE LIZARDS: OVIPOSITION AND ACTIVITY PATTERNS DURING THE BREEDING SEASON.—Many reptiles are inconspicuous prior to and during oviposition. Consequently, their activities at this time are rarely documented (Parker and Brown, 1972; Lieberman, 1980). This information is, however, important for a complete understanding of a species' reproductive biology. Although field and enclosure studies on tree lizards (Iguanidae: *Urosaurus ornatus*) suggest that females are sedentary during the breeding season (Russell, 1985; Zucker, 1987), no studies report their activity patterns during oviposition. In this paper we summarize our observations on the oviposition behavior of tree lizards and document female activity patterns throughout the breeding season. Observations were made on a colony of lizards housed in a large indoor enclosure.

Materials and methods.—Tree lizards are insectivorous, sexually dimorphic, and rarely exceed a SVL of 55 mm (Dunham, 1981). They are generally saxicolous or arboreal, located throughout much of the western United States and northwestern Mexico (Stebbins, 1954), and may be locally abundant, particularly in riparian woodland habitat (Vitt et al., 1981; M'Closkey et al., 1987b). For example, we have observed as many as four adult males and seven adult females simultaneously occupying the same mesquite tree (*Prosopis juliflora*) (M'Closkey et al., unpubl.). Where densities are high, a polygynous mating system is common (Milstead, 1970; M'Closkey et al., in press).

In early May 1987, nine adult *U. ornatus* (5 ♀♀; 4 ♂♂) were captured in southeastern Arizona, and transported to our laboratory at the University of Windsor. They were individually weighed and measured (SVL), toe-clipped and marked with paint on the dorsum for permanent and temporary identification. After an individual shedded, it was captured, re-painted, and measured and/or weighed.

The lizards were housed in an indoor enclosure measuring 4.93 × 1.85 × 0.84 m, and including three similar, but discrete, circular habitats of logs and rocks. The average dimensions of the logs (n = 23) and rocks (n = 7) were approx. 10 × 45 cm, and 25 × 20 × 15 cm, respectively. Habitats were equidistant and functioned as basking and oviposition sites. Each habitat covered an area approx. 0.65 m², and 3