



The Effect of a Total Sun Eclipse on the Vocal Behavior of Some Amphibians

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Source: *Copeia*, Vol. 1975, No. 4 (Dec. 31, 1975), pp. 764-765

Published by: American Society of Ichthyologists and Herpetologists (ASIH)

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Accessed: 18-08-2017 13:49 UTC

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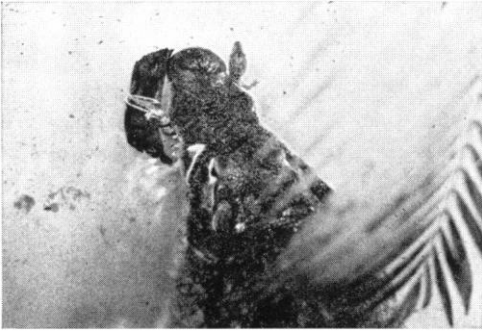


Fig. 1. Female *C. moreletii* releasing a two-month old baby into water.

hatched (Fig. 1). Female AZP 25 also tried to pick up and carry the babies to the water but female AZP 21 attacked her. On 5 December the experiment was repeated using older, captive hatched *C. moreletii*. A 3-year-old, 76 cm crocodile was tied and a 30-minute recording of the distress grunts of another 3-year-old was played. Both females responded and chased me out of the solarium. Female AZP 21 stayed within 1.5 m of the 3-year-old, but she made no attempt to pick it up in her mouth.

The adult *C. moreletii* became unusually aggressive during these experiments. Male AZP 20 killed a male *Crocodylus cataphractus* 1.5 m in length and the females killed a male *Tomistoma schlegeli* 1.2 m in length. After each of these 10 November to 5 December experiments, the young crocodiles were removed from the solarium within 6 hours of their introduction. For 2 days after the last experiment female AZP 21 and male AZP 20 attacked and chased human beings or crocodilians that approached the areas previously occupied by the young *C. moreletii*. To prevent a continued loss of crocodilians living with this group of *C. moreletii*, the experiments were discontinued after 5 December 1973.

LITERATURE CITED

- ALVAREZ DEL TORO, M. 1969. Breeding the spectacled caiman (*Caiman crocodylus*) at Tuxtla Gutierrez Zoo. *International Zoo Yearbook* 9: 35-36.
- HADLEY, D. 1969. Breeding of crocodile in Livingstone Game Park. Puku: Occ. Pap. Dept. Wildlife, Fish, Nat. Parks Zambia 5:226-228.
- OGDEN, J., AND C. SINGLETARY. 1973. Night of the crocodile. *Audubon* 75 (3):32-37.

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THE EFFECT OF A TOTAL SUN ECLIPSE ON THE VOCAL BEHAVIOR OF SOME AMPHIBIANS.—Under the aegis of "Opération éclipse," set up by the French "Direction générale de la Recherche scientifique et technique," I went to Surinam to observe animal behavior during the total eclipse of the sun of 30 June 1973.

The only previous observations on the reactions of anurans to a total solar eclipse are reported by Wheeler et al. (1935). They state that several people had reported that during the sun eclipse of 31 August 1932, individuals of *Bufo americanus* or *fowleri* were observed to leave their shelter and that frogs (perhaps *Hyla v. versicolor* and *Rana* sp.) were heard calling.

The study site was situated at 53° 05' W and 5° 24' N on the upper bank of the Wayambo River near the village of Corneliskondre. The site was within the zone of total eclipse. Populations of *Hyla calcarata* Troschel and *H. geographica* Spix were located prior to the eclipse. I continuously recorded general vocal activity of anurans and avians from 0557 to 0657 hrs (local time) with a Uher 4000 Report L tape-recorder and M 534 microphone. The recording time extended from one-half hour before to one-half hour after the eclipse. A control recording was made at the same time the following day.

Hyla calcarata, after an isolated call at 0558 hrs, called clearly as the eclipse was under way from 0619 to 0627 hrs (two calls/min). Two isolated calls were made 15 min after the eclipse. *Hyla geographica* was not heard during the eclipse. The next day, two calls of *H. calcarata* were recorded at 0559 and 0601 hrs.

In the days preceding the eclipse we had noticed that *H. geographica* called only during the night after heavy rain. Darkness alone during the eclipse did not constitute a sufficient threshold to release the call of that species.

In contrast, darkness alone apparently is sufficient to release calling in *H. calcarata*. This is more than a casual observation, since one can assume the eclipse provided an "ideal" ethological experiment, in that only one isolated factor was modified. The subject did not leave its biotope (away from human presence) and was in no way disturbed by the experimental setting. The observation that *H. calcarata* regularly calls at sunset during the rainy season is not sufficient proof that a decline in light intensity provokes vocal activity. Other environmental factors besides light could be causally involved as could be an entirely endogenous circadian rhythm.

This paramount effect of darkness due a total solar eclipse is analogous to the consequences of the lunar eclipse of 12 April 1968 (Hassinger and Anderson, 1970): the lunar eclipse induced vertical movements and stratification of *Ambystoma opacum* larvae in a pond.

The observation afforded by the eclipse is apparently the first to demonstrate so clearly the role of declining light intensity as a releaser of amphibian vocal activity.

LITERATURE CITED

- HASSINGER, D. D., AND J. D. ANDERSON. 1970. The effect of lunar eclipse on nocturnal stratification of larval *Ambystoma opacum*. *Copeia* 1970:178-179.
- WHEELER, W. M., C. V. MACCOY, L. GRISCOM, G. M. ALLEN AND H. J. COOLIDGE, JR. 1935. Observations on the behavior of animals during the total solar eclipse of August 31, 1932. *Proc. Amer. Acad. Arts* 70:33-70.
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THE EFFECT OF DDT ON TAIL REGENERATION IN *RANA PIPIENS* AND *R. CATESBEIANA* TADPOLES.—Tail regeneration in anuran tadpoles has been studied extensively (Durbin, 1909; Mapp, 1950; Morgan and Davis, 1902; Niazi, 1966; Overton and Mapp, 1974). These studies have revealed the importance of the notochord for regeneration and the relative unimportance of the spinal cord. Although the spinal cord is not necessary for tail regeneration in the tadpole, the regenerate does become innervated by nerves growing from more anterior levels in the stump.

Pesticides have been found to have a wide variety of effects on non-target organisms. Deleterious effects of pesticides on anurans have been noted by Cooke (1970, 1972), Ferguson and Gilbert (1967), Herald (1949), Kaplan and Overpeck (1964) and Vinson et al. (1963). These studies have yielded data on direct toxicity as well as on biochemical and physiological parameters. Cooke (1970, 1972, 1973) found hyperactivity and skeletal abnormalities in *R. temporaria* tadpoles exposed to chronic low doses of DDT. Hyperactive tadpoles showed retardation of development.

This study was designed to ascertain the effects of DDT on tail regeneration in two species of *Rana*.

Tadpoles were obtained from the Great Swamp, Morris County, N.J., and were main-

tained in groups in spring water under static conditions at ambient room temperature (22–24 C). After immersion in ice water for anaesthesia, the tails were amputated halfway along their length, with a sharp scalpel. DDT (1, 1, 1-trichloro-2, 2-bis (*p* chlorophenyl) ethane 72% technical grade, Montrose Chemical Co., Torrance, Cal., recrystallized from ethanol to yield 98% *p,p'* DDT) was introduced as an acetone solution into experimental dishes at the concentration of 5 and 25 parts per billion. Control dishes received an equivalent amount of acetone (10 μ l). Animals were fed canned spinach and the water was changed and re-dosed twice weekly. Regenerates were measured with a calibrated ocular micrometer, and lengths of experimental and control regenerates compared by a t-test.

In the first experiment *R. pipiens* tadpoles in limb bud stage II–III (Taylor and Kollros, 1946) were used. There were initially 20 animals in each group. After five days the tadpoles in 25 ppb DDT had undergone significantly less regeneration than controls ($p < .005$). This group appeared weak and disoriented. The amount of regeneration in the 5 ppb animals was not significantly different from the controls. After eight days both experimental groups had regenerated significantly less than the controls ($p < .005$). There had been 60% mortality in the 25 ppb group and a number of those in 5 ppb looked unhealthy. After twelve days, regeneration in the 5 ppb group was still significantly less than controls, and 30% mortality had taken place. Only one survivor remained in 25 ppb and it too, had regenerated considerably less than the controls.

In the second experiment *R. catesbeiana* in limb bud stage II–III (Taylor and Kollros, 1946) were used. There were initially 10 animals in each group. After five days there was no significant difference in regeneration in either experimental group as compared to the controls. After seven and nine days, however, those in 25 ppb DDT had regenerated significantly less than the controls ($p = .01$) although regeneration in 5 ppb was not different from that of the controls. There had been 30% mortality in both experimental groups by this time. The experiment was terminated because it became extremely difficult to ascertain the point at which the amputation had taken place. The data are shown in Table 1.

It can be seen that *R. pipiens* was much more affected by the DDT, with obvious retardation in 5 ppb, and was also much more vulnerable to the insecticide in terms of direct