

THE CLOACA SEXING METHOD FOR IMMATURE ALLIGATORS

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Abstract: The cloacal method of sexing imature alligators (*Alligator mississippiensis*) was tested on 72 individuals; 24 in the 6 month, 28 in the 18 month and 20 in the 30 month old class. This method of sex determination was not feasible for the 6-12 month class, whereas the 18 month and over age groups could be sexed reliably.

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The only acceptable method of determining the sex of live crocodilians is by cloacal examination (Viosca 1939, Chabreck 1963, Brazaitis 1968). Our field observations indicate that considerable error may be inherent in using the cloacal sexing method for young alligators, especially those 12 months of age (< 500 mm total length) or less.

Forbes (1940) reported alligators exhibit a considerable degree of embryonic and juvenile bisexuality. He further speculated heterosexual structures probably persist in females up to sexual maturity.

Field workers and alligator farmers alike have experienced difficulty in reliably sexing alligators less than 2 or 3 years of age. The development of sex organs is understandably slow in a reptile that reaches sexual maturity at almost 10 years of age. The winter dormancy period probably further retards sexual development. In our studies at Rockefeller Refuge, alligators raised under controlled environmental conditions show greater accelerated sexual development than do their wild counterparts.

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METHODS AND MATERIALS

To test the accuracy of the only known field sexing technique, a study was conducted to compare cloacal sexing against sexing by internal examination. Alligators were grouped according to size and age as described by McIlhenny (1935). The test group included 6 month, 18 month, and 30 month old animals. All study animals were collected in March and April, 1978 in southwest Louisiana. As hatching usually takes place in August and September, hatching year size class was between 6 and 7 months of age (Table 1).

Table 1. Length, weight and estimated age of alligators collected in southwest Louisiana, 1978.

<i>Average Total Length (mm)</i>	<i>Number in Sample</i>	<i>Average Weight (g)</i>	<i>Estimated Age (Months)</i>
312	24	71	6
598	28	516	18
936	20	1,968	30

Seventy-two alligators were hand captured at night using an airboat and spotlight. All animals were weighed, measured, and sexed by the cloaca method, which involved either extruding the cloaca on small alligators or finger probing the larger ones and checking for presence or absence of the penis. Next, the alligators were sacrificed and

internal anatomy studied. Macroscopic internal examinations were enhanced by measurements of the gonads, penis, and clitoris. Color of the penis/clitoris for the various size groups was recorded. A photographic record was maintained for comparative purposes. Macroscopic determinations were made relative to the development of gamete transport ducts. In alligators < 12 months of age, the duct analogous to the vas deferens was termed the Wolffian duct and for the oviduct the term Müllerian duct was used (Forbes 1940).

DISCUSSION OF RESULTS

Six Month Age Group

The cloacal sexing method proved invalid for 6 month old alligators (n = 24). The clitoris/penis could be seen in only 10% of this age group. The problem was the minute size of the penis/clitoris and that their opaque-milky white color blended in with that of the cloacal wall making differentiation extremely difficult. The lack of size differential between clitoris and penis further complicated our sexing technique.

Sex also could not be determined by macroscopic internal examination. At this stage, the gonads could best be described as bisexual but showing rapid development and growth. We could not determine macroscopically which of the paired ducts, Wolffian or Müllerian, were regressing. Size of gonads averaged 13.2 x 2 mm.

Forbes (1940) described the development of reptilian reproductive systems, and concluded that during embryonic development, both male and female gonad components were present in primitive form per individual alligator.

Eighteen Month Age Group

Seven percent of this age group (n = 28) were sexed incorrectly using the cloaca method. The penis was readily distinguishable from the clitoris, the penis being much larger. The body of the penis was red to purplish with some showing a black tip. The clitoris was light pink to pale red. Our error was caused by not getting a full inversion of the cloaca, and mistaking the clitoris for the penis tip, thus incorrectly lending a slight bias towards males.

Macroscopic internal examination and organ measurements showed the penis was twice the size of the clitoris. The penis average length was 9.7 mm and the clitoris 5.2 mm. Gonad measurements showed the ovaries were larger than testes. Average length was 26.1 x 4.3 mm for ovaries and 17.5 x 2.6 mm for testes. The right gonad was usually the larger.

A bisexual condition still existed in all females and 10% of males in the 18 month class. At this stage the primary gonad-duct system was rapidly developing and the secondary gonad-duct system showing rapid regression.

Thirty Month Age Group

Five percent of this age group (n = 20) were sexed incorrectly using the cloaca method. Larger individuals could be sexed by finger probing the cloaca and/or cloaca inversion. Small individuals were sexed by cloaca inversion and this group is where sexing errors can be easily made. The penis exhibited a purple color while the clitoris was pale pinkish or reddish, similar to the previously described age group.

Macroscopic internal examination and organ measurements showed the penis slightly over twice the size of the clitoris. Total length of the penis averaged 15.9 mm, whereas, the clitoris averaged 7.3 mm. Gonad measurements confirmed that ovaries were larger than testes. Average length was 34.1 x 6.6 mm for ovaries and 23.8 x 4.1 mm for testes. The right gonad was significantly larger. Most females showed remnants of a bisexual reproductive system; however, the vestigial Müllerian ducts were seldom present in males and much less conspicuous as compared to younger age class males. If present, the vestigial Müllerian duct was located in the area adjacent to the cloaca wall and extended approximately one-third of the original duct's length.

Field workers should refrain from using the cloaca method for sexing alligators less than 12 months of age (<500 mm). Likewise, considerable scrutiny should be exercised in sexing 12-18 month old alligators, taking into careful consideration the size and color of penis/clitoris.

SUMMARY

Sexing methods for immature alligators up to 30 months of age were discussed. Sex determination for animals six months of age by the cloaca method proved totally ineffective due to the similarity in size, shape, and color of the reproductive organs. The persistency of bisexuality as described by Forbes (1940) during embryonic life also characterized alligators during the hatching year size class. Field workers can reliably sex live alligators using the cloaca method by extruding the cloaca to maximum extension beginning with animals in the 18 month old size class or approximately 600 mm total length. For this age group and larger, there was a definite color change in the penis from opaque creamy white to a red or purple, also the penis was twice the size of the clitoris for the same age group.

In our study, the degree of accuracy increased with the size of the alligator. Manual finger probing the cloaca for the presence or absence of the penis character was found to be a most accurate method and was used on alligators 30 months of age or approximately 900 mm in length and in combination with extension of the cloaca.

Further investigations regarding the findings in our study should be conducted in other parts of the alligator's range. Environmental parameters within the animal's range vary considerably and may contribute significantly to its development and growth.

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