

construction of the line, or whether there was a greater influx of raptors into east-central Colorado in 1974-75 than the previous year.

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UNILATERAL LAPAROTOMY AS A TECHNIQUE TO ASSAY AVIAN GONADAL CYCLES

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The technique for performing unilateral laparotomy on small birds as described in detail by Risser (*Condor* 73:376, 1971) facilitates several types of biological investigations including: a) sex determination in sexually monomorphic species, b) placement of electronic devices within the peritoneal cavity to transmit certain physiological measurements and, c) in situ monitoring of the gonadal cycle from individual birds without requiring that the animal be sacrificed. Essentially, the unilateral laparotomy technique involves a small surgical incision in the abdominal wall through which the gonad can be seen and measured. Birds recover rapidly after the operation and the incision usually heals within two weeks.

Although this technique has been used to assay avian gonadal cycles for at least twenty years (Miller,

Caldasia 8:295, 1958), Hamner (*Ecology* 49:211, 1968) first reported that "repeated laparotomy does not alter the testis cycle." However, he did not present supporting data. Thus, potential effects, or the lack thereof, of unilateral laparotomy on the gonadal cycle in birds remained undocumented. The purpose of this paper is to report the results of an experiment specifically designed to discover whether repeated unilateral laparotomy has an overt effect on the testicular cycle of the Starling (*Sturnus vulgaris*).

Immature male Starlings were captured during the early summer from the San Joaquin Valley, Solano Co., California and held under natural photoperiods (Lat. 38° N) in an outdoor aviary at Davis, California. Food (turkey pellets) and water were provided ad libitum. On 23 January 1967, just prior to the time when spontaneous gonadal metamorphosis could be expected, ten birds were randomly selected from this captive population and tagged with numbered leg bands. The testicular size of these Starlings was assayed via repeated unilateral laparotomy at about 3-week intervals. On the date of each assay, another ten birds were removed from the parent flock and the testis in each bird measured via laparotomy. Subsequently, these ten 10-bird groups were tagged with colored leg bands so that they could be recognized and not subjected to a second laparotomy. They were then returned to the population to maintain constant numerical density within the cage.

The testicular size (width of the left testis) was monitored from the experimental group and the control groups at ten dates spanning the gonadal growth-involution phase of the annual reproductive cycle in Starlings at this latitude (Table 1). At no time during the test was the testicular size of the experimental group and the corresponding control group significantly different ($P > 0.05$, Student's *t*-test, two-tailed). Thus, neither the duration of the testicular growth-involution phase, nor the rate of testicular metamorphosis within this phase was affected by repeated unilateral laparotomy. I conclude that this technique can be used, at least at 3-week or longer intervals between laparotomies, without danger of experimental error.

TABLE 1. Statistical description (mean, standard error, and range) of testicular growth-involution cycles in laparotomized Starlings.

Date 1967	Single laparotomy			Multiple laparotomy		
	\bar{x}	SE	Range	\bar{x}	SE	Range
23 Jan.	2.0*			2.0		
12 Feb.	2.4	0.20	2.0-3.9	2.4	0.17	2.0-3.5
2 Mar.	4.9	0.63	2.7-8.3	4.6	0.41	3.0-7.0
22 Mar.	7.0	0.27	5.1-8.0	7.1	0.42	4.0-8.5
11 Apr.	7.8	0.15	7.0-8.5	7.7	0.14	7.0-8.2
1 May	7.4	0.56	3.2-9.3	7.5	0.21	6.1-8.2
22 May	5.1	0.67	2.0-8.5	5.0	0.52	3.0-7.3
9 June	2.1	0.04	2.0-2.3	2.1	0.05	2.0-2.5
30 June	2.0	0.01	2.0-2.1	2.0	0.02	2.0-2.2
20 July	2.0			2.0		

* Values represent width of left testis in mm. Testis widths below 2.0 mm cannot be measured accurately via laparotomy and were mathematically considered as "2.0 mm" although in vitro measurements of testicular widths in previous experiments indicate that quiescent testes in this species may be as little as 1.0 mm wide.

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