

ONSET OF PUBERTY IN THE WEAVER BIRD (*PLOCEUS PHILIPPINUS*)

by R. N. SAXENA* and J. P. THAPLIYAL, *Department of Zoology,
Banaras Hindu University, Varanasi*

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The weaver bird (*Ploceus philippinus*) does not respond to photostimulation during the first few months of its life. However, the neuroendocrine apparatus, characteristic of the adult, develops in May/June when the bird is eight or nine months old. In nature, however, juveniles mature only during the second spring/summer of their life. It is suggested that probably an inhibitor, provided by the thyroids, is responsible for the inactivity of the hypophyseal/gonadal axis during the first summer months.

INTRODUCTION

Animals become puberal when their neuroendocrine apparatus matures (Scharrer 1959). But, while the neuroendocrine apparatus, characteristic of the adult, develops early in prepuberal life, the actual time and the factors regulating onset of maturity are not clearly understood. The present study was, therefore, undertaken to determine the time when the neuroendocrine apparatus of the weaver bird (*Ploceus philippinus*) first matures in response to light.

MATERIAL AND METHODS

The weaver bird (*Ploceus philippinus*) is a non-migratory, locally distributed, sparrow-sized ploceid, which breeds during the summer months (July-August). At the approach of the breeding season, adult males develop yellow- and black-coloured plumage on head, breast and throat respectively and darkening of bill (Thapliyal and Saxena 1964). Females, juveniles and off-season males have straw-coloured bill and fulvous brown plumage. The hypophysis regulates plumage pigmentation, and the male hormone the bill colouration (Thapliyal and Saxena 1961; Saxena and Thapliyal 1962). In nature males take more than a year and a half to mature, consequently during breeding months non-pigmented juveniles are always present along with the brilliantly coloured adult males (Thapliyal and Chatterji 1965).

Young birds, collected from the nests in August and maintained under natural conditions of photofluctuation, were used for the present study.

* Present address : Department of Zoology, University of Delhi, Delhi 7.

Five-month-old juvenile males were divided into two groups, of eight birds each. One group was subjected to 15-hour photoperiod while the other maintained under normal conditions of light and daylength obtaining at Varanasi (25° 18' N., 83° 1' E.). The longest day at Varanasi is of 13 hours and 34 minutes and shortest of 10 hours and 26 minutes duration. The experiment was started on 1st January, 1964, and was continued up to 1st June of the same year when all the birds had developed full breeding conditions.

Monthly observations were made on the plumage, bill and left testis *in situ*. During the course of this experiment all birds remained healthy. The husbandry conditions were the same as described earlier by Thapliyal and Chatterji (1965).

TABLE I

Juvenile weaver birds (Ploceus philippinus) treated with 15-hour photoperiod

Bird No.	Left testis volume in mm 3					
	1st Jan. '64	1st Feb. '64	1st March '64	1st April '64	1st May '64	1st June '64
R 11	0.6	0.6	0.6	0.6	5.4	50.2
R 12	0.8	0.8	0.8	3.0	10.5	34.0
R 13	0.9	0.9	0.9	5.8	14.7	48.6
R 14	0.8	0.9	0.8	5.0	19.8	48.0
R 15	0.6	0.6	0.6	0.6	0.6	18.8
R 16	1.2	1.2	1.2	1.2	10.6	46.2
R 17	1.2	1.2	1.2	13.1	46.0	65.6
R 18	0.8	0.8	0.8	3.4	24.6	60.8
Plumage	H	H	H	H but few cock feath- ers in R 13, R 17 and R 18	C in all except R 15	C
Bill	St	St	St	St but dark in R 17	Dark in all except R 15	Bl

H = Henny or non-pigmented dull feathers.

C = Cock or pigmented bright feathers.

St = Straw-coloured.

Bl = Black.

OBSERVATIONS

The response of the juveniles to 15-hour photoperiod is shown in Table I. Until March there was no change either in the testis size or in bill and feather colouration. However, there was increase in the gonadal size of five birds (R 12, R 13, R 14, R 17, R 18) in April, mixed plumage was observed in three (R 13, R 17 and R 18) and darkening of the bill was noticed in only one bird (R 17). By May all the birds except one (R 15) had developing gonads, pigmented plumage and darkening of bill. On first June, when experiment was stopped, all the birds had put on pigmented plumage, dark bill and had developed active testes (Fig. 1).

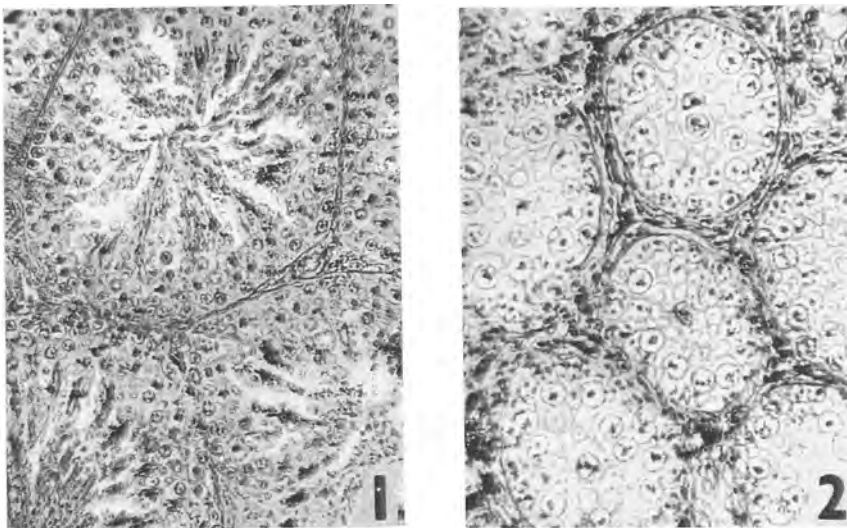


FIG. 1. Transverse section of an active testis of 15 hours of photoperiod bird. $\times 230$.

FIG. 2. Transverse section of a completely inactive testis of control bird. $\times 490$.

During the same period of five months there was no change either in the size and activity of the testes (Fig. 2) or in the colour of the plumage and bill of the control birds experiencing normal changes in daylength as in their natural habitat (Table II).

DISCUSSION

Our results clearly show that the light responding neuroendocrine apparatus, characteristic of the adult weaver birds, develops when juveniles are seven to eight months old and long photoperiods advance the plumage and gonad cycles by about a year. In nature the hypophyseal/gonadal axis of these young birds (Table II) for some unknown reason(s) remains inactive during the first year and becomes active during the second summer

of their life. In adults, however, 13- or even 11-hour photoperiod readily induces pigmented plumage, gonadal development and darkening of the bill (Saxena—*unpublished*). In other birds also, viz. *Sturnus vulgaris* (Bissonnette 1932), *Zonotrichia coronata* (Miller 1948), *Melopsittacus undulatus* (Vaugien 1953), *Puffinus tenuirostris* (Marshall and Serventy 1956) and *Zonotrichia capensis* (Miller 1963), the neuroendocrine apparatus develops much earlier than actually called upon to function. But the maintenance of the juvenile phase, even when the neuroendocrine mechanism is fully developed and stimulatory long days are available, is the unusual feature of the weaver

TABLE II

Juvenile weaver birds kept as controls under natural photofluctuations

Bird No.	Left testis volume in mm ³					
	1st Jan. '64	1st Feb. '64	1st March '64	1st April '64	1st May '64	1st June '64
R 1	0.6	0.6	0.6	0.6	0.6	0.6
R 2	0.8	0.8	0.8	0.8	0.8	0.8
R 3	0.8	0.8	0.8	0.8	0.8	0.8
R 4	1.2	1.2	1.2	1.2	1.2	1.2
R 5	0.9	0.9	0.9	0.9	0.9	0.9
R 6	0.8	0.8	0.8	0.8	0.8	0.8
R 7	1.1	1.1	1.1	1.1	1.1	0.1
R 8	0.8	0.8	0.8	0.8	0.8	0.8
Plumage	H	H	H	H	H	H
Bill	St	St	St	St	St	St

Abbreviations same as in Table I.

birds. Similarly the presence of a long photoinsensitive phase, when the neuroendocrine apparatus apparently matures, is a unique feature in this species. A long juvenile phase, without the development of the light-responding mechanism, has not been reported so far in the other birds studied. The absence of response in the juveniles to normally increasing days (Table II), even after the development of the light-responding mechanism (Table I), explains the simultaneous presence of the breeding and non-breeding males (Thapliyal and Chatterji 1965), and suggests the operation of a factor(s)

that prohibits the developed neuroendocrine apparatus from entering in an active phase during the first summer of the life of these birds.

The inhibition, however, does not seem absolute as it is easily overcome if stronger stimulation is provided (Table I). In nature, probably, the inhibitor gradually weakens with age and, when it reaches a certain low level, birds experience their first sexual cycle.

Thyroids probably provide the inhibitor, as they are relatively more active prior to maturity (Chu 1938) and have a role to play in inducing annual gonadal regression (Davis and Davis 1954; Hohn 1961). The work of Thapliyal and Pandha (1965), reporting precocious gonadal development and sexual maturity in the thyroidectomized juveniles of Spotted Munia (*Uroloncha punctulata*), is also in conformity with the above suggestion. Present study is, however, inadequate to indicate if thyroids are similarly involved in the weaver bird. Experiments are, therefore, being planned to understand the role of thyroids in determining the time of onset of maturity in weaver birds.

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