

The chemical nature of the pigment was studied following the methods outlined by Sundara Rajulu^{3,4}. For thin-layer chromatography, silica gel-G plates were used. Iso-propanol-ammonia-water (20 : 1 : 2 V/V) was used as irrigating solvent. The absorption spectrum of the pigment was examined in a Beckman DU ultraviolet spectrophotometer.

The pigment dissolved in water and the aqueous solution exhibited weak yellow-green fluorescence in ultraviolet light. The pigment was also soluble in methanol and ethanol but insoluble in diethylether, petroleum ether and chloroform. It was precipitated from solution in glacial acetic acid by the addition of diethylether.

Reduction of the pigment with dithionite or borohydride in aqueous solution caused its colour to change from green to yellow-brown. The pigment gave a typical Gmelin reaction with concentrated nitric acid turning in succession to violet, orange-red and finally yellow. The reaction was arrested at the violet stage when a mixture of concentrated nitric acid and sulphuric acid (1 : 1 V/V) was used as the oxidising agent.

The pigment was chromatographically homogeneous. In thin-layer chromatography it had a Rf. value of 0.63. The absorption spectrum of the pigment in methanol containing 5% (W/V) hydrochloric acid shows maxima at 370 and 680 m μ and inflexions at 270, 330 and 440 m μ (Fig. 1).

The greenish-yellow colour of the pigment, the reactions and its Rf value in thin-layer chromatography identify the pigment as belonging to the class bilatrienes.⁵ The absorption maxima at 370 and 680 m μ exhibited by the solution of the pigment in methanolic-hydrochloric acid are again characteristic of bilatrienes. The presence of inflexions in the absorption spectrum at 440 and 330 m μ may suggest that the pigment in question may not be a biliverdin or mesobiliverdin, but bilirubin⁶.

Bilatrienes are said to be responsible for the green or greenish-yellow colour of the integument and shells of some bivalve molluscs where the pigment is formed as an end-product of myoglobin metabolism^{5,7}. But there is no report of the occurrence of myoglobin in sipunculan worms. Therefore the metabolic source of the bilatriene in the pigmented cells in the sub-epidermal connective tissue in sipunculan worms deserves further study.

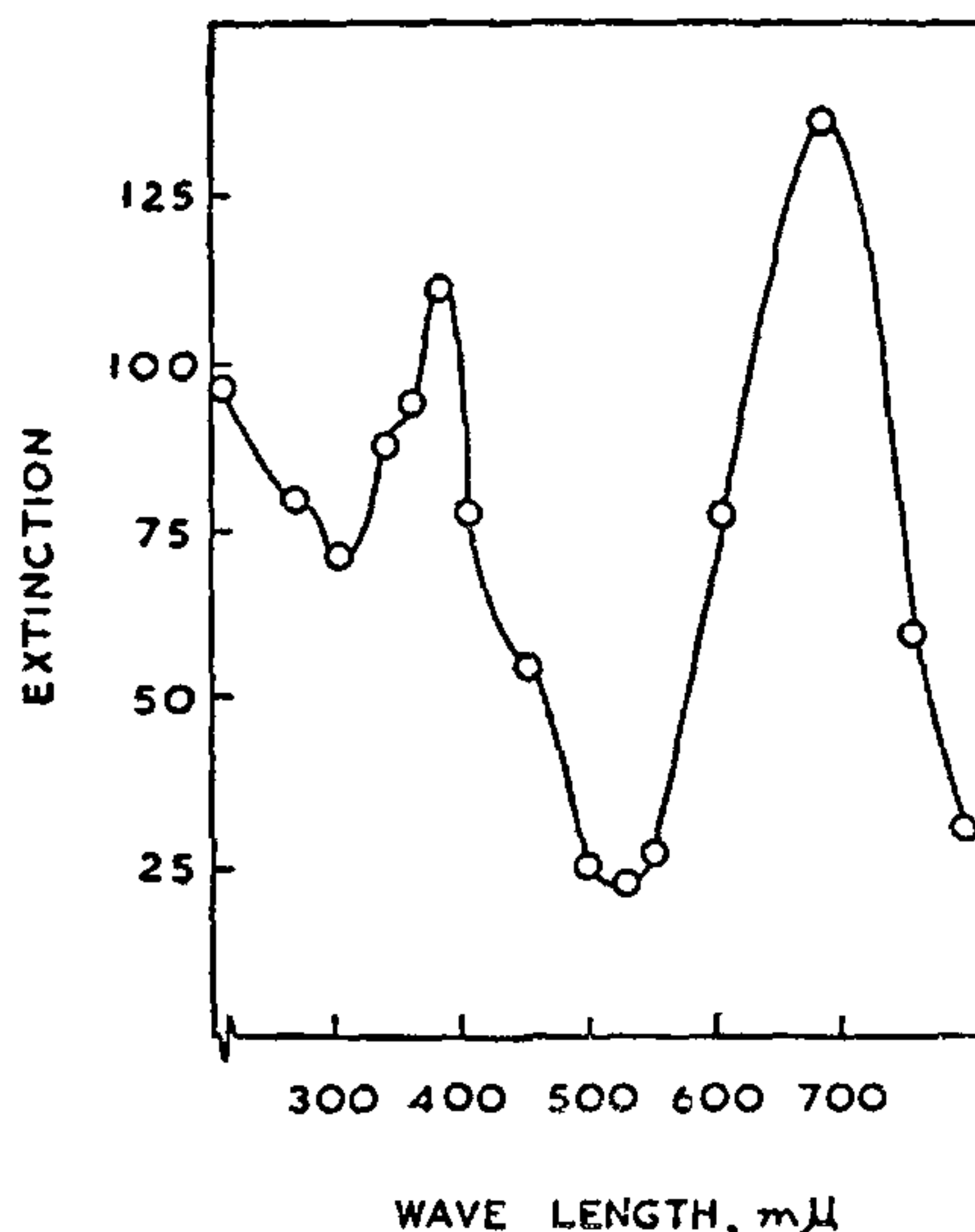


FIG. 1. Absorption spectrum of the green pigment from *Sipunculus nudus*. (Extinction coefficient calculated from absorbance value.)

I wish to thank Dr. G. Sundara Rajulu for his valuable guidance and encouragement during the course of this work. I am indebted to Prof. G. Krishnan for helpful discussions and provision of facilities. The financial support from the University Grants Commission is gratefully acknowledged.

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THE YOLK NUCLEUS OF BALBIANI IN INDIAN FRESHWATER GOBY, *GLOSSOGOBIUS GIURIS* (HAM)

WITTICH (1845)¹ described the yolk nucleus of Balbiani in the oocytes of spiders and Hubbard (1894)² described it in the oocytes of the fish, *Cymatogaster aggregatus*. Wallace (1904)³ made a comparative study of the yolk nucleus

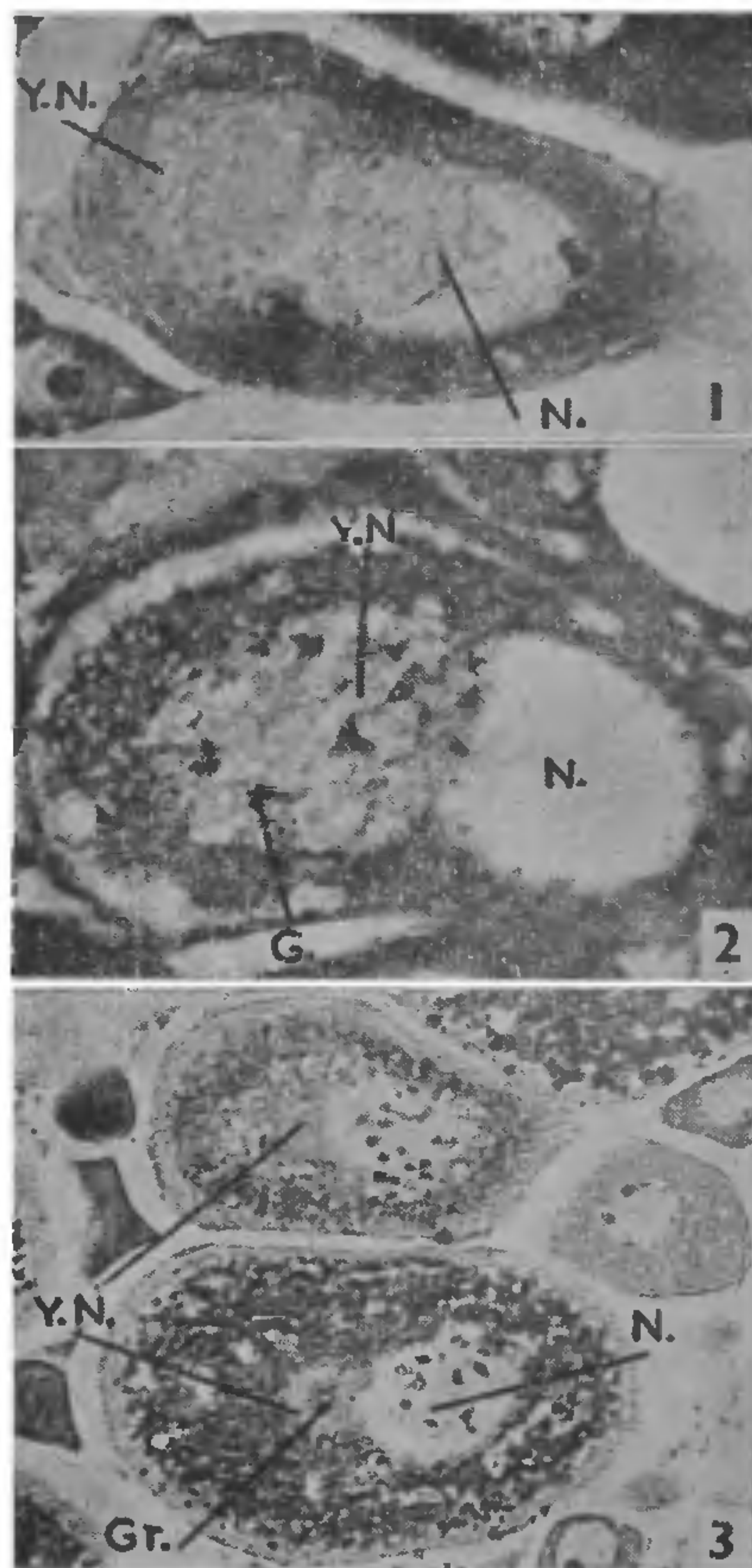
in a number of marine teleosts, concluding that the yolk nucleus is in the form of a spheroid body, which travels to the periphery of the oocyte where it gets spongy, breaks into pieces and ultimately degenerated giving rise to the fats, confounded and connected with another structure, the centrosphere. Franz (1909)⁴ observed only one structure in the oocytes of *Pleuronectes platessa* corresponding to the centrosphere of Wallace. Hubbord (1898), Wheeler (1924)⁵, Subramaniam and Aiyar (1935)⁶ and Sathyanesan (1959)⁷ regard the yolk nucleus as an organelle of nuclear origin which passes through the nuclear membrane to invade the cytoplasm. However, its cytoplasmic origin has been held by Narain (1951)⁸, Chaudhry (1952)⁹ and Nayyar (1964)¹⁰ and they find a relationship between yolk nucleus, golgi, and mitochondrial elements. Bara (1960)¹¹ also observed an association between the yolk nucleus and mitochondria.

An attempt has been made here to study the structure and functional significance of the yolk nucleus in *Glossogobius giuris* (Ham.).

In the late peri-nucleolus stage of the oocytes, the yolk nucleus makes its first appearance *de novo* in the cytoplasm as a homogeneous body and later on it assumes a vesicle-like structure with distinct granules within it. At the yolk-vesicle stage, the yolk nucleus enlarges and attains a size which is equal or sometimes even bigger than the nucleus itself (Figs. 1 and 2). The granules take up dark colour with haematoxylin against light background. With further growth of oocytes, the carminophilic and eosinophilic granules, having a similar tinctorial behaviour to the yolk granules, appear in the centre of the yolk nucleus (Fig. 3). The yolk nucleus lasts through the primary, secondary and tertiary yolk stages. As the oocyte attains maturity, the yolk nucleus becomes spongy and shows signs of degeneration. It is completely disorganised in the prematuration stage and is not seen in the mature oocytes. With the staining techniques used (Ehrlich's Acid Haematoxylin and Eosin, Delafield's Haematoxylin and Eosin and Heidenhain's Azan) in the present study, the type of zonation reported by Chaudhry (1952) in *Triacanthus brevirostris* and Gopal Dutt (1964)¹² in *Anabas scandens* could not be seen.

According to Wheeler (1924), 'the yolk nucleus is inactive; at least it does not contribute visibly to the formation of yolk'. Chaudhry (1952) assigned some indirect role to the yolk nucleus in the formation of yolk possibly acting

as a catalytic agent. He, however, infers its initial focus on the growth and dispersal of various significant cytoplasmic inclusions and also taking a leading part in the change-over of these inclusions into reserve food material. Nayyar (1964) has remarked that the yolk nucleus initiates the synthesis of lipids.



FIGS. 1-3. Photomicrographs of I.S. of ovary of *G. giuris* showing: Fig. 1. The yolk nucleus in late-peri-nucleolus stage of the oocyte, $\times 450$. Fig. 2. Fully formed yolk nucleus in yolk-vesicle stage of the oocyte, $\times 450$. Fig. 3. The yolk nucleus in yolk-stages of the oocyte, $\times 200$. G., Granules in the vesicle of yolk nucleus; Gr., Granules in the yolk nucleus with similar tinctorial behaviour to the yolk granules; N., Nucleus of the oocyte; Y.N., Yolk nucleus.)

In the present study on *G. giuris* there seems no visible role of the yolk nucleus in the process of vitellogenesis as in many teleosts (Wallace, 1904; Chaudhry, 1952; Nayyar, 1964). All the

same the appearance of yolk nucleus in the late peri-nucleolus stage, its presence throughout the yolk stages and disappearance in the mature ovum after the process of vitellogenesis is completed, points out its possible indirect role in the vitellogenesis of the oocyte, thus confirming the observations of Chaudhry (1952).

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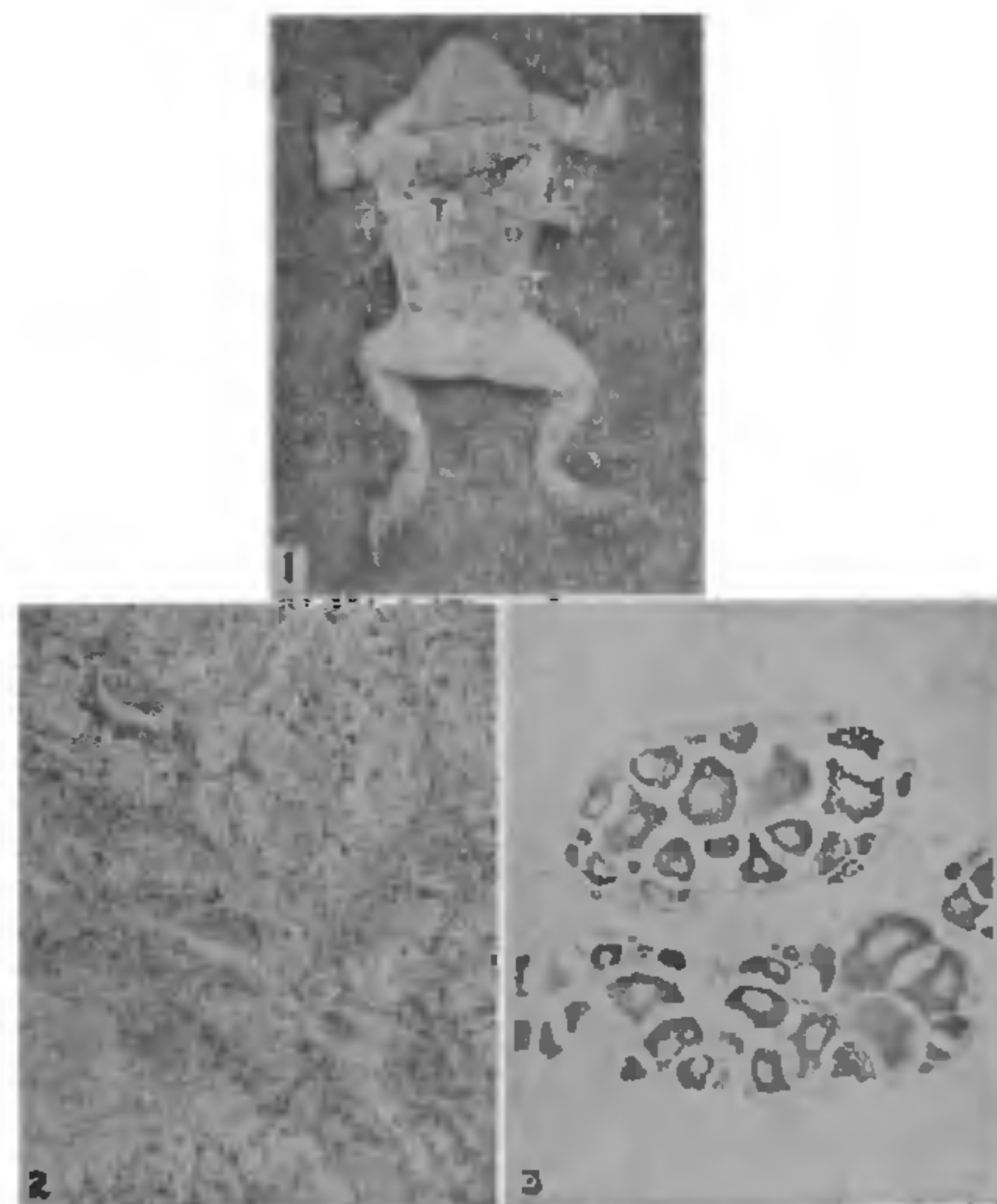
* Not consulted in original.

SEXUAL GYNANDROMORPHISM IN THE TOAD, *BUFO MELANOSTICTUS* (SCHN.)

WHILE being engaged with the reproductive biology of the toads, we have come across a very unique and a classic case of lateral gynandromorphism in the male toad, *Bufo melanostictus* (Schn.). Occurrence of hermaphroditism with Bidder's organ both in male and female toads is very common and, of ovotestis or testis with pseudovocytes has also been reported very rarely¹⁻⁴. In all these cases there is a dominant and a rudimentary gonad showing bilateral disposition in their appearance and differentiation. The accessory reproductive organs follow the dominant gonad. The appearance of ovotestis or testis with pseudovocytes may be on one side only or on both sides. But at least the dominant gonad shows bilateral differentiation. In human beings many hermaphroditic varieties have been reported, like lateral hermaphrodites having ovary on one side and a testis on the other, bilateral hermaphrodites, having both ovarian and testicular tissue on both sides, unilateral hermaphrodites having an ovary or testis on one side and an ovotestis on the other⁵. But the term lateral hermaphroditism is not reported in Anurans. So far no one has reported a case of an Anuran having an ovary and oviduct on one side and a testis on the

other. The case, now under report, had testis on the right side attached to the anterior end of the right kidney with well-developed fat bodies. On the left side there was a strip of rudimentary or immature ovary with a well-developed oviduct (Fig. 1). The differentiation of right side gonad into a testis and the left side gonad into a ovary and consequent differentiation of müllerian duct of that side into an oviduct may be due to different sensitivity to the hormone, during differentiation of gonads.

The testis, ovary and kidney were fixed in 10% formalin, sectioned at 8 μ , stained in Heidenhain's haematoxylin and haematoxylin-eosine respectively. Histological observations of the testis show that it is well differentiated with seminiferous tubules, cell nests, sperm bundles, free sperms and interstitial cells (Fig. 2). The observations of ovarian section show that the ovary is juvenile with only immature oocytes (Fig. 3).



FIGS. 1-3. Fig. 1. Photograph of the sexual gynandromorph Toad showing testis on the left side and ovary and oviduct on the right side of the photograph. $\times 0.50$. Fig. 2. Transverse section of the testis. $\times 180$. Fig. 3. Transverse section of the ovary. $\times 180$. (Fb = Fat bodies; Ov = Ovary; Od = Oviduct; T = Testis.)

On going through the literature we find no mention of any such case as this in the Amphibia and the present report seems to be unique to Anurans. Such phenomenon was also found in case of birds, where a chicken was found on autopsy with a testis and vas deferens on the right and an ovary with