extensions of the western trough, namely the Pranhita-Godavari (Wardha) trough, of the main Godavari graben (figure 1). Also, traverse-I was laid passing through the Astona borehole, drilled by the Directorate of Geology and Mining, Maharashtra, where coal bearing Barakars were encountered at a depth of about 200 m to orient the resistivity parametres. The resistivity soundings were conducted adopting the Schlumberger array with a maximum half-current electrode separation equal to 2 km keeping the electrode spread invariably along the expected strike of the Gondwanas and using a sophisticated resistivity equipment model RDC-8 of Scintrex make. The resistivity sounding curves were interpreted both by curve matching technique and by direct interpretation using the computer techniques available at the Central Geophysical Division.

The resistivity soundings have picked-up a characteristic conductive zone (5 to 25 ohm metres resistivity) at depth having a general order of thickness of about 600 to 800 m all along the traverse-I. This zone showing the same order of resistivities, as reported by earlier investigators in the adjacent areas where Gondwanas are exposed represents the Talchir formations and/or shale formations within Vindhyans. The depth to this conductive layer varies from 40 to 300 m, and comprises trap and Gondwanas younger to Talchirs as overlying formations having resistivity layers varying from 40 to 200 ohm metres. It is not possible at this stage, to distinguish the trap and Gondwanas, *i.e.*, Kamthis/Moturs and coal-bearing Barakars, as they showed an overlapping nature of resistivities. however, the expected thickness of trap rocks in this area seems to be not more than 75 m, as shown in the Astona borehole on traverse-I and as reported earlier[3] in the vicinity of traverse-II. In such cases, it would be reasonable to infer the presence of Kamthis/Moturs and Barakars as part of the overlying formations above the conductive zone where the depth to this conductive zone exceeds more than 75 m. The last layer showing high order or resistivity (more than 300 ohm metres), underlying the conductive zone, represents Vindhyan limestones or Crystallines. Along traverse-II, the formations with a thickness varying from 100 to 300 m overlying the high resistivity layer represent the total thickness of the trap and Gondwana formations. The conductive zone, which is so predominant along traverse-I does not appear to continue or is very thin all along traverse-II. While the resistivity surveys picked-up the high resistivity layer at shallow depths towards east in both the traverses, they appear to suggest a faulted contact nature towards west passing through the soundings 9 and 30 on traverses-I and II respectively (figure 1).

Detailed geophysical investigations — deep resistivity soundings at every 500 m — along certain selected traverses based on regional gravity surveys help in delineating the Gondwanas below the trap cover[4]. In addition, because of the sufficient resistivity contrast observed between trap rocks, Talchir rocks of Gondwanas and pre-Cambrian formations, these investigations play an important role in mapping the geology below the Deccan trap cover.

18 *December* 1981

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## OCCURRENCE OF CYSTIC ATRESIA IN THE OVARY OF *CHANNA GACHUA*

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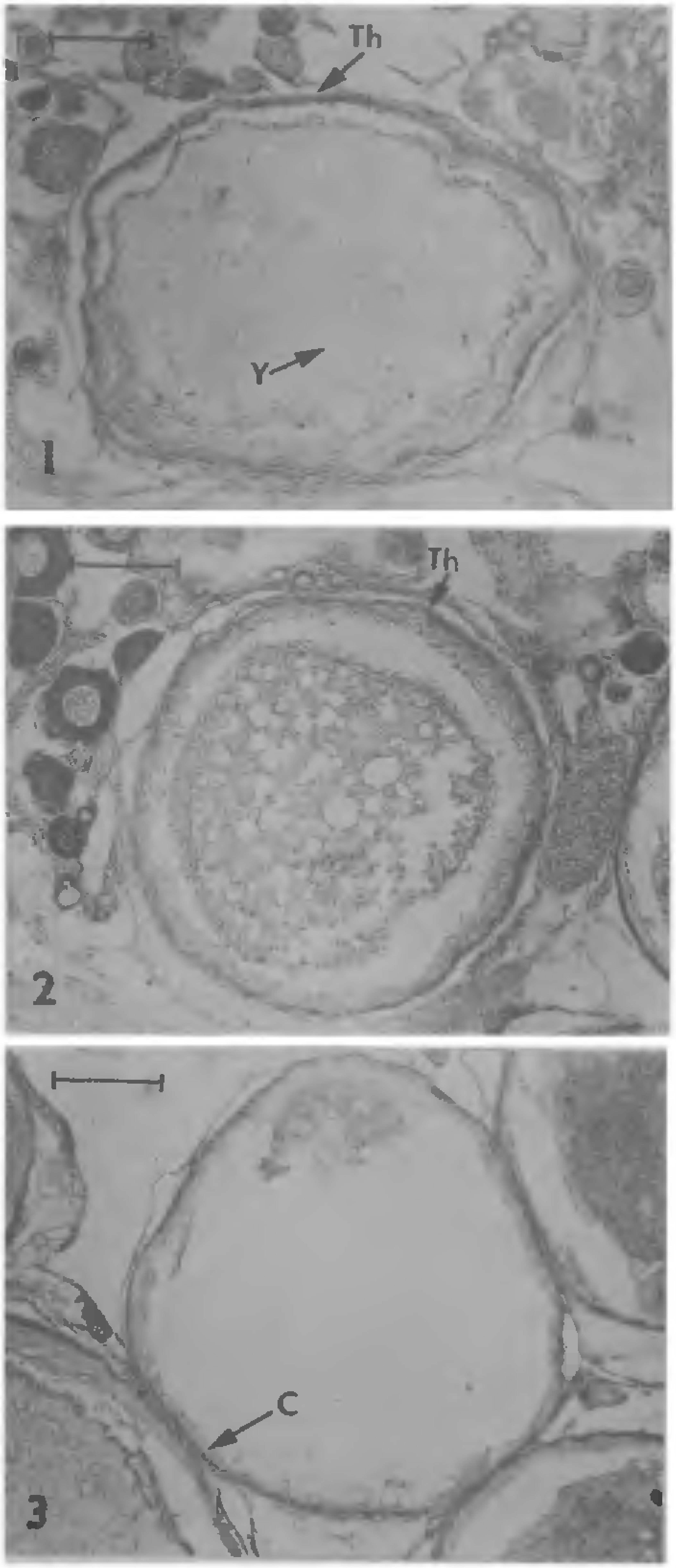
FOLLICULAR atresia is a widely occurring phenomenon in the ovaries of all vertebrates [1-4]. The process was formerly considered to be a degenerative phenomenon aimed at disposition of supernumerary follicles by a process other than ovulation[3]. Recently it has been proposed that the process might have a role in intraovarian control over follicular development and ovulation[1]. Based on the actual mode of degeneration and the developmental stage of the follicle, six types of follicular artesia namely, previtellogenic, yolky, glandular, bursting, haemorragic and cystic have been described in reptiles[2] and birds[5,6]. However, in fish the glandular type of follicular atresia is of common occurrence. There are also a few reports on the occurrence of previtellogenic[7] and bursting[8,9] atresia in the ovary of fish. The present study reports the occurrence of cystic atresia in the ovary of a freshwater teleost, *Channa gachua*.

Adult female specimens measuring 19–25 cm in total length were procured from the freshwater tanks around Dharwar city (15°27′ N and 75° 01′ E). They were kept in the laboratory aquaria for one day before sacrificing. Small pieces of ovaries from the middle region were fixed in Bouin's fluid every month for a period of one year, embedded in paraffin wax, 8–10 $\mu$ thick sections were taken and stained with haematoxylin-eosin. *C. gachua* is reported to breed twice a year in Dharwar (June-September and February-March)[10]. Previous reports have indicated that the glandular atresia of the follicles in the ovary of *C. gachua* occurs throughout the year[10,11]. The process is pronounced during spawning and postspawning phases of the breeding cycle.

Cystic atresia is characterised by *in situ* regression of oocytes. In the initial stage, the theca becomes hypertrophied and fibrous. Concomitantly, the follicle gets converted into vacuolated hyaline mass due to degeneration of granulosa cells, vitelline membrane and the liquification of yolk paltelets (figure 1). Thereafter the liquified contents get detached from the fibrous theca and start receding inwards from one or more sides (figure 2). On resorption of the inner contents, the degenerating follicle is left for some time in the form of a fibrous cyst (figure 3). Ultimately the cyst wall breaks down and joins with the stromal mass.

Generally large yolky oocytes are affected by cystic atresia. Cystic atretic follicles are rare and found during spawning and postspawning periods. Further, ovaries containing cystic atretic follicles generally lack glandular atretic follicles and are rich in stroma.

Cystic atresia is common in mammalian ovary[3]. In nonmammalian vertebrates, it has been reported in the garden lizard, *Calotes versicolor*[2] and the domestic pigeon, *Columbia livia*[5]. To the best of our knowledge there are no reports on the occurrence of cystic atresia in the ovary of the fish. The present study reports its occurrence in the ovary of the freshwater teleost, *C. gachua* in addition to the already reported glandular and previtellogenic follicular atresia in the same fish [10,11]. Our findings with respect to chronological sequence of histogenesis and rarity of its occurrence with those of the earlier report on pigeon[5]. The present findings that predominantly large yolky oocytes undergo cystic atresia in *C. gachua* are in contrast to those of Gouder *et al.*[2] in *C. versicolor* wherein only small vitellogenic follicles were found to undergo cystic atresia.



**Figures 1–3. 1.** Early stage of cystic atresia wherein theca (Th) is hypertrophied and yolk (Y) and granulosa cells are denatured. **2.** Progress in cystic atresia wherein denatured yolk is retreating from the fibrous theca (Th). **3.** Final stage of cystic atresia wherein the follicle is left in a form of fibrous cyst (C). Scale line indicates 100$\mu$m.

It is generally accepted that glandular atretic follicles breakdown and provide interstitial glandular cells in the ovarian stroma. Histochemical demonstration of enzymes involved in steroidogenesis in the glandular atretic follicle[10] of *C. gachua* suggests that these cells might have a transitory steroidogenic potential. However, similar histochemcial studies could not be carried out on cystic atretic follicles of *C. gachua* due to their rare occurrence. The presence of fibrous cells and the absence of glandular cells in the cystic wall indicate that they might be the result of a degenerative process of large vitellogenic follicles without having any steroidogenic potential.

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# PRELIMINARY OBSERVATIONS ON TAIL REGENERATION IN NORMAL AND HYPOTHYROID TADPOLES OF *BUFO ANDERSONII*

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THE anuran tadpole is a choice model for studies on development. Hormonal control of tail resorption during metamorphosis is extensively documented[1]. Unlike literature on amphibian limb regeneration[2] that on anuran tadpole tail regeneration is sporadic and fragmentary[3-6]. The anuran tadpole tail is a special category in itself by virtue of its being the target system for thyroid hormones which set off regressive changes therein[1]. The involvement of thyroid hormones in analysing regenerative ability of the tail may prove to be considerably interesting. The present note is a report on some preliminary observations regarding tail regeneration in the tadpoles of *Bufo andersonii* rendered functionally athyroidic by treatment with thiourea.

Tadpoles of *B. andersonii* acclimated to laboratory conditions for a few days were staged as pre- and prometamorphic, according to morphological criteria such as presence or absence of hindlimbs[7]. Five groups of twenty tadpoles each were kept in separate aquaria. Of these three groups were maintained in 0·035% thiourea (w/v in tap water), while the other two groups (controls) were maintained in tap water. Events of normal metamorphosis and time taken for tail regeneration were followed in the control groups. In all the groups various measurements such as head size, total length (head to tail tip) and total tail length were made. Records of day-to-day observations were kept. Tadpoles were fed on boiled spinach leaves. Amputation of tails was performed under hypothermic anaesthesia and necessary conditions for post-amputational survival were evaluated. Time taken for restoration of the original tail length was noted.

Histochemical distributions of enzymes such as succinate (SDH), malate (MDH), lactate (LDH) and $\alpha$-glycerophosphate ($\alpha$-GPDH) dehydrogenases in the tail tissues of normal and hypothyroidic tadpoles were studied.

## 1. *Progress of metamorphosis*

Thiourea induces arrest of metamorphosis only when the tadpoles are in the premetamorphic condition, *i.e.* before emergence of hind limbs. Tadpoles with hindlimbs in various stages of development complete metamorphosis in a time schedule comparable to that of the controls despite the treatment with the goitrogen. In premetamorphic tadpoles, development of hindlimbs is not hampered following the drug treatment, however, their musculature is poor. Some develop limb abnormalities, such as rigid and stiff hindlimbs that are apparently not functional. Hypothyroidic tadpoles are voracious eaters as compared with the controls. Nearly 25% of the tadpoles in the experimental groups develop into 'giant' ones. These are with larger heads and greater body and tail length.

## 2. *Survival of the tadpoles*

Daily changes of water/medium were found to enhance the survival chances of the tadpoles. Whenever the medium/water was not changed for more than two days the smaller tadpoles died. Cannibalistic tendency was not exhibited by the surviving tadpoles nor did they try to eat the dead ones. In this respect the *B. andersonii* tadpoles appear to differ from *Rana* sp. which reportedly exhibit cannibalism after the hindlimb eruption[8,9].

Survival after amputation of tail depends upon a number of factors. When more than 70% of the tail was amputated, the mortality rate was very high; 40 to 50% of the tail could be removed safely. However, infection of the stump was a major cause of post-