

of a few salient stages in the division of these cells. They are essentially the same as given by Sinnott and Bloch in their Fig. 3 (p. 227).

The results of the study of my material confirm the *phragmosome theory* of cell division in vacuolate plant cells as formulated by Sinnott and Bloch.¹

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May 11, 1944.

GOPAL CH. MITRA.

1. Sinnott, E. W. and R. Bloch, "Division in vacuolate plant cells," *Amer. Jour. Bot.*, 28: 225-232. 2. —, "The relative position of the cell walls in developing plant tissues," *Ibid.*, pp. 607-17 (for complete literature).

DUCTUS CAROTICUS IN THE PIGEON

IN a pigeon dissected in the class in February 1944, I came across an abnormality in the arterial system due to the presence of the *Ductus caroticus*. A similar variation has just been observed in the Presidency College, Madras, and recorded in *Current Science*.¹ The only other record of such a variation which I could come across is one from Calcutta.² Since such variations are rather rare in the pigeon I give below a sketch of the dissection of the chief arterial vessels in this Trivandrum specimen.

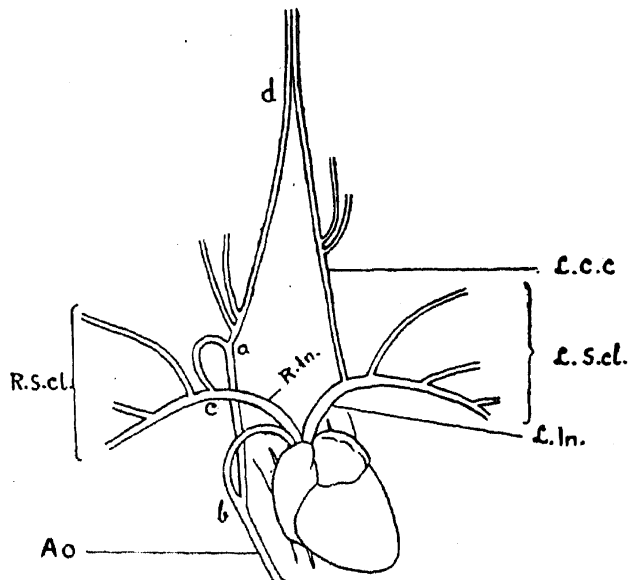


FIG. 1.—Ventral view of the arterial arches of the Trivandrum specimen referred to in the Text.

There can be no doubt that this variation represents the persistence of certain embryonic conditions which did not change while the other parts of the circulatory system changed to the adult arrangement. The part of the embryonic lateral dorsal aorta on the right side, between the third arch (Carotid) and the fourth arch (Systemic) has persisted as it does normally in *Sphenodon* and some of the lizards among the Reptilia and in the Apoda and some of the Urodela of the Amphibians. On the left side with the complete disappearance of the Systemic arch the corresponding

part of the dorsal aorta on that side has completely disappeared.

It is interesting that this connection was quite as broad and full of blood as the basal part of the Carotid. The Carotid itself, while sufficiently broad at the base, became slightly narrower just beyond this connection but further beyond it got normal in size comparing with the Carotid of the other side. Judging from the figures of the other specimens it would appear that in them too, it was an open connection with clear blood flow.

Lillie³ suggests as one of the causes for the disappearance of this part of the dorsal aorta in normal development, the reduction of the blood flow in it as the developing Carotid arch would draw off a forward current of blood and the Systemic would drain off backwards with little chance of blood flowing through this connecting part. A glance at the figure given here and the figure of the Presidency College specimen¹ would easily suggest a probable cause that has brought about the persistence of this part in these specimens: for here we find that the base of the Carotid has got bent downwards more or less, resulting in a flow of blood through this connecting region. This is not so well marked in the Calcutta specimen but still, even here there is a slight bend at the junction of the Carotid and the ductus.

Interpreting the Presidency College specimen Miss Subhadrappa¹ looks upon the entire region from the *Innominate* to the *aortic arch* (c a b, Fig. 2 C) as the *Ductus caroticus*. As a result of this assumption she is faced with certain conclusions which as she correctly remarks are inexplicable embryologically. For instance, on this view it would appear that the *Ductus caroticus* connects the *Innominate* (or *Subclavian*) with the *aorta* and that the *Carotid* arises from the *Ductus caroticus*!

From a study of the three specimens I suggest another view which makes this anatomical peculiarity easily understood in the light of embryological development. To elucidate this I am giving diagrams of the arteries of the three specimens. The part of the *Ductus*

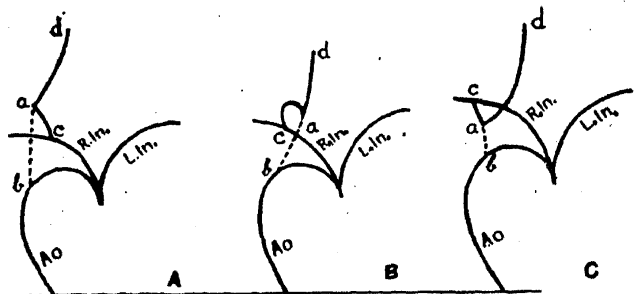


FIG. 2.—Diagrams of the three abnormal specimens recorded.

- A—as in the Calcutta specimen.
- B—as in the Trivandrum specimen.
- C—as in the Madras specimen.

Ao, Aortic arch. ab, *Ductus caroticus*. ca, Basal part of the Right Common carotid. d, The Carotid. L.C.C., Left Common Carotid. L.In., Left Innominate. R.In., Right Innominate. L.S.C.L., Left Subclavian. R.S.C.L., Right Subclavian.

caroticus from the *Innominate* to the point of origin of the right *Common Carotid* (*ca*) forms really the basal part of the *Carotid* itself, i.e., the basal part of the *Carotid* has been bent backwards probably due to the backward pull by the contracting *ductus*. The remaining part alone (*ab*) which is rather short in the Presidency College specimen, connecting the *Carotid* with the *aortic arch* is the *Ductus caroticus*. This view brings these three abnormal specimens in the same category with varying degrees of contraction of the *Ductus caroticus* and explains the conditions in full accordance with embryological development. The Calcutta specimen would seem to represent the simplest condition with a typical *Ductus caroticus* (A, *a b*). The Trivandrum specimen would come next where the *Ductus caroticus* has contracted to a certain extent pulling the *Carotid* at its junction with the ductus slightly downwards (B, *a b*). In the Presidency College specimen which represents the extreme stage, (C, *a b*) the ductus has contracted considerably and the *Carotid* is pulled backwards from its very origin from the *Innominate* so as to bring the *ductus* and the base of the *Carotid* in a line. This apparent connection (C, *cab*) between the *Innominate* and the *aorta* is easily mistaken for the *Ductus caroticus* and the *Carotid* would then appear to arise from this connection! The backward displacement of the Vertebral and the oesophageal arteries on the right side is evidently the result of the pulling backward of the base of the *Carotid* due to the contraction of the *Ductus caroticus*.

This study also suggests that during the transition of the arteries from the embryonic to the adult condition one of the mechanical forces at work in bringing about atrophy of the unnecessary vessels is contraction, side by side with constriction. Under normal conditions where the connection becomes practically bloodless contraction would have only the effect of aggravating the constriction: but in these abnormal cases where the connection has full blood flow and grows side by side with the other parts of the circulatory system, contraction would pull the base of the *Carotid* backwards.

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June 1944.

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1. *Curr. Sci.*, April, 1944. 2. *Anat. Anz. Bd.*, 1938, 80, No. 7/10, 178. 3. Lillie, F. R., "The Development of the chick" 1919, 361.

ON THE BIONOMICS OF THE *LEIOGNATHIDAE**

SPECIES of *Leiognathus* and *Gazza*, popularly known as the Silver-Bellies, contribute to one of the important fisheries in the shallow sea around Pamban and Rameswaram from September of one year to May of the next year.

One thousand and one hundred and seventy specimens ranging in size from 4 to 16 cm.

were examined in the laboratory of Krusadai Biological Station during the years 1941, 1942 and 1943. The following is the composition of the different species constituting the catches: *Leiognathus bindus* 40 per cent.; *L. equulus* 15 per cent.; *L. duara* 10 per cent.; *L. rucconius* 8 per cent.; *L. brevirostris* 4 per cent.; *L. insidiator* 3 per cent.; and *Gazza minuta* 20 per cent.

Food.—The diet consists entirely of plankton; but *Gazza minuta* occasionally feeds on fingerlings of the White-Bait (*Stolephorus* sp.). The following is the analysis of the planktonic food:—

Phytoplankton: (1) *Coscinodiscus*, (2) *Rhizosolenia*, (3) *Nitzschia*, (4) *Thalassiothrix*, (5) *Fragilaria*, (6) *Pleurosigma*, (7) *Biddulphia*, (8) *Detonula*, and (9) algal filaments.

Zooplankton: (1) Copepods, (2) *Rhopalophthalmus egregius*, (3) *Leucifer hansenii*, (4) Crustacean eggs, (5) *Megalopa* larvæ, (6) Ostracods, (7) Larval bivalves, (8) *Spiratella* spp., (9) Foraminifers, (10) *Ceratium* spp., and (11) Fish eggs of *Stolephorus* sp.

Spawning Season.—There are two spawning seasons, namely, November & December, and April & May.

Enemies.—Silver-Bellies form the natural food of the following carnivorous fishes: (1) the Black-finned Shark, *Carcharias melanopterus*, (2) the Seer, *Scomberomorus commersonii*, (3) the Jew-fishes, *Sciaenaglauca* and *Otolithus ruber*, (4) the Ribbon Fish, *Trichiurus savala*, (5) the Horse Mackerel, *Caranx sansun*, (6) the Big-jawed Jumper, *Lactarius lactarius*, and (7) the Barracuda, *Sphyræna obtusata*.

Food Value.—The Silver-Bellies contain fine bones, and the flesh is scanty. Yet they are esteemed both in the fresh and sun-dried condition, the latter being considered as more palatable. The dried Silver-Bellies are of medicinal value, it being given to convalescents in general and to patients suffering from Malaria in particular.

Fisheries Section,
Dept. of Industries &
Commerce, Madras,
July 4, 1944.

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FOOD OF THE INDIAN MACKEREL (*RASTRELLIGER KANAGURTA* RUSSELL) OF THE WEST COAST OF MADRAS PRESIDENCY¹

"Upon the abundance of mackerel depends the welfare of many thousands of the citizens of Massachusetts and Maine." So observed Prof. Goode on the American mackerel fishery. So is the case with the mackerel of the West Coast of the Madras Presidency. The Indian mackerel (*Rastrelliger kanagurta* Russell) constitutes one of the important food fishes of the Malabar Coast.