appears to warrant further investigation by marine biologists.

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An Intra-Pericardial Hepatic Intrusion in the Common Dogfish

MISS BARBARA STEVENS, of Brooklands Technical College, has been kind enough to send me a dogfish (*Scyliorhinus canicula*) with an intra-pericardial hepatic intrusion. Only the anterior end of the dogfish is available; but the length from the tip of the snout to the anterior insertion of the pectoral fin is 9 cm., and the anterior ends of the testes present a mature appearance. Thus it may be inferred that the dogfish had practically reached full size with this abnormality when it was caught.

The septum transversum is perforated on the right side only, and the hepatic intrusion is remarkable for its extent (Fig. 1). On the right side the liver extends through the pericardial cavity for a distance of 18 mm., almost reaching the anterior end of the conus arteriosus. Laterally, the liver extends 23 mm., reaching across almost the entire width of the pericardial cavity at its posterior end. The heart appears to be normal, except that the ventricle is displaced slightly forward and to the left.

Fig. 1. Hepatic intrusion in the pericardial cavity of a dogfish. A, Auricle; H, hepatic intrusion; L, liver; S, septum transversum; V, ventricle

The volume of the intra-pericardial intrusion was estimated by making a 'Plasticine' replica and measuring the volume of this by displacement. This was found to be 2.7 c.c. Similarly, the volume of the heart was found to be 2.2 c.c. Thus the hepatic intrusion occupied rather more of the pericardial cavity than the heart. The volumes of the hearts of a small number of dogfish under class dissection were also estimated by making 'Plasticine' models, and then the volumes of the actual hearts were determined by displacement after excision. The method, as performed by students, was found subject to an error of not more than 20 per cent. The volumes of the pericardial cavities of the normal animals were also found by making 'Plasticine' casts of the cavities after

excision of the hearts. From these results it appears that the volumes of the heart and of the pericardial cavity of the abnormal animal are within the range to be expected, and that often the heart occupies only about half the volume of the pericardial cavity.

In the development of craniates, the pericardial cavity is first delineated from the perivisceral coelom by the mesocardia. At this stage the pericardial coelom is still in contact with the perivisceral coelom by the dorsal and ventral parietal recesses of His. Afterwards the primary septum transversum is formed by proliferation of connective tissue on the anterior face of the developing liver¹. It must be presumed that in this animal the liver rudiment initially developed asymmetrically in such a way that the aperture ventral to the right mesocardium was not occluded by connective tissue on the anterior face of the liver rudiment. Thus the abnormality represents a patent right ventral parietal recess of His. Goodrich² has shown that in *Scyliorhinus canicula* the dorsal apertures remain as a forked pericardio-peritoneal canal. The anterior end of this canal was clearly visible in the abnormal animal, although the forked posterior ends could not be traced.

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Shoaling Behaviour in a Mysid

Mysidium columbiae (Zimmer) is common in shallow water in Kingston Harbour, Jamaica. It is found during the day in shoals close to the mangroves, usually but not exclusively in the shade of the trees. The shoals can be seen swimming horizontally a few centimetres below the surface of the water in a manner similar to shoals of small fish, for which indeed they were at first mistaken. The behaviour of *Mysidium* proves to be a combination of fixed responses to external stimuli and social responses by which the shoals are built up and maintained.

A number of *Mysidium* placed in a large vessel of sea-water will form a shoal in a few minutes and swim around with their bodies oriented parallel with each other at a constant distance apart. Small shoals tend to join larger ones and *Mysidium* separated from the main shoal by a sheet of glass attempt to swim through the glass to join the shoal provided the latter is close enough for them to see it. The critical distance for shoaling by visual orientation is about 4 cm. at 150 ft.-candles illumination. *Mysidium* placed in a circular dish 18 cm. in diameter illuminated from above swim in one direction around it, keeping station with each other so that all those along a given radius tend to complete a circuit in the same time, those near the circumference swimming several times faster than those near the centre. The speed of swimming is photokinetically controlled, being proportional to the logarithm of the light intensity over a range of at least two logarithmic units of illumination. At very high intensities swimming tend to be inhibited and the mysids sink to the bottom, while in very dim light the shoal breaks up. Removal of both eyes abolishes both the photokinetic response and the ability to swim in a shoal. Some astonishingly high swimming speeds have been recorded in these