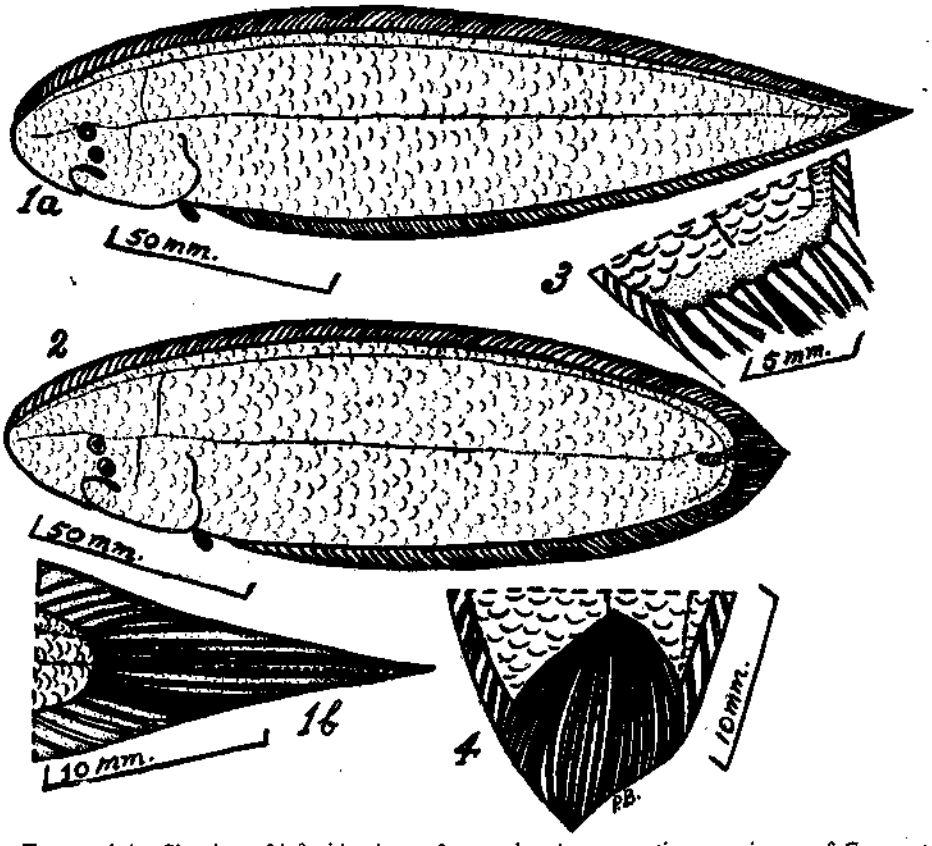
REGENERATION IN THE FLATFISH, *CYNOGLOSSUS MACROLEPIDOTUS* (BLEEKER)

In the course of examining the experimental fish catches of the Government of India Offshore Fishing Station trawlers, M.V. 'Sagarsundari', M.F.V. 'Jheenga' and M.F.V. 'Meenabharati' during 1965-1968 at Tuticorin, eight specimens of *Cynoglossus macrolepidotus*, popularly called the large-scaled tongue sole in varying conditions of regeneration were collected from among several hundreds of normal specimens and the observations made on them are given in the present account. In normal specimens the body tapers posteriorly and ends in a somewhat pointed caudal fin (figure 1 a) formed by 10-12 rays. There are two lateral lines on the ocular side and none on the other side. One of the lateral lines is the usual median one, while the other, situated dorsolaterally may be called the upper lateral line. The caudal fin carries extensions from the two lateral lines and near the tip of the tail the extension from the upper line tends to converge towards the extension from the median one (figure 1 b). For the actual length of the regenerating specimens and the estimated length to which they might have grown but for the truncation (calculated from the relationship of the total length to head length) reference may be made to the legend to figures 2-9.

In one specimen, 14% of the posterior part of the body appears to have been amputated (Fig. 2) and the regenerating rays numbering 17 constitute an ill-formed caudal fin. A small portion of the vertebral column anterior to the amputated region has undergone thickening in front of which the median lateral line ends, but the extension from the upper lateral line turns ventrally paralled to the margin of the truncated body and proceeds anteriorly along the ventral region. In another case where 34% of the body seems to have been truncated, the injury appears to have taken place quite recently, as the basal fine buds which regenerate the future rays numbering about 13 are prominently seen along the amputated margin (Fig. 3),

Four other specimens have undergone less damage. Of them in one case (Fig. 4) 18% of the hinder region is affected, while in others 17% 12% and 10% (figures

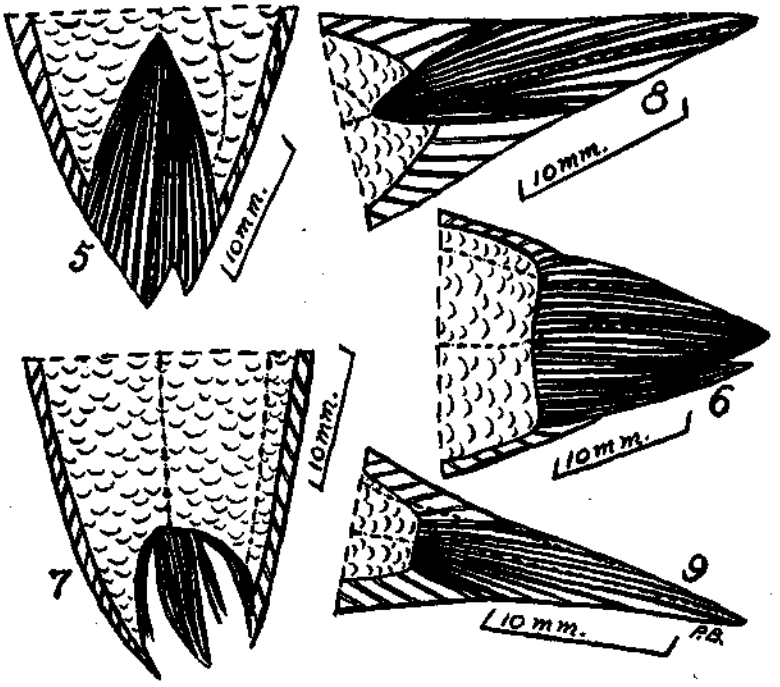
5, 6 and 7 respectively). About 22, 20, 25 and 17 regenerating rays are recognisable in these four specimens. The newly developing lateral lines have undergone some changes from the normal condition. In two other specimens only small regions of the tail have undergone injury, namely 8% (Fig. 8) and 5% (Fig. 9). In these the newly developing lateral lines do not show marked variations in their disposition.



FIGURES 1-4. Sketches of left side views of normal and regenerating specimens of *C. macrolepidotus*. FIG. 1a. normal specimen of 199 mm. total length ; FIG. 1b enlarged caudal end of the same ; FIG. 2 regenerating specimen of 170 mm. (estimated total length 209 mm.) ; FIGS. 3 and 4 enlarged regenerating areas of specimens 176 and 184 mm. (e.t.l. 264 and 224 mm.) respectively.

Remarks : Regeneration among Indian fishes is described by Menon (1950), Jones and Menon (1952), Gopinath and Joseph (1952) and others. Chabanaud (1949) described certain terratological conditions in the flatfishes *Glyptocephalus cynoglossus* and *Solea ovata*. Such deformities have been reported among other groups of fishes also and the general tendency in most of these cases has been to regard the malformations as a result of regeneration after certain injuries suffered by the individuals concerned in the course of some stage in their life history. Gemmil (1912) has stated that the causes of deformities in fishes are numerous and that no single factor is sufficient to explain it. The process of regeneration in *C. macrolepidotus* involves the regrowth of the fin rays to begin with. The other truncated components of the body, such as myotomes, vertebral column etc., if at all

regenerate (Nusbaum, 1903 ; 1907 ; Okada 1943) seem to do so only subsequent to the regeneration of the fin rays. The number of rays regenerated depends upon the extent of the regenerating area, as has been observed by Jones and Menon (1952) in the case of *Coilia* spp. Regarding the homology of the fin rays, it may be stated



FIGS. 5-9. Enlarged left views of regenerating *C. macrolepidotus*. FIG. 5 of 230 mm. specimen (estimated total length 278 mm.) ; FIG. 6 of 166 mm. (e.t.l. 183 mm.) ; FIG. 7 of 153 mm. (e.t.l. 161 mm.) ; FIG. 8 of 215 mm. (e.t.l. 234 mm.) and FIG. 9 of 216 mm. (e.t.l. 229 mm.).

from a study of the present specimens and the earlier literature (Okada, 1948 ; Menon 1950 ; Jones and Menon, 1952) that the regenerating rays are probably homologous with the rays of both dorsal and anal fins, thus pointing out the probability of the posterior dorsal and anal fin ray elements facilitating the regrowth of the new caudal fin.

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REFERENCES

CHABANAUD, P. 1949. *Bijdragen tot de Dierlaunde*, **28** : 90-96.

GEMMIL, J. F. 1952. *The teratology of fishes*, Glasgow.

GOPINATH, K. AND JOSEPH, A. 1952. *Curr. Sci.*, **21** (6) : 164-165.

JONES, S. AND MENON, P. M. G. 1952. *J. zool. Soc. India* **4** (1) : 17-36.

MENON, P. M. G. 1950. *J. Roy. Asiatic Soc. Bengal*, **16** (2) : 123-126.

NUSBAUM, J. 1903. *Anat. Anz.*, **22** : 358-363.

———. 1907. *Arch. Entn. Mech.*, **24** : 114-123.

OKADA, Y. K. 1943. *Annot. Zool. Jap.*, **22** (2) : 59-68.