

ON THE OCCURRENCE OF OSTEOCHONDROMA AND OSTEOMA IN THE MARINE CAT-FISH *TACHYSURUS JELLA* (DAY)

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ABSTRACT

This paper embodies a brief description of the different types (osteochondromata and osteomata) and transitional forms of tumours observed on different regions of the body of the three specimens of the cat-fish *Tachysurus jella* (Day), collected from the south west coast of India. The biochemical composition of the muscle and tumour tissues have been analysed and the aetiology of tumourigenesis in marine cat-fishes are discussed.

The present record is the first of such type of skin and bone tumours reported on this species which has a fairly wide distribution in the Indian Seas.

INTRODUCTION

SEVERAL instances of skin and bone tumours have been reported among marine fishes (Mulsow, 1915; Thomas, 1932, 1933; Nigrelli and Gordon, 1946; Mawdesley-Thomas, 1972), but there is hardly any information available on skin tumours in marine fishes from the Indian waters. Instances of hyperostosis have been reported among sciaenids (Chaubanaud, 1926), carangids (Barnard, 1948; Gopinath, 1951), ribbon fishes (Bhatt and Murti, 1960; James, 1960) and bat fishes (Murty, 1967) from Indian waters. The present paper embodies a brief description of hitherto unreported conditions of skin tumours, bone tumours and fin tumours observed on different regions of the body of the cat fish *Tachysurus jella* (Day). The only noted abnormality reported from this species is albinism (Gupta and Bhowmik, 1958).

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MATERIAL AND METHODS

A. 1 male: 27-3-1972, M. F. V. BLUEFIN, trawled at 35 metres off Alleppey, T. L. 410 mm, Wt. 850 gms, with multiple tumours, (Total weight of tumour tissues 37.5 gms); B. 1 female: 7-9-1972, from the local fish market, Cochin, T. L. 400 mm Wt. 800 gms, with osteomata on the fins; C. 1 male: 11-2-1973, private fishing vessel trawled at 27 metres, off Karwar, T. L. 285 mm, Wt. 270 gms, with single osteochondromata.

Radiographs of the specimens were taken to ascertain the presence and nature of internal tumours and to see whether they had any connection with the

bones. The tumour tissues were dissected out, measured and treated for biochemical studies. Lipids were extracted from the muscle and tumour tissues by the method of Bligh and Dyer (1959). Phosphorus content of the muscle, tumour tissues and 'stones' was determined by the method of Fiske and Subba Row (1925). Sodium, potassium and calcium were estimated by the Flame photometry. Moisture and protein were calculated by the standard methods adopted by the Association of Official Agricultural Chemists (1960). The body proportions, meristic counts and dentition were as typical for the species (Chandy, 1954).

OBSERVATIONS

The skin, bone and fins were affected by tumours of different types. The 410 mm specimen showed multiple skin tumours and a bone tumour, while the 400 mm and 285 mm specimens had only bone tumours and skin tumour respectively.

Skin tumours

Three types of skin tumours of size ranging from 3 mm to 45 mm diameter were present in specimen A. Of these lesions, the angio-epithelial nodule observed on the ventral side of the head (diameter 3 mm) was the smallest. It had a smooth surface and the postmortem colour was pink. It was covered by a slightly thickened hyperplastic layer of epidermal cells, without any ossification in the centre (Pl. 1A). The second type of tumour was osseous, present in two regions of the body, one (11 mm diameter) on the ventral side near the left pectoral fin and the second (10 mm diameter and height 7 mm) on the right opercular flap. Both were grey to dusky brown in colour. While the former was characterised by a slight proliferation of the epidermis with a hard 'stone' like (stone No. I) substance embedded just beneath the skin, the latter was seen outside by a marked papillomatous proliferation of the 'stone' (stone No. II) surrounded by a thin layer of epidermal tissues (Pl. I A-C). The third was, skin tumours of a cartilaginous nature (osteochondromata), much larger and grey to pink in colour. By radiograph as well as necroscopy, two or three small 'stone-like' hard substances could be traced within the tumour (Pl. II A). Two such larger osteochondromata were present superficially on either side of the base of the anal fin, the one on the right being 45 x 26 mm in diameter and height and that on the left side being 30 x 13 mm. In the larger osteochondromata, one of the ossified 'stones' was seen outside in the centre (Pl. I E, F).

Another tumour of almost the similar type (14 x 9 mm) but with little cartilaginous coating was present on the right lateral side of the inner wall of the body cavity (stone No. III) (Pls. I F and II A). Specimen C also had osteochondromata on the ventral side of the lower jaw, the tumour measuring 18 x 14 mm (Pl. II C). Necroscopy showed that these solid masses (Pl. I F) were just attached to the body in a 'socket' formed by the surrounding skin, without any vascular connection. It was also clear that these cartilaginous and osseous tumours had no direct connections with the bones of the fish.

Bone tumours

Specimens A and B had bone tumours which were apparently formed by exostosis. In specimen A, the nasal part of the skull had osteomata on the left side of the snout close to the nasal opening, measuring 22 x 8 mm (stone No. IV), and covered by skin (Pls. I D and II A). In specimen B, the middle portion of the left pectoral spine and the first two pelvic fin rays were affected by osteoma. These

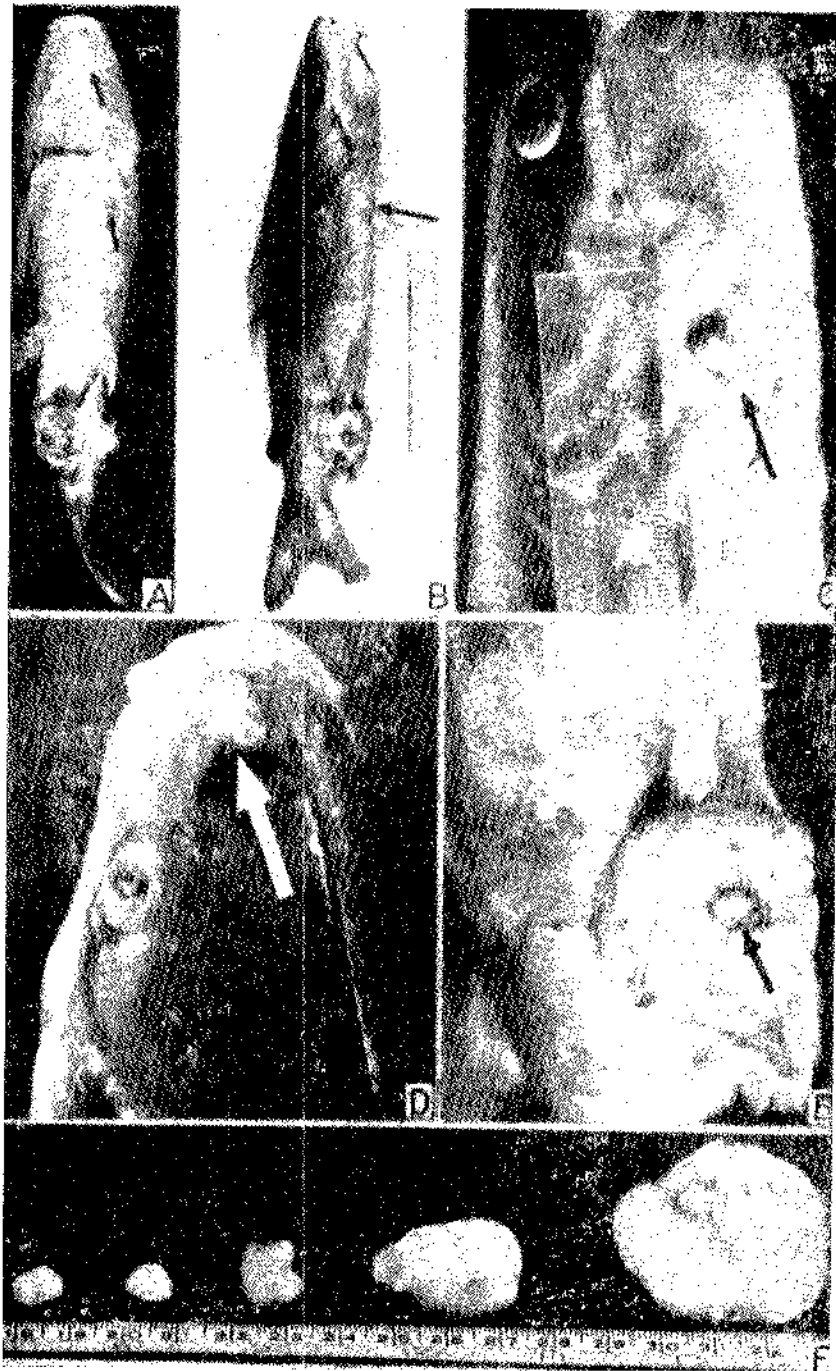


PLATE I. *Tachysurus jella* (Day) with multiple tumours (Specimen A T.L. 410 mm). A & B. Ventral and lateral view showing angioepithelial nodule, skin osteomata and osteochondromata; C. Skin osteomata with the stone projecting out; D. Bone osteomata; E. Larger osteochondromata with a 'stone' in the centre; and F. Tumour tissues of skin osteomata and osteochondromata (from left to right: Stone I, Stone II, Stone III (see text) and osteochondromata from the left and right side of the anal fin base respectively).

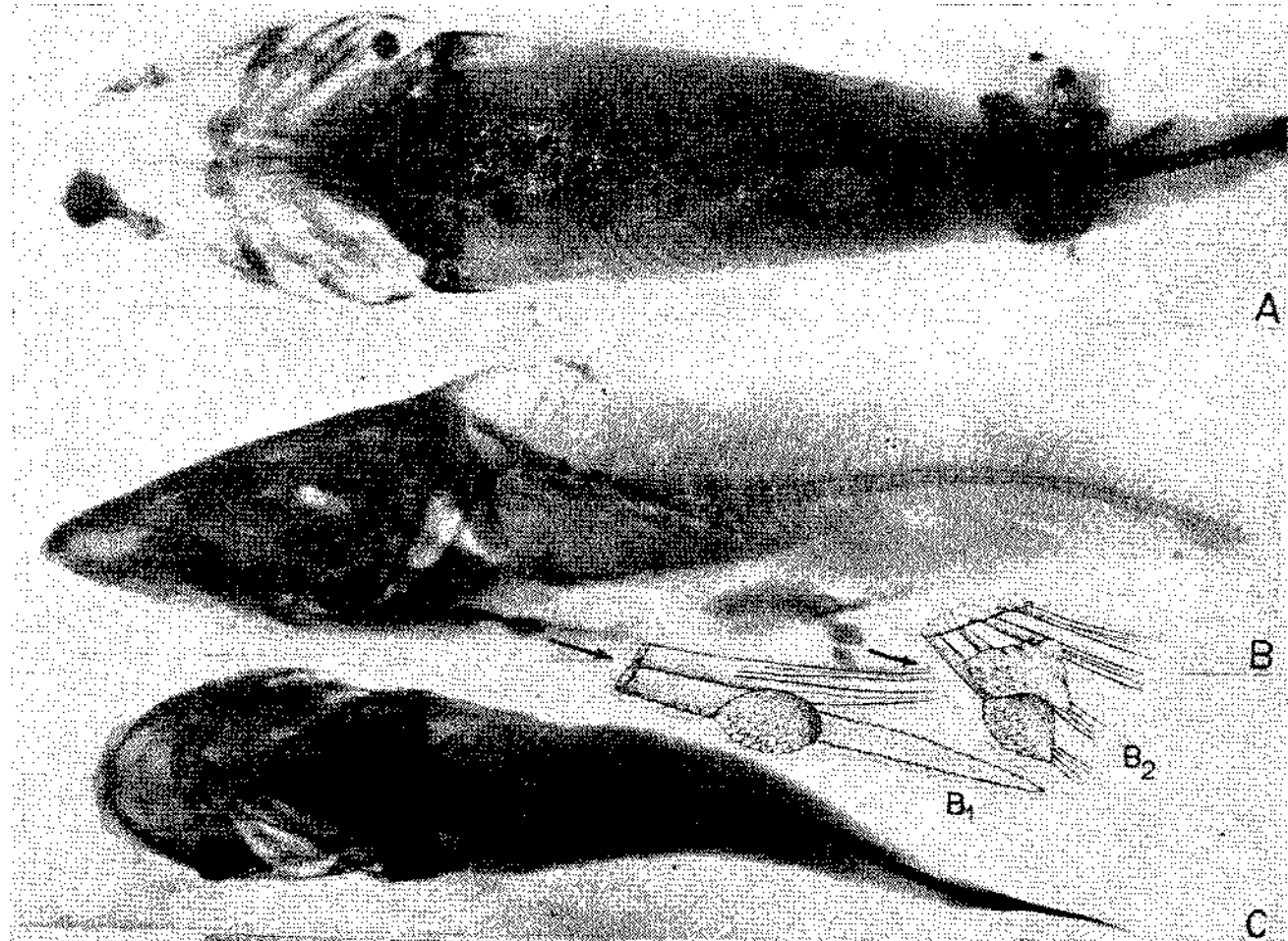


PLATE II. Radiographs of *Tachysurus jella* (Day) showing skin, bone and fin tumours. A. Specimen A (T. L. 410 mm) showing multiple tumours with ossified stones; B. Specimen B (T. L. 400 mm) with fin tumours; B₁. Pectoral spine with osteomata; B₂. Pelvic fin with osteomata; and C. Specimen C (T. L. 285 mm) with single osteochondromata.

osseous tumours are very hard showing some sort of irregular corrugations over them (Pl. II B, B₁, B₂). Specimen C did not show any hyperostosis of the bones or the fins.

Biochemical analysis

Analysis of the muscle, tumour tissues and 'stones' are given in Table 1 and 2

TABLE 1. *Analysis of muscle and tumour tissues (osteochondromata)*
(Minerals in ash as %)

	Muscle tissues (%)	Tumour tissues (%)
Protein	— 17.87	20.66
Moisture	— 77.47	74.63
Ash	— 1.13	1.31
Fat	— 2.00	1.30
Calcium	— 3.80	3.30
Sodium	— 10.90	10.96
Potassium	— 4.10	4.20
Phosphorus	— 2.64	5.41

TABLE 2. *Analysis of osseous stones*
(Minerals in ash as %)

	Stone I (Skin osteomata)	Stone II	Stone III (Early osteochondromata)	Stone IV (Bone osteomata)
Moisture (as % of wet stone)	3.86	4.15	5.44	4.52
Ash in %	62.55	63.61	54.67	62.15
Acid insoluble residue in %	1.00	< 1.00	< 1.00	1.20
Calcium	0.80	0.77	0.57	0.82
Potassium	0.04	0.03	0.35	0.05
Sodium	0.33	0.37	0.41	0.36
Phosphorus	16.47	15.79	19.06	8.96

Muscle and tumour tissues: The water content of the tumour tissues was found to be relatively low compared to that of the normal tissues. However, this was compensated by the higher protein content of the tumour tissues. This is indicative of a more rapid protein synthesis taking place in this part of the muscle. The phosphorus content of the tumour tissues was high compared to that of the ordinary muscle tissues, whereas calcium showed a reverse trend though not to a significant extent (Table 1). The phosphate metabolism is seen to be upset in the tumour tissues resulting in the accumulation of the phosphates of sodium, potassium and calcium. There is no significant difference in the level of ash content between the two types of tissues. The ash content of the tissues is within the limits seen in different fish species. Phosphorus and potassium are the intracellular constituents (Love, 1970) whereas sodium is extra-cellular. Since it is known that proper functioning of the muscle depends on the correct balance of protein, water and ionic constituents (Love, 1970), these findings are of interest.

It is seen that the increase in protein content in the tumour tissues, accompanied by the lowering of moisture level (Table 1) is due to the increase in the number of

cells. The marked toughening of the tumour tissues, evidently suggests a sizeable increase in the number of cells per unit area compared to normal muscle. Since potassium and phosphorus are intracellular constituents their concentration is also consequently higher in the tumour portion.

Osseous stones: Analysis of the 'stones' revealed that they are mostly of the inorganic type (Table 2). Acid insoluble residues of all these 'stones' are practically insignificant showing a high mineral content. This shows that, though the fish is a bottom feeder, there is no deposition of silicates or sand particles in the 'stones'. It is evident from this that the occurrence of 'stones' in the tissues are mainly due to the impaired ionic metabolism of tissues of that particular part of the fish. The results of the study also prove that the 'stones' are largely composed of the phosphates of calcium, sodium and potassium.

DISCUSSION

Although tumours detected on *T. jella* have been broadly grouped as skin tumours and bone tumours, the former may be more specifically indicated as angioepithelial nodule, skin osteomata and osteochondromata. Radiograph as well as biochemical analysis showed that the hard substances found in these skin tumours were only ossified 'stones' the origin of which is not fully known. Poor vascularisation and impaired ionic metabolism of the connective tissues could lead to the formation of such stones. At present there is very little information available on such ossified stones of skin tumours among fishes. In this connection, the report by Thomas (1933) on the Dogfish *Scylliorhinus caniculus* and Nigrelli and Gordon (1946) on the Jewelfish *Hemichromis bimaculatus* should be of interest.

In the present case, the osteomata of the skin which had no cartilaginous coating had relatively more ossification than in conditions of osteochondromata. It is doubtful whether this may be a different type of skin tumour or a transitional form which may develop into a bigger osteochondromata at a later stage, where the ossified stone may break off into two or three pieces as evidenced from the size and number of 'stones' in the larger osteochondromata (Pl. II A). But the analysis of portions of the skin osteomata and osteochondromata shows a wide range in the percentage composition of minerals (Table 1 and 2). At this stage it is not known whether these tumours represent transitional conditions of one type or whether they are allied forms of skin tumours. It is likely that the angioepithelial nodule may develop a small 'stone' in the centre by ossification (skin osteomata) which ultimately may or may not transform into osteochondromata.

In the case of bone tumours (osteomata) it was suspected that these bony overgrowths were associated with a previous traumatic aetiology. However, radiographic examinations failed to reveal any fractures. James (1960) considers the hyperostosis of bones in *Trichiurus lepturus* Linnaeus as species specific. But Gunther (1860) and Bhatt and Murti (1960) have opined that hyperostosis is a neoplastic disease.

The true tumours which are present in both sexes of *T. jella*, probably represent hyperostosis. It is likely that *T. jella* may have a genetic predisposition to develop such tumours. Although no significant difference in the values of calcium, potassium and sodium are seen, the phosphorus content of 'bone osteomata' shows a very low value (8.96%) compared to that of 'skin osteomata' (Table 2). In *T. jella*, since there is no evidence of scars or other signs of regressive processes

characteristic of hyperplastic epidermal diseases, these tumours may be of true neoplasms.

The occurrence of affected specimens in the trawl catches from different areas during different periods indicates that this condition is not uncommon in *T. jella*. It is also evident that these diseased fishes occur in healthy shoals, but it is not known whether they are subjected to early mortality. The present investigation does not throw light as to the stage at which *T. jella* is affected by this disease, but mature and immature specimens of both sexes were found affected. Compared to the normal specimens of *T. jella*, the affected specimens do not appear to be emaciated in any way. The conditions of the gonads of both sexes were found to be normal in the affected specimens. It may be desirable to study the incidence of such conditions in *T. jella*, especially as this species may find a place in mariculture.

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