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FUNGI-RELATED OUTGROWTHS ON PTERYGOPHORES OF SINGLE FINS OF *LEPIDOPUS CAUDATUS* (EUPHRASEN, 1788) (*PISCES: TRICHIURIDAE*)

NAROŚLA NA DŹWIGACZACH PROMIENI PŁETW NIEPARZYSTYCH U PAŁASZA OGONIASTEGO *LEPIDOPUS CAUDATUS* (EUPHRASEN, 1788) (*PISCES: TRICHIURIDAE*) NA TLE GRZYBICZYM

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The author describes the occurrence and structure of outgrowths fairly commonly found on pterygophores of dorsal and subcaudal fins in *Lepidopus caudatus* from the Namibian fishing grounds. The outgrowths, although at the first glance can be considered bone structures, are formed in a tissue displaying features of the chondroidal one. It is suspected that the outgrowths result from the fins being attacked by unknown lower fungi of the genus *Candida*.

INTRODUCTION

When examining specimens of *Lepidopus caudatus* (Euphrasen, 1788) caught in the Namibian fishing grounds, it was observed that numerous individuals possessed subcutaneous nodes palpable beneath the dorsal fin base; sometimes – less frequently –

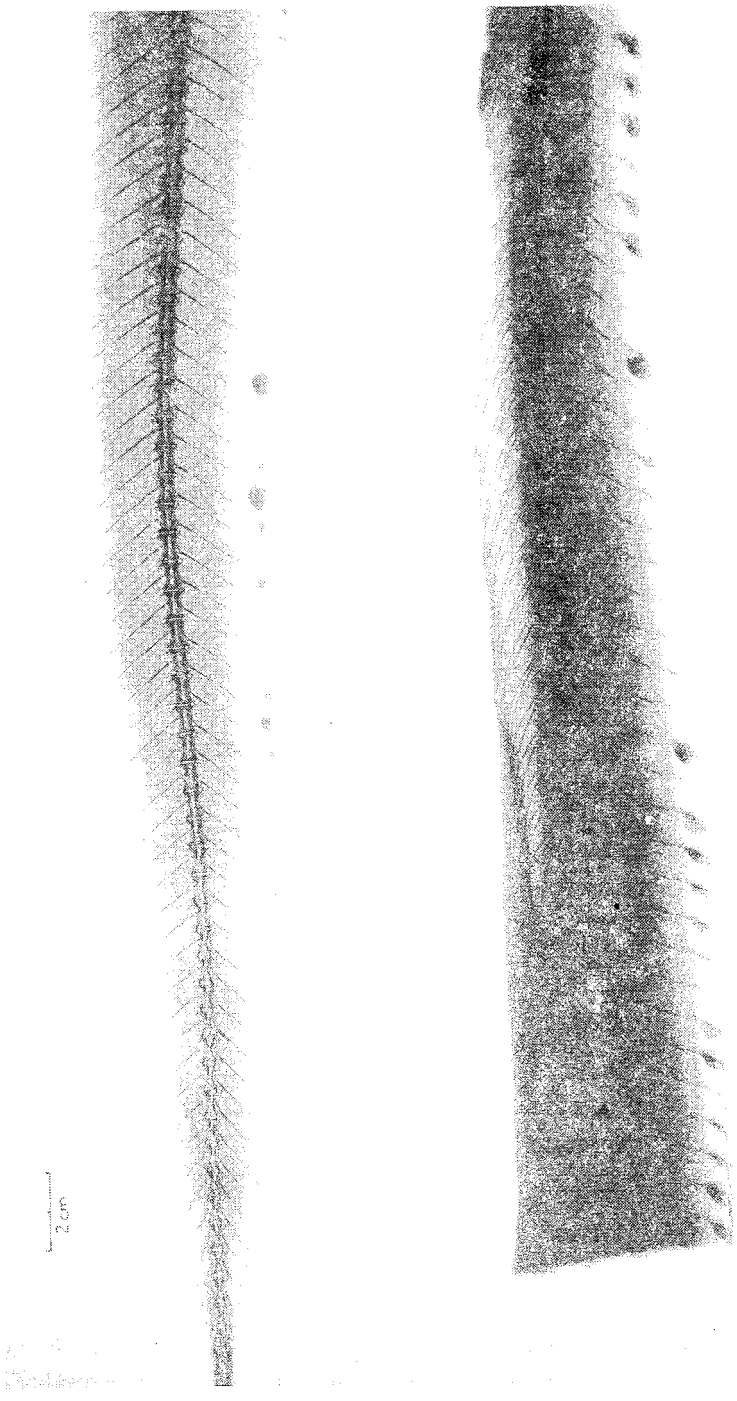

Fig. 1. X-ray autoradiograph of an infested fish

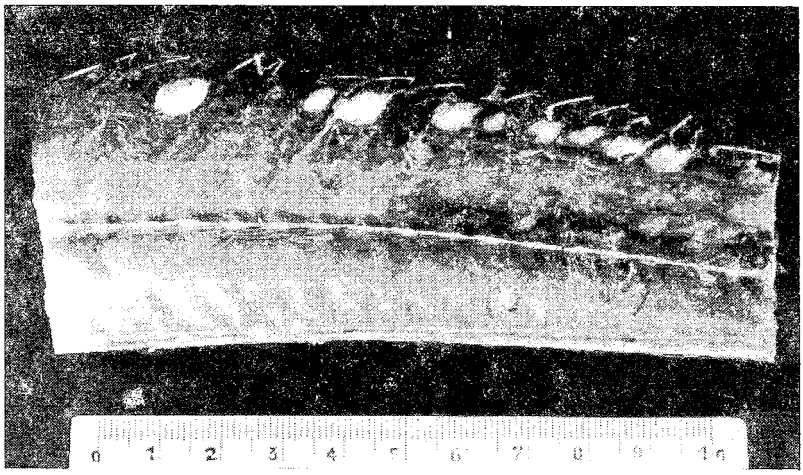

Fig. 2. Outgrowths after removal of a muscle layer

they were found above the subcaudal fin base too. At as closer scrutiny, the structures turned out to be pea-shaped outgrowths on the pterygophores. The pattern of occurrence of the outgrowths is clearly seen on X-ray autoradiographs (Fig. 1).

The percentage of attacked individuals has not bee calculated, but 75% will not be an exaggeration.

It is supposed that the outgrowths occur perhaps less frequently in other parts of the

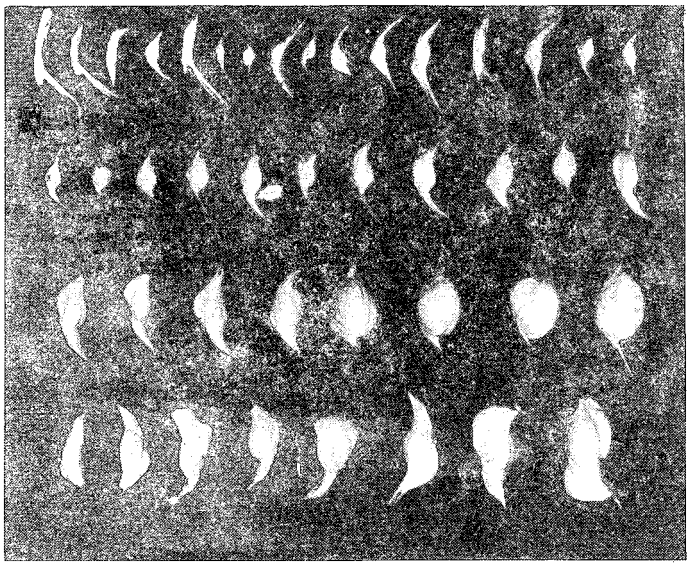

Fig. 3. Isolated outgrowths in various developmental stages

species: distribution range. Similar, although less numerous lesions occur in a related species, *Trichiurus lepturus* L. from the Indian Ocean. Outgrowths in that species looked somewhat different (they were smaller and more elliptical) and were found most often on the subcaudal fin pterygophores.

The muscular layer removed, the outgrowths were clearly visible as white hard nodes submerged in a mass of muscles on the pterygophores (Fig. 2). Isolated outgrowths show different shapes depending on their developmental stage as seen in Fig. 3.

MATERIALS AND METHODS

The specimens examined were collected from commercial catches frozen in blocks down to −28°C. Frozen individuals were brought to the laboratory. After thawing the fishes were given a check-up for parasites and samples of pathologically changed tissues were taken, the samples being subsequently fixed in mercuric chloride with 3% acetic acid, in the Romeis fluid or in 10% formalin. Microtome sections, 5–10 μm thick, were cut and stained in hematoxylineosin, by means of the Mallory technique as well as in resorcinfuchsine for the connective tissue fibres. It is worth mentioning that at first the outgrowths were regarded as osteoses.

On the histological examination, fairly clear images allowing an accurate determination of tissues and their structures were obtained; however, the materials were found

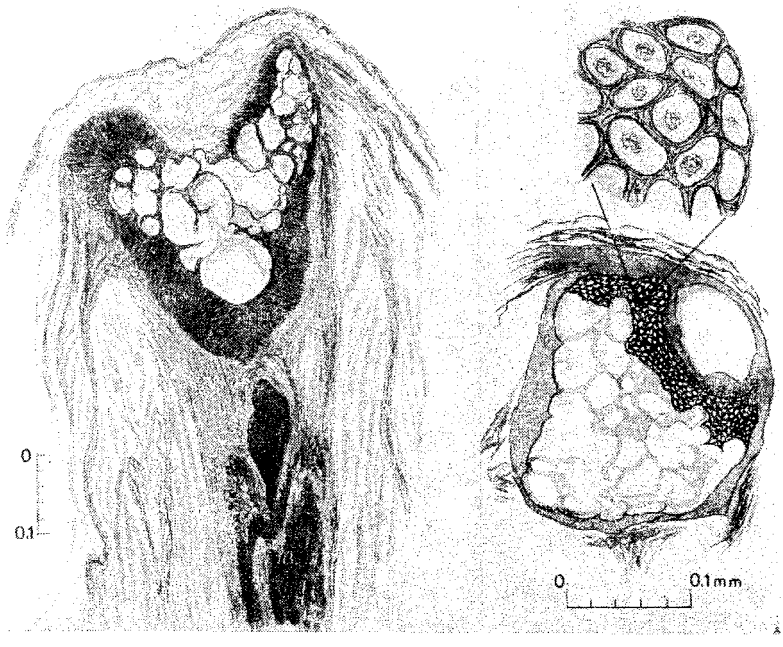

Fig. 4. Unchanged chondroidal tissue, strongly alcaline staining (dark parts on the figure)

unsuitable for more precise histological studies. In the outhgrowth "eyes", thought to be strongly swollen chondrocyten (or lacunae thereof) of a normal tissue, cytoplasmic structures lacking the nuclei were found. The nuclei either perish beforehand or cannot endure the prolonged freezing. Nevertheless, the alcaline reaction of the basic tissue is retained for a long time (Fig. 4).

RESULTS OF EXAMINATIONS

The dorsal fin pterygophores (only these were studied) of *L. caudatus* have a rather complex structure as revealed by histological mounts. They are biramous, the rami being bent at an angle (Fig. 5).

The pterygophores are anchored in the muscular tissue by means of a whole system of the connective tissue fibres branching off and collected into a knot-like structure beneath the pterygophore (Fig. 6). Owing to this, the pterygophore is tightly connected with the surrounding tissue, which is still visible in large pathologic outgrowths (Fig. 12). The

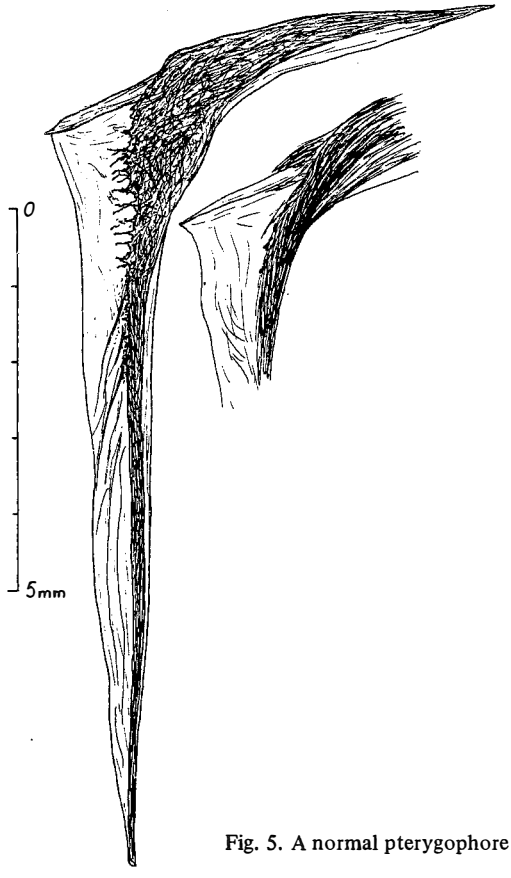

Fig. 5. A normal pterygophore

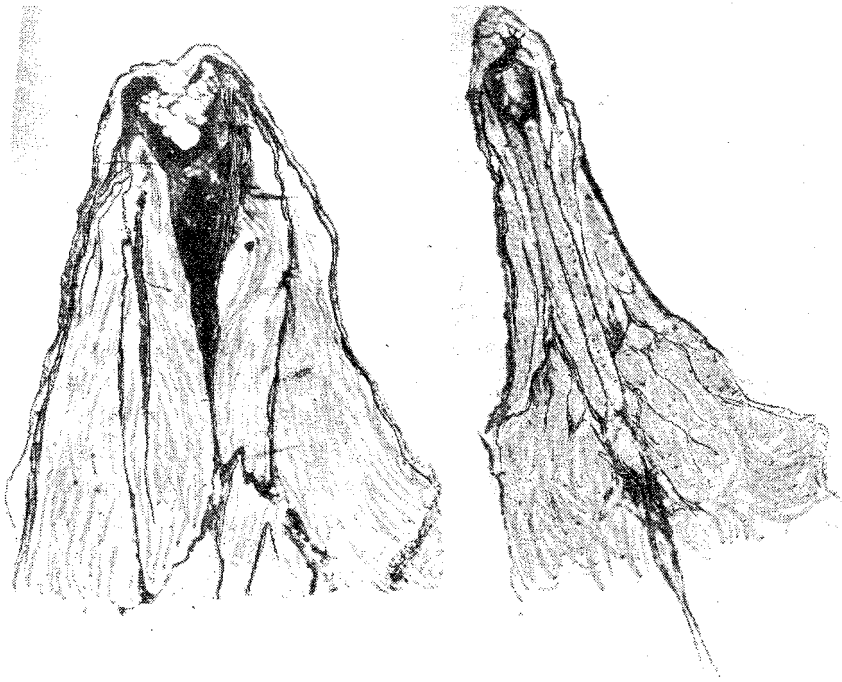

Fig. 6. Pterygophore attachment in the muscular tissue. Dark strands of fibrous connective tissue visible

connective tissue strands are clearly alcaline and stain well in both hematoxylin and resorcin. The pterygophores are connected with the fin ray proper by means of a complex joint.

The pterygophores are made of a tissue that can be described as chondroidal and sometimes called "osteoidal" (Bertin, 1958). The tissue is rather poor in intercellular substance; in the present case, fine, strongly flattened chondrocytes tend to occur near the surface. On the other hand, the intercellular substance is well developed and stratified towards the inside of the organ. The chondrocytes lack plasmatic processes, are tightly packed as if pressed by the fibres and arranged parallel to the surface (Figs. 7 and 8).

As mentioned earlier, the intercellular substance is homogenous with a clear fibrous structure. It stains pink in eosin although some parts, still unchanged, contain clearly alcaline fragments, i.e., staining bright blue (Fig. 4).

The outgrowths are found beneath the joint connecting the pterygophore to the fin ray, under the angular part (Fig. 9); they are poorly visible at first. The chondrocytes are seen to swell and branch off into a system of lacunae filled with granular protoplasm. At the same time, the intercellular substance develops too (Fig. 10).

The pathologic tissue growth begins with the formation of lacunae-like structures within the pterygrophore. The present material did not allow to state with confidence whether the structures had resulted from a strong growth of chondroid cells or

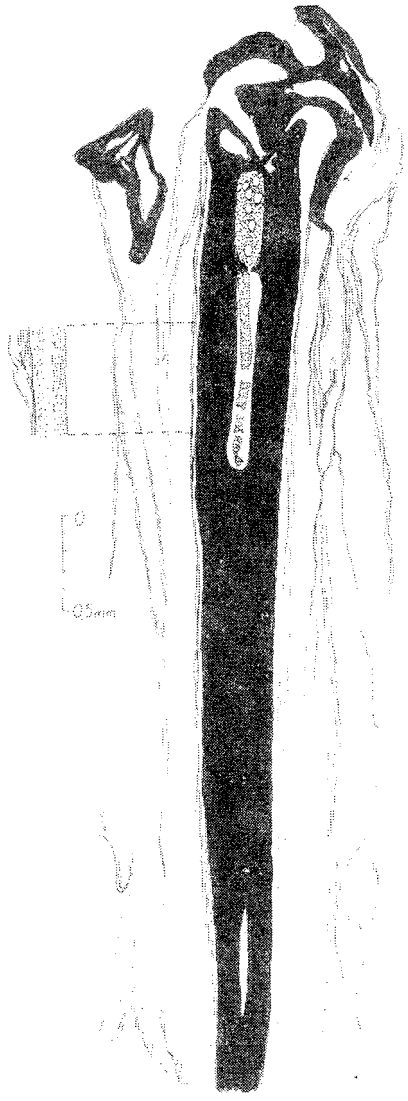

Fig. 7. Longitudinal cross-section of a pterygophore. Normal chondroidal tissue marked black

independently. Bearing in mind the lacunae-like spaces filled with protoplasm, the author is inclined to accept the first hypothesis, i.e., the pathological nature of growth of chondrocytes.

The outgrowths become more and more clearly visible with a growing intensity of the pathologic process (Fig. 11) until their final size of about 11 × 8 mm; larger outgrowths are an exception.

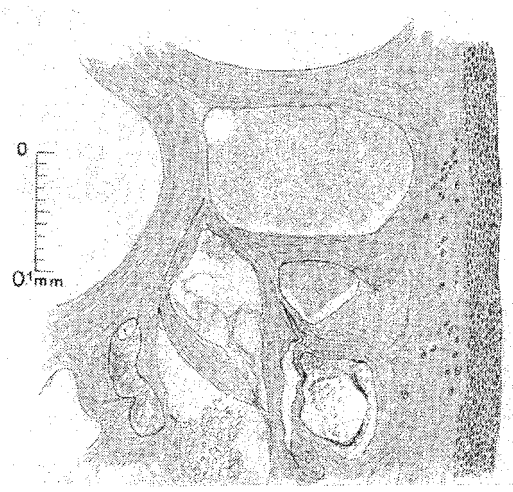

Fig. 8. A transition from the normal tissue (on the periphery) to a strongly lacunar one

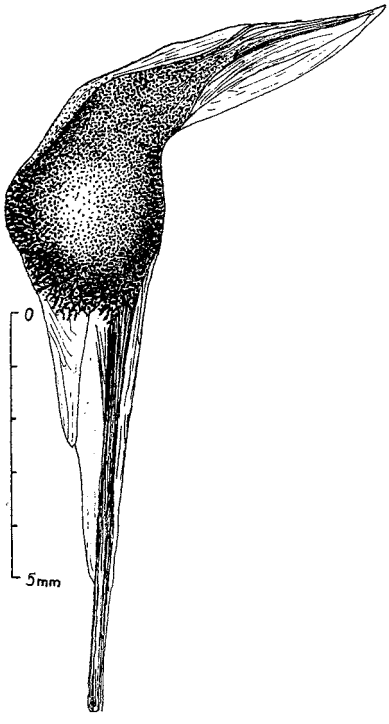

Fig. 9. Outgrowth formation

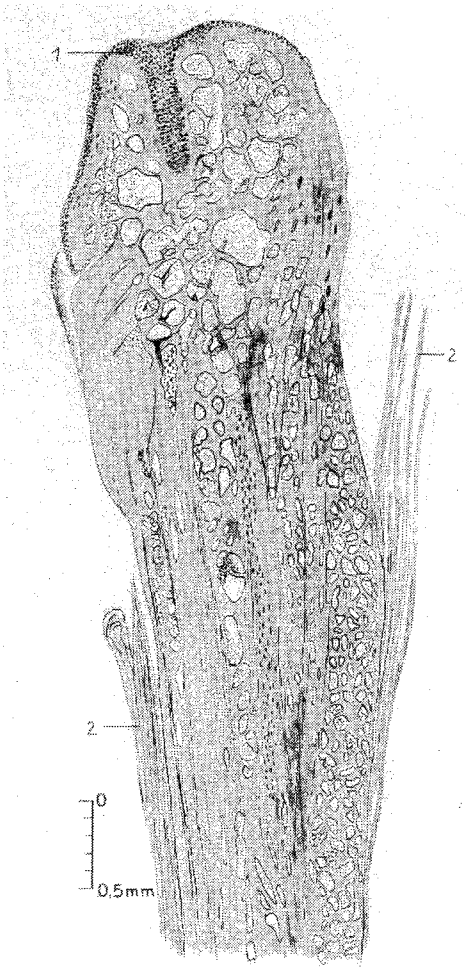

Fig. 10. Longitudinal cross-section of a pterygophore at an initial stage of outgrowth formation.
1 – chondrocytes; 2 – muscles

In their final form, the outgrowths are ellipsoid bodies of a clearly sponge-like internal structure (Fig. 12). Numerous lacunae are interconnected, thus forming a system of fine channels. Quite early the content of the lacunae undergoes far-reaching changes: the initially granulous protoplasm show a strong tendency to vacuolise. Fig. 13 illustrates initial stages of formation of vacuoles inside the lacunar plasm. In older lacunae, traces of vacuoles are seen as in Fig. 14 D, the vacuoles giving an impression of hollow spaces. When alive, they are most probably filled with a fluid which disappears on a standard mounting. Frequently the plasm is arranged in strands forming a kind of a network (Fig. 14 A), the knots of which showing clearly darkened spots of dense plasm. That has

Fig. 11. Longitudinal cross-section of an outgrowth at a later developmental stage

Fig. 12. Cross-section of a fully formed outgrowth. Strands of the connective tissue attaching the pterygophore to muscles are visible

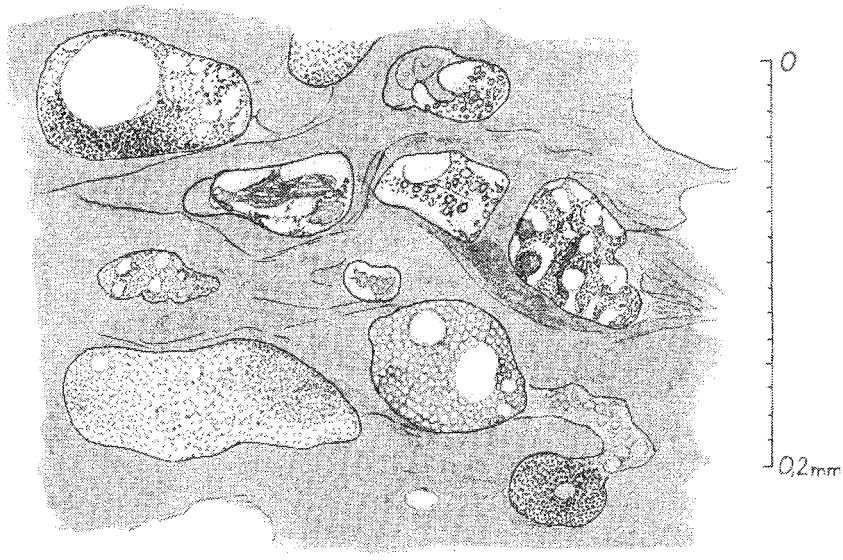

Fig. 13. A fragment of pathologically changed tissue with still well-preserved cytoplasm undergoing vacuolisation

sometimes suggested the presence of nuclei (?); perhaps we are dealing with spores? This latter suggestion results from further studies indicating infestation by fungi.

Sometimes a totally incomprehensible picture may be obteined, as in Fig. 15; Most often, fine spherical structures staining intensively with hematoxylin are found to occur (Fig. 15 B).

The structures described above were observed on the frozen materials. Thanks to Mr Heese, M.Sc. I obtained fresh materials in 4% formalin preserved directly after capture on a fishing ground (July, 1981). The histological picture of these materials showed no basic differences from that described previously. The only difference were frequently occurring blood vessels full of blood cells and interlacing within the canals (Fig. 16).

INFESTATION WITH A YEAST-LIKE FUNGUS OF THE GENUS *CANDIDA*

In some instances, a picture resembling that of mycelium threads penetrating from one lacuna to another was encountered. It was difficult to identify them with certainty, particularly in view of the fact that the materials had been stored frozen (Fig. 17).

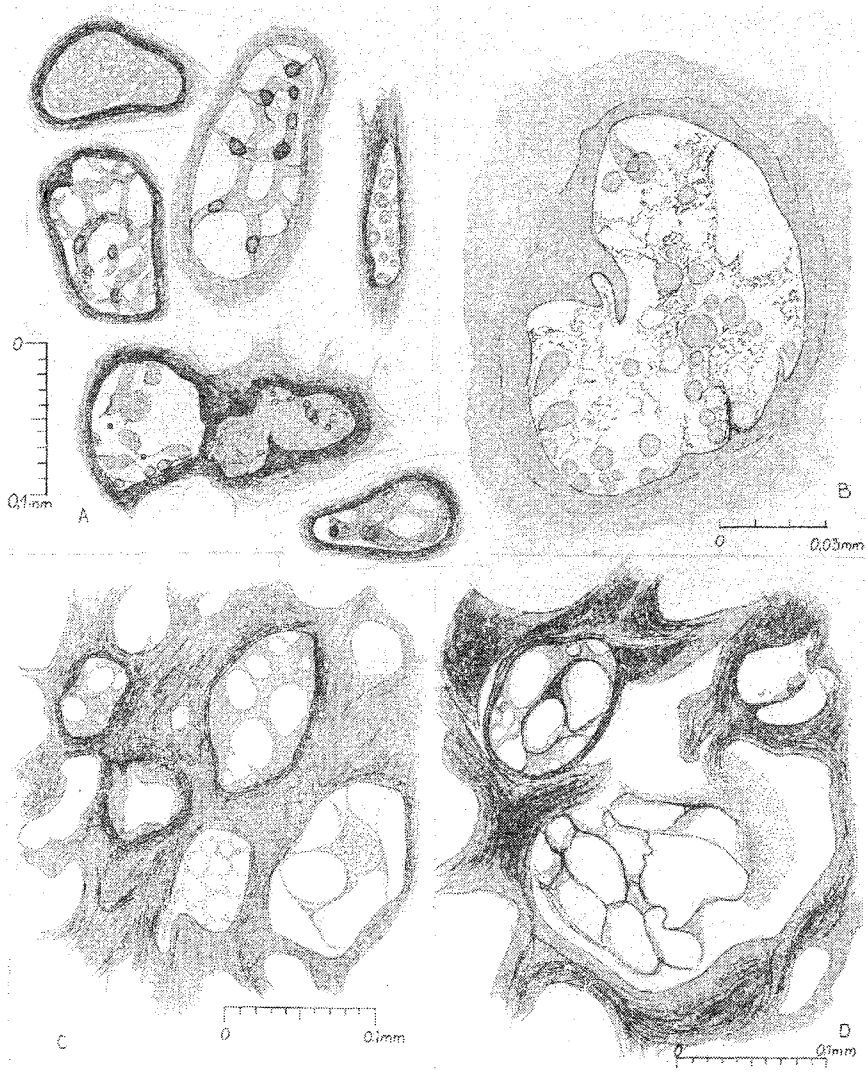

Fig. 14. Most frequent pictures of outgrowth lacunae contents

In order to make sure if fungi are really involved, newly caught frozen fishes were brought from the Namibian fishing grounds thanks to Mr Ryszard Majchrzak of the Sea Fisheries Institute, Świnoujście Branch.

After thawing, the outgrowths were isolated, superficially disinfected, crushed, and inoculated in a fungal medium. Practically in every case (more than 22 samples) a homogenous mycelium was obtained. After this encouraging trial, a similar procedure was

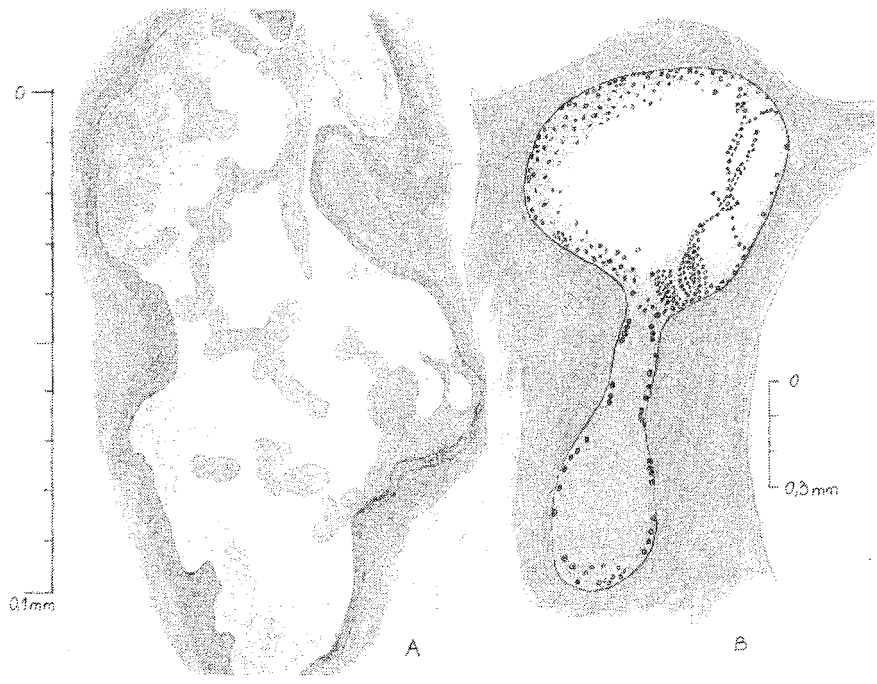

Fig. 15. Lacunae interior. A – most frequently found; B – found exceptionally

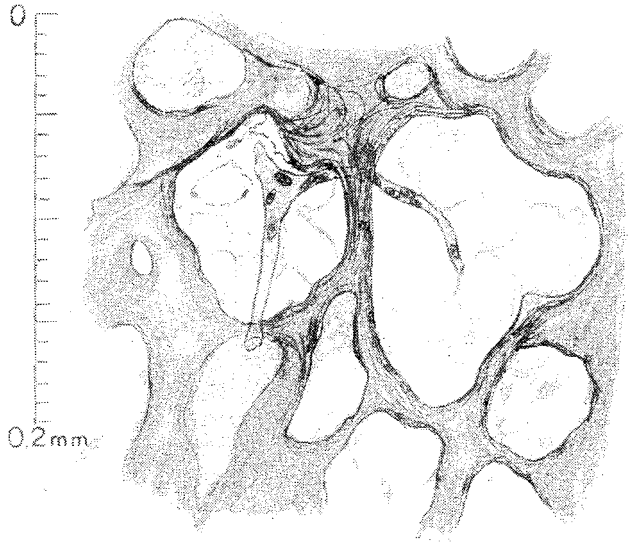

Fig. 16. Blood vessels in outgrowth canals

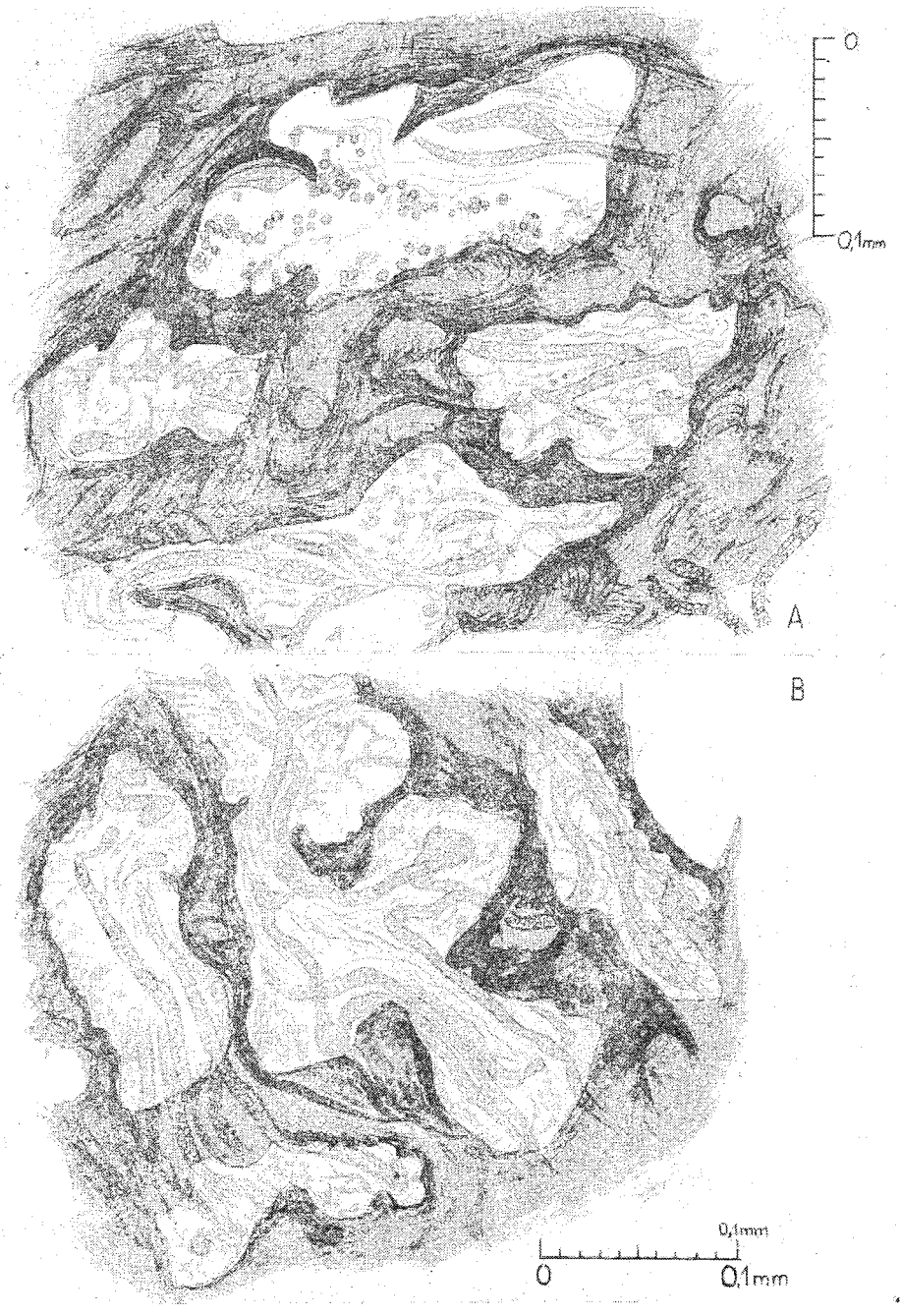

Fig. 17. Mycelium inside the lacune

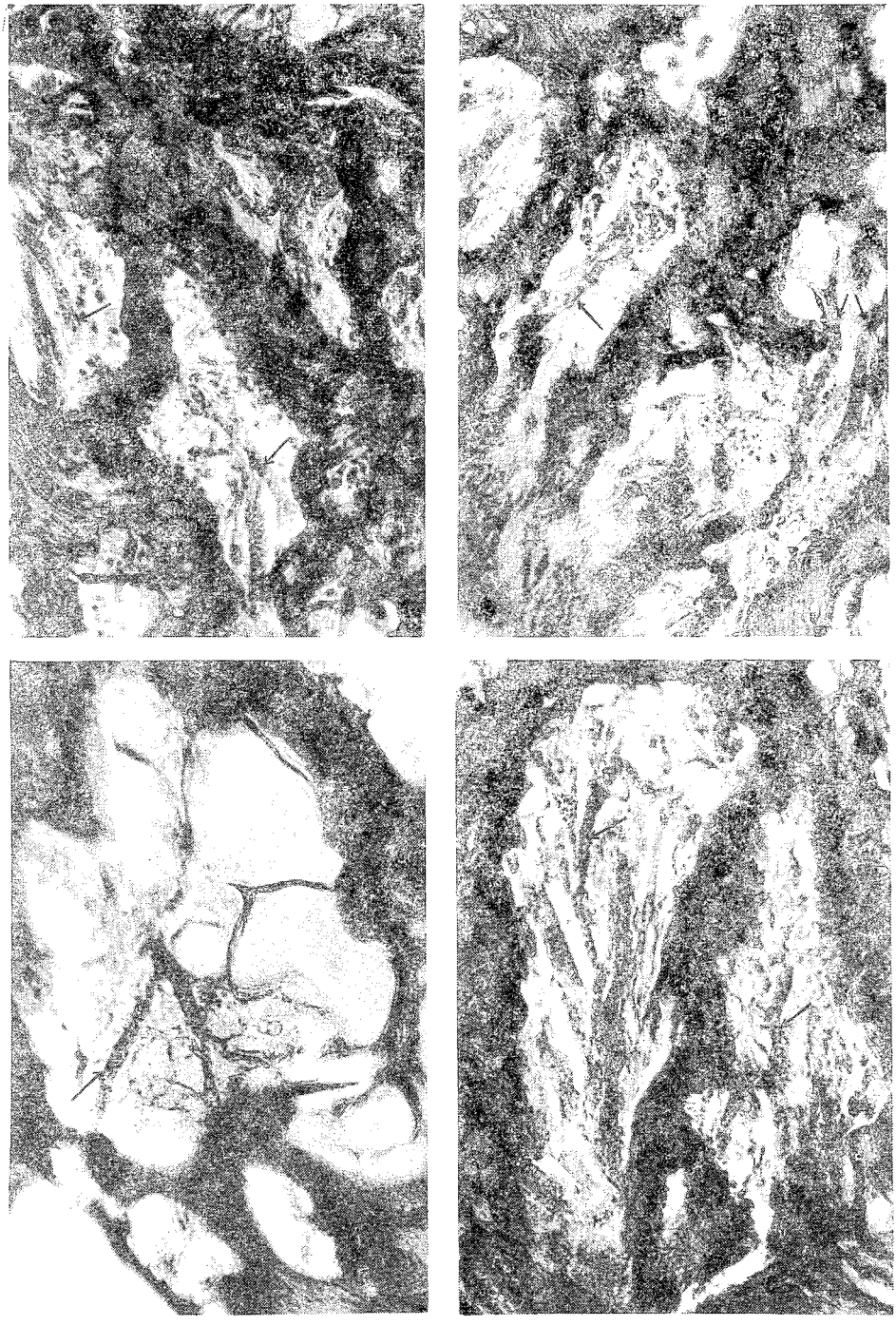

Fig. 18. Mycelium inside the lacunae. Arrows indicate the mycelium (Photo: Dr I. Majchrowicz)

Fig. 19. A branched mycelium inside a lacunae. (Photo: I. Korzyńska)

applied to muscles of other fish specimens from the same batch. The materials were taken from dorsal muscles of those individuals possessing outgrowths. Similar colonies of fungi were obtained in every case. The colonies were identical and very abundant in the two groups. The fungi were tentatively identified as *Candida sp.* (?).

CONCLUSIONS

The ourgrowths found on the fin pterygophores result from the infestation with yeast-like fungi (*Phycomycetes*) identified as *Candida sp.* (?).

ACKNOWLEDGEMENTS

I would like to extend my sinclere thanks to Dr. Maciej Krzeptowski for his assistance in obtaining the materials; my special gratitude is due to Dr. Irena Majchrowicz for her help in identifying the fungi and my sincere thanks go to Mr Heese M.Sc., for collecting and preserving the materials from Namibian fishing grounds.

REFERENCES

Bertin L., 1958: Tissus squeletiques. in Grassé – Traité de Zoologie. Agnatha et Poissons. Anatomie, ethologie, systematique. XII, 1: 557–559.

Translated: Dr Teresa Radziejewska

E. Grabda

NAROŚLA NA DŹWIGACZACH PROMIENI PŁETW NIEPARZYSTYCH U PAŁASZA OGONIASTEGO *LEPIDOPUS CAUDATUS* (EUPHRASEN, 1788) (*PISCES: TRICHIURIDAE*) NA TLE GRZYBICZYM

Streszczenie

Autor zainteresował się kulistymi naroślami, występującymi u pałasza ogoniastego *Lepidopus caudatus* na dźwigaczach promieni (*pterygophores*), głównie płetwy grzbietowej ale i podogonowej. (Fig. 1–3). Przebadano szczegółowo ich budowę pod względem histologicznym.

Mają one jakby charakter dobrotliwych rozrostów o typie nakostniaków (*osteoses*), silnie zwapniałych. Jednakże okazało się że dźwigacze nie są zbudowane z tkanki kostnej a tzw. chondroidalnej. Narośla w miarę wzrostu przyjmują strukturę silnie gąbczastą (Fig. 11, 12). Okazało się również, że nie są osadzone w mięśniach wprost, ale jakby umocnione całym szeregiem „wsporników" – pasm tkanki łącznej włóknistej (Fig. 6, 12).

Przypuszcza się, że wolne przestrzenie są silnie rozrośniętymi chondrocytami, których cytoplazma ulega silnej degeneracji a przede wszystkim wakuolizacji.

Na niektórych preparatach zauważono we wnętrzu komór obecność nitek splątka grzybni. Dało to asumpt do sprawdzenia narośli na obecność grzybów drogą wysiewu. Uzyskano potwierdzenie 100%. Na pożywce Sabouro stwierdzono we wszystkich przypadkach porost jednolitych grzybów z grupy drożdżaków zbliżonych do rodzaju *Candida* sensu lato. Jednakże bliżej ich przynależności systematycznej nie udało się dotychczas ustalić.

Э. Грабда

НАРОСТЫ НА ПОДЪЕМНИКАХ ЛУЧЕЙ НЕЧЁТНЫХ ПЛАВНИКОВ САБЛИ - РЫБЫ LEPIDOPUS CAUDATUS (EUPHRASEN, 1788) (PISCES; TRICHIURIDAE) НА ОСНОВЕ МИКОЗА

Р е з ю м е

Объектом заинтересования автора были шаровидные наросты обнаруженные у сабли - рыбы Lepidopus caudatus на подъёмниках лучей (pterygophores) в основном спинного плавника, но также и подхвостого (рис.1-3). Исследовали тщательно их строение гистологическими методами.

Имеют они как будто вид незлокачественных нарослей накостного типа (osteoses), сильно окостенелых. Однако оказалось, что подъемники лучей не имеют костной структуры, а имеют тнз хроноидальную. Наросты по мере роста принимают ярко-выраженную губчастую структуру (рис.11,12). Обнару-

жили также они не размещаются непосредственно в мышцах, а как будто крепятся рядом „опор" - пучков соединительной волокнистой ткани (рис.6,12).

Предполагается что свободные промужуточные пространства являются сильно разросшимися хондроцитами, которых цитоплазма подвергается значительной дегенерации и прежде всего вакуолизации.

В некоторых препаратах наблюдали внутри клеток наличие ниток сплетков микоза. Это дало толчок к проверке нароста на наличие грибов путём посева. Получили 100%-ое подтверждение. На питательной среде Sabouro обнаружили что во всех случаях поросли одинаковых грибов из группы дрожжевых близских к роду Candida sensu lato . Однако ближшей систематической принадлежности установить не удалось.

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