

Discovery of a Myxosporidean With Four Valves in a Freshwater Fish and Discussion of Its Taxonomic Position

HSIEH SHING-REN and XIAO CHONGXUE

Institute of Hydrobiology
Academia Sinica
Wuhan, Hubei 430072
China

Abstract - A new myxosporidean, *Octospina tongrensis* n.g., n.sp. is described from the swimbladder wall and gallbladder of a grass carp (*Ctenopharyngodon idella*) collected in May 1988 in Tongren District, Guizhou Province, China. The spore is oval in frontal view with four similar shell valves of elongate oval form. The four sutural ridges are fine and distinct, extending anteriorly and posteriorly in the form of eight spines. Four equal pyriform polar capsules are present in the anterior part of the spore; a large iodophilous vacuole is present in the sporoplasm. A new family Spinavaculidae n. fam., is created to contain the new genus *Octospina*.

The new family clearly does not fit within either of the two myxosporean orders as they are currently defined, i.e., Bivalvulida and Multivalvukida. We suggest that it be defined as "incertae sedis."

Octospina tongrensis n. sp. shares the characteristics of both marine and freshwater myxosporideans. Based on the geographical and geological processes which have occurred in the Tongren District, it is considered a euryhaline relict of a previously marine environment.

A myxosporidean was discovered in the swimbladder wall and gallbladder of a grass carp in May 1988, in Tongren District, Guizhou Province, in southern China. The taxonomic characteristics of this species are as follows:

Species description: *Octospina tongrensis* n.sp.

Host : *Ctenopharyngodon idella* (22 cm. in length, 120 g in weight)

Location : Swimbladder wall, gallbladder (densely attached to the inner epithelium of swimbladder wall and gallbladder wall, and floating in the bile)

- Locality : Tongren District, Guizhou Province, China, 27°37'N, 109°19'E
- Date of collection : May 1988
- Deposition of material : Two vials, one each containing formalin-fixed gallbladder and swimbladder, designated as syntypes, are deposited in the Museum of the Institute of Hydrobiology, Academia Sinica, Wuhan, as Sci. No. 8801.
- Trophozoite : Not observed.
- Spore : Spore oval in frontal view with broadly rounded anterior, tapering gradually from middle of spore to bluntly rounded posterior. Spore composed of four identical valves with smooth surfaces. Sutural ridges four in number, straight, fine, extending anteriorly and posteriorly as four well developed anterior spines, and four similar posterior spines sub-equal in length. Spore rounded to squarish in anterior view, with suture lines passing diagonally across polar capsules. Polar capsules pyriform, containing polar filament with 4-5 coils. Polar capsule nuclei present near posterior margins of polar capsules. Sporoplasm homogeneous and finely granular, containing a prominent iodophilous vacuole and two nuclei (Fig. 1). Dimensions, given in micrometers, and based on measurement of 20 formalin-preserved spores are as follows: Spore 12.2-13.5 (12.9 ± 0.4) in length, 8.5-9.8 (9.0 ± 0.3) in width. Length of anterior valvular spines 10.2-18.3 (16.1 ± 1.6); that of posterior valvular spines 14.0-27.0 (23.4 ± 2.6). Polar capsules 3.8-4.5 (4.0 ± 0.2) long, 2.8-3.5 (3.0 ± 0.2) wide.

Based on the above species descriptions, this new myxosporidean is identified as belonging to *Octospina* n.gen., and *Octospina tongrensis* n.sp. Although the Family Kudoidae (Lom and Noble 1984), within the Order Multivalvulida contains species with four valves and four polar capsules, the new genus bears little

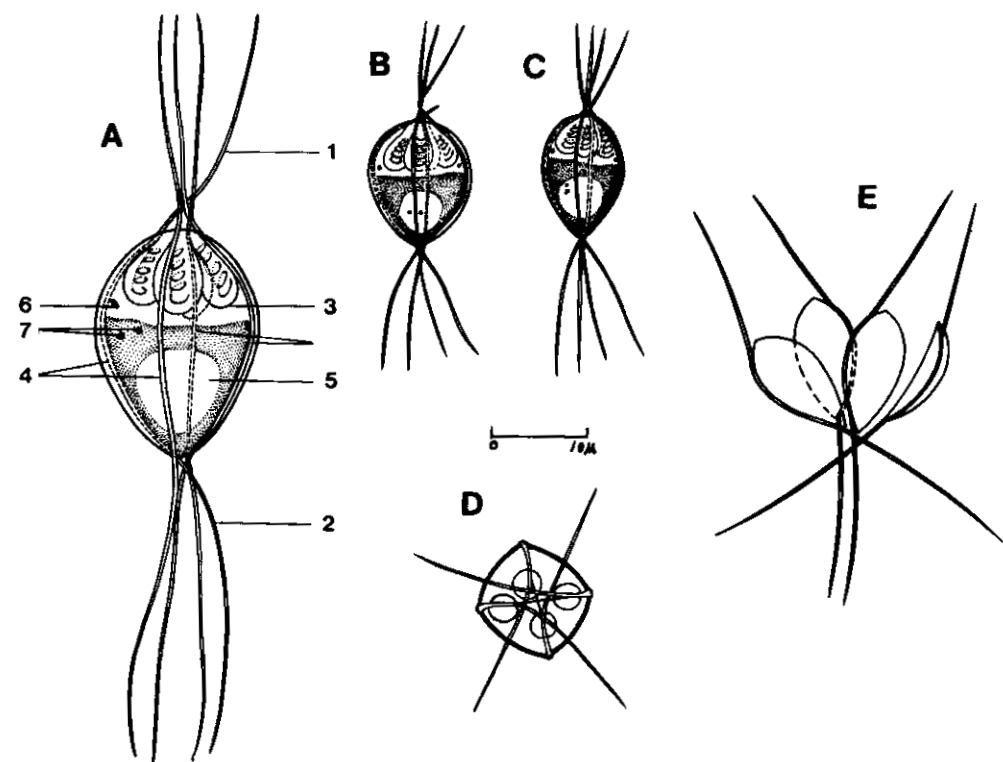


Fig. 1. Spore of *Octospina tongrensis* n. sp. A. Schematic diagram; B-C. Front view; D. Apex view; E. Illustration of how the spore valves separate; (1. Anterior spine; 2. Posterior spine; 3. Polar capsules; 4. Sutural ridge; 5. Iodinophilous vacuole; 6. Polar capsule nucleus; 7. Sporoplasm nuclei.) Scale bar A-C = 10 μ m.

resemblance to members of this family and therefore cannot be assigned to it. Given that the number of polar capsules and presence of an iodophilous vacuole are both criteria for separation of families, a new family can be established: Spinavaculidae n.fam.

Diagnoses for these new taxa are as follows:

Family Spinavaculidae: Myxosporidea possessing spores with four valves, four polar capsules at one pole, and an iodophilous vacuole, and with spines.

Genus *Octospina*: Myxosporidea possessing spores with four valves, four polar capsules at one pole, an iodophilous vacuole, and eight spines.

The number of valves is one of the most stable characters of myxosporideans and is the main criterion for the separation of orders in the Myxosporia (Shulman 1966; Gaevskaya et al. 1982). The Bivalvulida, members of which have two valves, contains more than 1,000 species, much more than the Multivalvulida; most of them live in freshwater fish. Multivalvulida have three, four, five (Naidenova and Zaika 1970), six (Arai and Matsumoto 1953) or seven (Hsieh and Chen 1984) valves. Only about 50 species have been discovered and their structures are simple.

From the above description, it can be seen that spores of this new family have a very special structure compared with those of Bivalvulida and Multivalvulida. The new family shares certain characteristics of both of these orders. Nevertheless, there are important differences between them. Bivalvulida have only two shell valves, while this new family has four. Multivalvulida (Levine et al. 1980) live in marine fish and have no iodophilous vacuole; their shells extend radially and their spores are anteriorly-posteriorly flattened, while this new family has an iodophilous vacuole. Its single species *Octospina tongrensis* lives in a freshwater fish and has a large iodophilous vacuole located in the posterior of the spore, which is oval and possesses four sutural ridges extending anteriorly and posteriorly as eight free spines.

Given these differences, we think that the taxonomic position of this new family in the established taxonomic system cannot be decided. Since it is inappropriate to place the new family in either the Bivalvulida or the Multivalvulida, we suggest that it be defined as "incertae sedis" temporarily. The final taxonomic position depends on the improvement and completeness of myxosporidean taxonomy.

We believe that with the unceasing discovery of new species, the Multivalvulida will perhaps be separated into several new orders. Among Multivalvulida, the four-valve myxosporideans have more species (about 40) (Egusa 1986) than any other Multivalvulida myxosporideans. Besides marine species, they also have species in freshwater with an iodophilous vacuole. Perhaps they can be separated first from the Multivalvulida to form a new order - Tetra-valvulida. Then the Spinavaculidae can be placed in the new order.

Acknowledgements

We would like to express our sincere thanks to Prof. Liu Jiankang, Dr. J.R. Arthur, Wu Baohua and Ma Cheng-lun for their valuable comments on the manuscript.

References

- Arai, Y. and K. Matsumoto. 1953. On a new Sporozoa, *Hexacapsula neothunni* gen. et sp. nov. from the muscle of yellowfin tuna, *Neothunnus macropterus*. Bull. Japan. Soc. Sci. Fish. 18:293-299.
- Egusa, S., 1986 The Order Multivalvulida Schulman, 1959 (Myxozoa: Myxosporidea): A review. Fish Pathol. 21:261-274. (In Japanese.)
- Gaevskaya, A.V., A.A. Kovaleva and S.S. Shulman. 1982. *Neoparvicapsula* gen. n. and the position of the Family Parvicapsulidae among the Myxosporidia. Zool. Zh. 61:774-776. (In Russian with English abstract.)
- Hsieh Shing-ren and Chen Chih-leu 1984. *Septemcapsula yasunagai* gen. et sp. nov., representative of a new family of the Class Myxosporidea. Acta Zootaxonom. Sin. 9:225-227.
- Levine, N.D., J.O. Corliss, F.E.G. Cox, G. Deroux, J. Grain, B.M. Honigberg, G.F. Leedale, A.R. Loeblich, III, J. Lom, D. Lynn, E.G. Merinfeld, S.F.C. Page, G. Poljansky, V. Sprague, J. Vavra and F.G. Wallage. 1980. A newly revised classification of the Protozoa. J. Protozool. 27:37-58.
- Lom, J. and E.R. Noble. 1984. Revised classification of the Class Myxosporidea Butschli, 1881. Folia Parasitol. 31:193-205.
- Naidenova, N.N. and V.E. Zaika. 1970. Three new genera of Myxosporidia-fish parasites from the Indian Ocean. Zool. Zh. N.3. (In Russian with English abstract.)
- Shulman, S.S. 1966. Myxosporidia in the fauna of the USSR. Izd. "Nauka", Moscow-Leningrad, 505 p.