Abstract №57

Disorder of Symmetry in the Marine Starfishes of the Amursky Bay of Japan sea

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Abstract. **The marine starfishes have usually radial five-armed symmetry. But some diversions were described. So, occurrence of specimens with 4-7 arms is described in big Indian star Oreaster reticulates that normally have 5 arms.**

We explored frequency of disorder in five-armed symmetry of starfishes Asterias amurensis and Patiria pectinifera from Amursky Bay of Japan sea.

Samples of Asterias amurensis taken on the shallow waters stripe near Skrebtsova Island from 0,5-2,5 m depth in 1992 consisted of more than 10000 specimens and samples of Patiria pectinifera included more than 5000 specimens. Frequency of occurrence of anomalous starfishes was determined regarding number of arms. Among 11520 starfishes of normally five-armed Asterias amurensis there were found 2 specimens of 4-armed, 13 specimens of 6-armed, 5 specimens of 7-armed, 1 specimen of 3-armed ones. In case of decrease in number of arms we counted only such animals, which had no signs of secondary loss. Specifically, it was noted that deviation from five-armed specimen often was observed towards increase in number of the feature. The 4-armed specimens as it was found in Asterias amurensis were encountered seldom.

High frequency of anomalous starfishes in the Amursky Bay is associated apparently with higher rate of contamination factors by heavy metals and toxicants of production that are specific for this bay.

Key words: starfishes, Asterias amurensis, Patiria pectinifera, disorders in symmetry.

I. INTRODUCTION

Presence of symmetry is inherent in various spices of animals from Protozoa to Entozoan ones. Two types of symmetry – bilateral and radial are assumed. The radial symmetry features coelenterates, radiolarians, echinodermata, sponges, ascidia and some other. The bilateral one seems to be more prospective in term of evolution. The animals having it evolutes towards segmentation of body, differentiation of segments, formation of active pedes with different functions. Possessing radial symmetry the animals are less intricate in their structure and slow moving or sedentary way of life features them. Appearing three – armed (in ambulacra channels development) and bilateral symmetry (as development in the center-ventral part of radial channel) both prevailing over usual five-armed symmetry were observed at the early stages of pentactules development in Cucumaria japonica and Eupentacta fraudatrix [1,2]. The larvae underwent changes in symmetry towards decrease of body parts number. So, the adult animals have partly bilateral symmetry.

Bilateral symmetry is the phenomenon when formation of feature from one side is associated with presence of such feature from the other side [3].

This phenomenon lies in the base of morphological and physiological processes of organism. It concerns external and internal structure.

Among animals there are possible various types of symmetry disorder. Some types are exposed by inheritance induced by adaptive changes (for example, left hemisphere function of the human being cerebrum). Such type of exposure in different groups of living beings seems to be absolutely distinct.

We explored disorder of symmetry in objects with radial symmetry that was not subjected to classification of N.V. Timofeev-Resovsky and V.I. Ivanov [3].

II. MATERIALS AND METHODS

The marine starfishes possess radial five-armed symmetry. But some diversions were depicted. So, occurrence of specimens with 4-7 arms [4] is described in big Indian starfish Oreaster reticulates that normally have 5 arms. We explored frequency of occurrence of anomalous marine starfishes of two species from Amursky Bay (regarding number of arms). Samples of Asterias amurensis taken on the shallow waters stripe near Skrebtsova Island from 0,5-2,5 m depth in 1992 consisted of more than 10000 specimens and samples of Patiria pectinifera included more than 5000 specimens. Frequency of occurrence of anomalous starfishes was determined regarding number of arms.

III. RESULTS

Among 11520 specimens of normally five-armed Asterias amurensis there were found 0,017% (2 pieces) of 4-armed, 0,113% (13 pieces) of 6-armed, 0,043% (5 pieces) of 7-armed, 0,009% (1) of 3-armed ones (Table, Fig. 1). In case of decrease in number of arms we counted only such animals, which had no signs of secondary loss (this example is given in Fig. 2). Variation of arms number was disclosed in Patiria pectinifera also. This normally five-armed starfish can have from 4 to 7 arms. Specifically, it was noted that diversion from five-armed specimen (Fig.

1) often was observed towards increase in number of the features. The 4-armed specimens as it was found in Asterias amurensis were encountered seldom.

Actually, the arm-rays aren't pedes, because they contain parts of various systems of the organism, those of quintuple multiplied. So, selection that eliminates anomalous starfishes accordingly this feature possibly was not so severe as, for example, accordingly anomalous number of pedes in vertebrata. In this case the asymmetry doesn't fulfill any function.

It is noticed that frequency of asymmetry exposure in number of starfish arms-rays is significantly lower, than FA (fluctuating asymmetry) in salmons which were studied also by us [5]. At the same time it is damage of ontogenesis that has some common features with FA. The asymmetry of starfishes is observed as toward decrease of feature as increase of it. Increase took place more often. Probably, high frequency of anomalous starfishes in the Amursky Bay is associated with higher level of contamination factors by heavy metals and various toxicants of production and domestic origin that were specific for this bay [6].

IV. CONCLUSIONS

The phenomenon of disorder in five-armed symmetry of starfishes Asterias amurensis and Patiria pectinifera from Amursky Bay is studied. Frequency of occurrence of 3-, 4-, 5-, 6-, 7-armed specimens is described. More often the 6-armed starfishes were encountered. The peculiarities of this phenomenon are discussed.

References

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TABLE

NUMBER OF SPICIES WITH ANOMALOUS FIGURES OF ARMS-RAYS IN ENTIRE STARFISH SAMPLE OF ASTERIAS AMURENSIS 11520 PIECES

№	Number of arms-rays	Number starfishes with anomalous	Number starfishes with anomalous, %
1	6	13	0,113
2	7	5	0,043
3	4	2	0,017
4	3	1	0,009

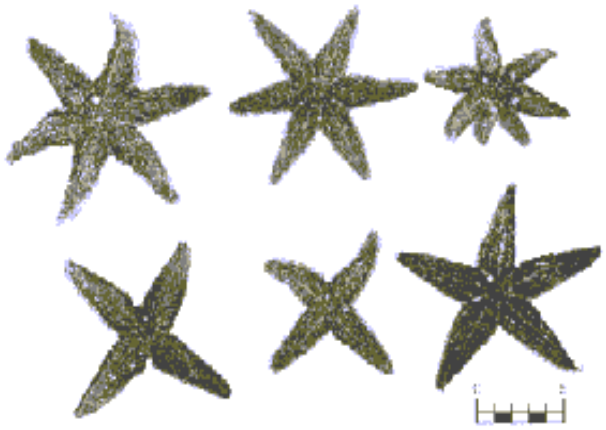


Fig. 1. Variability of number arms-rays Asterias amurensis.

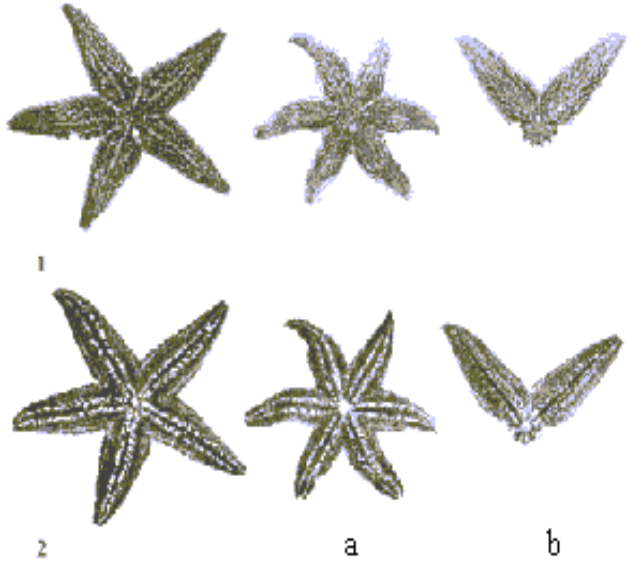
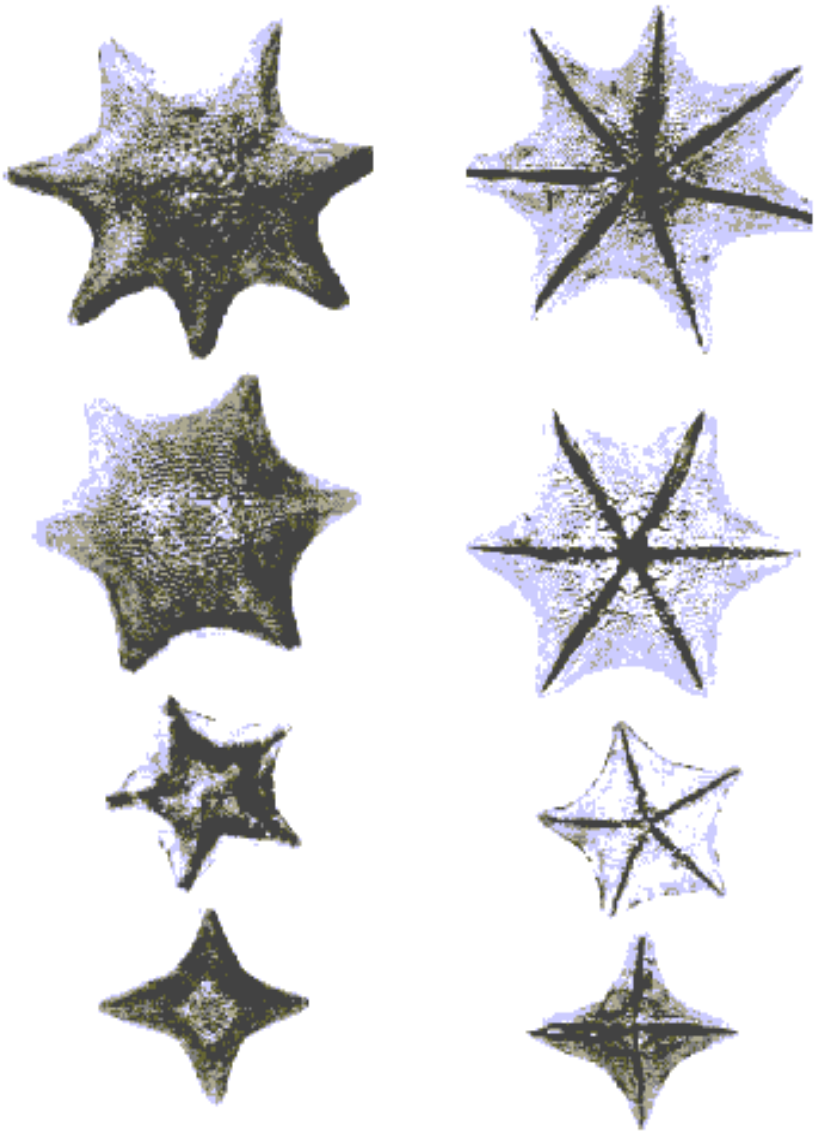


Fig. 2. Star-fishes Asterias amurensis: 1 – dorsal side, 2– ventral side;
with : a - anomalous number of arms-rays,
b - secondary loss of arms-rays.



a b

Fig. 3. Variability of number arms-rays of Patiria pectinifera: a – dorsal side, b – ventral side

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