

NOTES ON NATURAL EVISCERATION OF THE SEA CUCUMBER *ACTINOPYGA AGASSIZI* SELENKA

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ABSTRACT

Three cases of evisceration in nature of the aspidochirote holothurian, *Actinopyga agassizi* Selenka are reported from West End, Grand Bahama, together with the occurrence of natural evisceration in three out of a group of four animals collected at Powell Point, Eleuthera. Results of periodic checks of the population during a year in the West End area are given. The effect on the holothurians of a sudden appearance of an unidentified blue-green alga in the area is described.

INTRODUCTION

Many holothurians eviscerate if disturbed by man, but evisceration prompted by external or internal stimuli, under natural conditions, has been reported for only a few species. Hitherto, there has been no report of naturally occurring evisceration of *Actinopyga agassizi* Selenka. In the course of previous work with this species (Mosher, 1956), the author found no evidence of natural self-mutilation without stimulation caused by man's activities. In February of 1963, however, the author found a single individual with incomplete viscera. Periodic checks were made throughout the following year in order to determine whether *A. agassizi* should be grouped with those holothurians described as undergoing seasonal evisceration, *Stichopus regalis* reported by Bertolini (1932) and *Parastichopus californicus* reported by Swan (1961).

The author is indebted to Lowell P. Thomas of The Institute of Marine Science, University of Miami, for his invaluable assistance in preparing the manuscript.

EXPERIMENTS AND OBSERVATIONS

From February 1963 through January 1964, groups of eight to twelve individuals were collected at intervals of three to eight weeks. All collections were made from the shallow beds of *Thalassia testudinum* König immediately adjacent to the northern shore of Grand Bahama and extending from in front of the Grand Bahama Hotel through the village of West End, a distance of approximately two miles. All animals were dissected and examined. Concomitantly, two groups of cucumbers were experimentally induced to eviscerate, and individuals were sacrificed and examined periodically. One experimental group was studied from February to May, the other from July to August.

Initial regeneration in both experimental groups proceeded rapidly. In

the group studied during the winter months, a specimen sacrificed 38 days after induced evisceration, had a complete tubular intestine containing some ingested food material. However, in gross examination, there was no trace of regeneration of the associated rete mirabile. A specimen sacrificed 81 days after evisceration had only very rudimentary development of the rete mirabile, whereas at 97 days, specimens appeared almost normal. Although there was some acceleration of initial regeneration in the group studied during the summer months, the same lag was apparent between the completion of a tubular intestine and full development of the rete mirabile, no trace of the latter being evident after as much as 35 days.

On the basis of observation of the experimental groups, animals collected in the field were considered to be without complete viscera if the rete mirabile was in an obviously reduced state, even though they had an apparently functioning intestine. In the course of a year's study in the described collection area, no regenerating specimens, other than the original one noted above, were found out of a total of 131 animals examined in 13 groups. This specimen, found on February 1, 1963, was in an estimated two to three week stage of regeneration. Outside of the usual collecting grounds, two other animals in a partially regenerated condition were found: one on February 9 in a four to six week stage, and one on May 12 in a two to three week stage. They were collected singly near Sandy Cay, about nine miles distant from the principal collection grounds. It should be noted that this locality apparently is not particularly favorable to *A. agassizi*, this species being only a very occasional member of the fauna.

A single collection of four individuals was made on December 28, 1963, from Powell Point, Eleuthera, in a locality normally heavily populated by *A. agassizi*. Of these four animals, three had eviscerated very recently, probably within the preceding week. At West End, Grand Bahama, eleven animals on November 28 and twelve on January 23 showed no evidence of natural evisceration.

In order to determine if stormy seas might bring about evisceration, two collections were made, on April 5 and May 8, immediately following heavy on-shore winds of several days' duration. Despite strong wave action which resulted in extreme turbidity throughout the *Thalassia* environment, all of the specimens collected were packed with sand and were apparently feeding normally.

In the course of a collection made in late August, the author observed a rather startling phenomenon. There had been an abrupt appearance of an unidentified blue-green alga, which overlaid the bottom indiscriminately, coating sand, *Thalassia* blades and rocks alike. The sea cucumbers (*A. agassizi*), which were feeding on the bottom material, all had their normally dull tan oral tentacles stained a rather spectacular bright blue-green. Additionally, in two individuals, the tissues of the anterior gut, the sand

boluses enclosed in the posterior gut, and the respiratory trees, were stained to a somewhat lesser extent. Three days after this collection was made, several cucumbers were found with the discoloration of the tentacles persisting, although the alga had disappeared except for a few isolated patches. At the time of the following collection, forty days later, there was no trace of discoloration in any of the holothurians examined.

DISCUSSION

Although it is well known that under unfavorable conditions, such as fouling of the water, rise of temperature, or excessive irritation, captive holothurians do eject their viscera, evisceration under natural conditions has been described as a common event for only a few species. Crozier (1914) considered evisceration of *H. parvula* (*H. captiva*) the result of adverse conditions seldom occurring in nature. Likewise, Dawbin (1949) found it to be a rare natural phenomenon in *Stichopus mollis*. As a result of some most interesting tests, he concluded that one stimulus evoking the evisceration response in this species is the accumulation of its excretory products in the water. However, he points out that this and other adverse conditions stimulating evisceration experimentally could not be expected to occur in the natural habitat. Additionally, he simulated the irritation which might occur during predator attack, and concluded that, even though evisceration might take place, it was too slow a response to be of value in defense. In a recent paper, Swan (1961) has given data showing clear-cut evidence of the seasonal evisceration in nature of the population of *Parastichopus californicus* at Friday Harbour. His data show that the total population of this species probably undergoes evisceration in the month of October. This parallels Bertolini's (1932) observations, which show the probability of seasonal evisceration in late fall of *Stichopus regalis*. The question arises whether this is an event controlled by an internal rhythm, or whether it is a response by the holothurians to adverse conditions occurring only seasonally in the habitat.

The author wishes to stress that the present data on *Actinopyga agassizi* show that evisceration in nature of this species is a rather occasional phenomenon only in the immediate area of study, West End, Grand Bahama. Although the sample from Eleuthera was admittedly small, it does suggest the possibility of far more wide-spread evisceration in that environment. If such should be the case, further comparisons of seasonal conditions in the two habitats might show a correlation with some environmental change. Although the described effect of the blue-green alga on the holothurians at West End was a fleeting one and apparently not deleterious, it is possible that a similar periodic event might provide the stimulus for evisceration.

CONCLUSIONS

1. Regeneration rate, determined experimentally in *Actinopyga agassizi* Selenka, indicates that an animal which had eviscerated in nature would be recognizable as such after an interval of as long as eighty days at winter water temperatures (in the Bahamas).

2. Evisceration in nature of this species does occur occasionally in the vicinity of West End, Grand Bahama.

3. There is no evidence that this natural evisceration is either a seasonal phenomenon, or directly related to storms in the immediate area.

4. There is an indication of a far more wide-spread natural evisceration of this species during December in the vicinity of Eleuthera Island, Bahamas.

SUMARIO

NOTAS SOBRE LA EVISPERACIÓN NATURAL DEL PEPINO DE MAR,
Actinopyga agassizi SELENKA

Tres casos de evisperación natural en *Actinopyga agassizi* Selenka fueron encontrados en la vecindad de West End, Grand Bahama, dos en Febrero y uno en Mayo. Sin embargo, exámenes periódicos de grupos de esta especie, en el área, durante el año, revelaron no haber tendencia estacional para la evisperación espontánea, como ha sido descrito para otros holoturoideos aspidochirotas. Una pequeña colección de *A. agassizi* tomada en Eleuthera Island indica la posibilidad de una evisperación natural más ampliamente extendida durante Diciembre en este habitat particular. Se describe la coloración de los tentáculos orales y parte anterior del intestino por un alga verde-azul sin identificar.

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