Opisthobranch Newsletter

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EDITOR'S NOTES

Hans Bertsch, Dave Behrens and others frequently review material for the ON -- thanks! This publication would be impossible without their help. Gary McDonald, Mike Miller, Sandra Millen, Kerry Clark, Bob Bolland and many others are also regular contributors.

This is the final number for this volume. Please send in your subscriptions soon and consider setting up a second subscription for your favorite institution. I know this is a busy time of year -- support your ON.

CONCH-L went through an interesting discussion on bibliographical citations of Web material. Opinions differ but more and more information is going onto the Internet.

PERSONAL NOTES

From Ángel Valdés: I have got a postdoctoral fellowship from the Spanish goverment to carry out a project on cryptobranch dorid systematics at the California Academy of Sciences, San Francisco, under Terry Gosliner's supervision. In the next weeks I will probably bother some of you asking for material or information of any kind. As soon as our work progress we will inform you. - California Academy of Sciences, Department of Invertebrate Zoology and Geology, Golden Gate Park, San Francisco, CA 94118

From Manuel Ballesteros: My interest about opisthobranchs is the anatomy, ecology, reproduction of nudibranchs and sacoglossans from the european waters, principally from the Mediterranean sea. Actually, Dr. Conxita Avila and I are leading the research of a new student, Anna Domenech, who is carrying out a study about the faunistic, anatomy and the chemical ecology of the doridaceans from the Cabo de Creus (Costa Brava, NE Spain). - Dept. Biologia Animal, Facultat Biologia, Univ. Barcelona, Av. Diagonal, 645, 08028 Barcelona, Spain

Hans Bertsch is going down to Bahía de Los Angeles and La Paz at the end of November for some research. I'm not certain how long he will be there.

READER FORUM

Aspects of Chilean nudibranch biology: Effects of splanchnotrophid copepod parasitism on *Flabellina* sp.1 (Mollusca, Nudibranchia).

by Michael Schrödl

INTRODUCTION

Shell-less opisthobranchs, especially nudibranchs are known hosts for endoparasitic copepods of the family Splanchnotrophidae (Hyman, 1967; Jensen, 1987). However, little information exists on the effects of these parasites on their hosts. Chilean specimens of *Rostanga pulchra* MacFarland, 1906 and *Eubranchus agrius* Marcus, 1959 internally infected with a single copepod parasite were not obviously damaged (Marcus, 1959). A small *Acanthodoris falklandica* Eliot, 1907, however, was described to be in very bad condition due to a high number of endoparasites (Marcus, 1959). *Phidiana lynceus* Bergh, 1867 and *Ercolania funerea* (Costa) lacked most of their gonads due to the presence of relatively large but single females of *Ismaila monstrosa* Bergh, 1867 (Bergh, 1867; Jensen, 1987). In another case, the influence of the parasite appears to have been more subtle. The sacoglossan *Elysia australis* (Quoy & Gaimard, 1832), infected with a single female of *Splanchnotrophus elysiae* Jensen, 1990, had well developed gonads, but had apparently lost the interest or ability to copulate (Jensen, 1990).

Opisthobranch host species seem to be only sporadically infected by splanchnotrophids (e.g. Bergh, 1867; Ho, 1981; Jensen, 1987, 1990). However, Belcik (1965; 1981) reported that 62% of an unspecified number of *Janolus fuscus* O'Donoghue, 1924 collected in summer in Oregon were parasitized by *Ismaila belciki* Ho, 1987 (as *I. monstrosa;* see Ho, 1987). In a central Chilean population of *Okenia luna* Millen, Schrödl, Vargas & Indacochea, 1994 70% of the 121 specimens collected from March to May 1992 were infested with an unidentified *Ismaila* species (Millen *et al*., 1994; own observation). Neither study described any effects of the parasites on the nudibranchs.

It is not clear how the effects of splanchnotrophid parasitism depend on the species involved. Observed effects could result from diversion of energy resources from host to parasite, preemption of space for normal development of the host's gonads, or damage by a badly adapted parasitoid species. Owing to the general lack of information on infection rates and effects on reproductive output, little can be said at present about potential regulatory effects of these parasites on populations of their opisthobranch hosts.

During my studies of opisthobranchs in the central Chilean Bay of Coliumo, the rather common aeolidacean nudibranch species *Flabellina* sp. 1

(Millen & Schrödl, in description) was found to be infected with an endoparasitic *Ismaila* species (Schrödl, 1996). The present study gives data on infection rates, describes damage to the host, and suggests that parasitism by *Ismaila* sp. can significantly affect populations of *Flabellina* sp. 1.

METHODS

During 1991 to 1996, a total of 88 *Flabellina sp.* 1 (species name according to Schrödl, 1996) was collected in the Bahía de Coliumo from depths of 1-8 m using SCUBA, and then examined under a dissecting microscope for the presence of mature female *Ismaila* sp. (as indicated by the presence of external egg sacs). The presence and position of host gonads was studied through the translucent body integument of the living specimens, which were then preserved in 70% ethanol. Several infected and non-infected specimens were dissected to evaluate potential effects of parasitism on internal host organs. Parasites were identified to generic level using the key given by Jensen (1987).

To determine the effects of *Ismaila* sp. on the reproduction and survival of the aeolids, 10 mature specimens (12-16 mm crawling length), each infected with one egg-sac bearing copepod and ten equal sized, non-infected specimens collected from the same population in the Bay of Coliumo were held without food in separate one liter beakers under field temperature (16 C°). Seawater in the beakers was changed daily, and aeolids removed as they died. After one day of acclimation, the number of egg masses produced by each group of aeolids was recorded daily, as was mortality. The specimens used in this experiment were collected in January 1994, and the experiment was run in the same month.

RESULTS

Twenty to 50 percent of *Flabellina* sp. 1 collected in January 1994, April 1992 and September, 1996 were infected by at least one mature, female *Ismaila* (n = 40, 14, and 31 aeolids, respectively). None of three aeolids collected in March 1994 were infected. In total, 34 of 88 (39%) *Flabellina* sp. examined were parasitized. The aeolids measured up to 25 mm in length (averaging 10 to 18 mm), and the bodies of the female parasites up to 3 mm in length. Mature female parasites were found within the body cavity of their hosts, penetrating the body integument with their most posterior segments. They bore one pair of worm-like, curved, white egg-sacs which were hidden between the host's cerata. Usually, one or a few small sized males (up to about 1 mm in length) were loosely aggregated close to the posterior portion of the female, and also penetrating the host's body wall. External damage to the host was observed in only one instance: in the laboratory, a parasite abruptly destroyed the body integument of its host (Fig. 1), which in consequence died within a few minutes.

Usually, the parasites filled the hosts' body cavity posterior to the pericardium, obviously competing for space with the host gonads. Host gonads were absent or strongly reduced next to the parasites, but sometimes rudimentarily present in the most posterior parts of the body cavity which were not occupied by the parasite. In contrast, the gonads of non-infected specimens were present throughout the body cavity posterior to the pericardium. In January 1994, the gonads of all 16 infected *Flabellina* sp. collected from the Bahía de Coliumo were at least partially destroyed by the parasites (total rate of infection 40 %, n = 40). In the aquarium experiment (Fig.2), ten non-infected aeolids produced 13 large egg masses during the first four days, and did not begin dying until the last day of the experiment. In contrast, infected specimens did not produce a single egg mass during the entire experiment, and they all died between days five and nine (Fig. 2).

DISCUSSION

Regulatory mechanisms on nudibranch populations generally are far from being understood. Until now, parasite influences have never been seriously considered. In the Chilean *Flabellina* sp., as observed morphologically in this study, infection with *Ismaila* sp. clearly goes along with size reduction of the aeolid's gonads. The mechanisms underlying this reduction are unknow, but the end result, as suggested by the aquarium experiment (Fig. 2), appears to be sterilization of the hosts. This, coupled with the relatively high rates of infection observed in different seasons in the wild, suggests that parasitism by *Ismaila* sp. could have considerable regulative effects on populations of *Flabellina* sp. 1. The potential role of splanchnotrophids in limiting populations of their opisthobranch hosts and the ecological and evolutionary consequences have been overlooked in the past and clearly warrant further study.

My thanks to the staff of the Marine Biological Station in Dichato, Chile for friendly support during field and laboratory work, and to Sandra Millen for helpful comments on the manuscript. Jeff Goddard is especially acknowledged for his valuable contribution in improving the manuscript.

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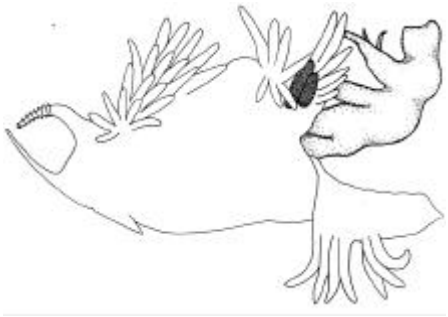

Figure 1: *Flabellina sp*. 1, killed in the laboratory by a egg-bearing female splanchnotrophid (body length 3 mm) which posteriorly opened the body of the host

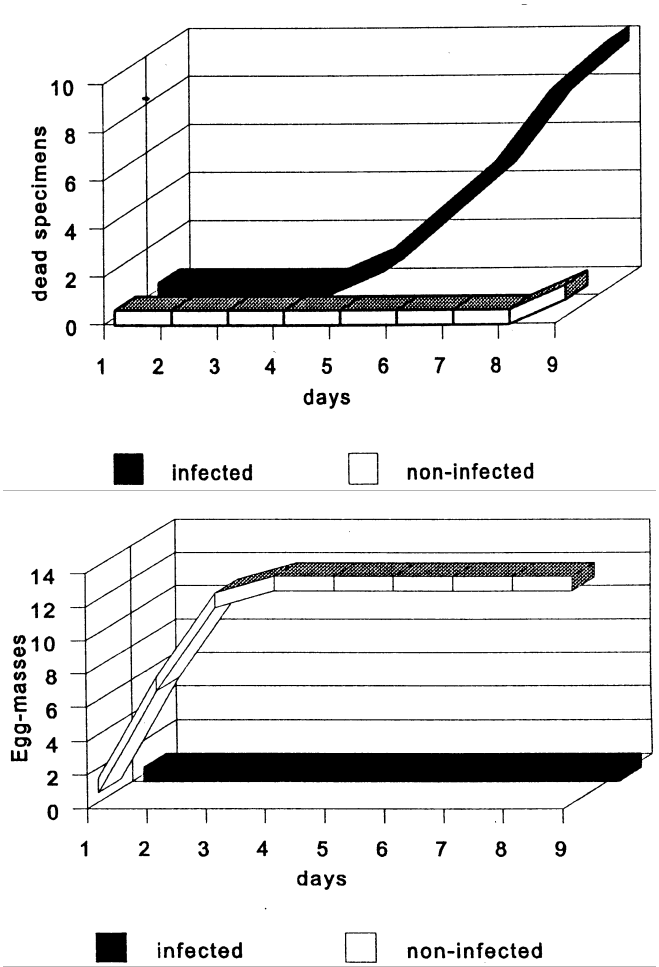

Figure 2: Cumulative mortality (top) and egg-mass production (below) of 10 *Flabellina sp*. 1 infected by *Ismalia* sp. compared with 10 non-infected *Flabellina* sp. 1.

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INFORMATION

From Richard Willan: I just looked at your (Phil Slosberg's) web site. The opisthobranch images are very nice but the names used can be improved upon. Allow me to make the following suggestions: "*Thuridilla* sp." (This is the same image shown in the November issuue of Opisthobranch Newsletter) is *Elysia ornata*. "*Chromodoris* sp." is *Glossodoris cincta*. There is a typo in the combination "*Chromadoris willani*". The genus should be *Chromodoris* of course. "*Phyllidia varicosa*" is *Phyllidia coelestis*. "*Chromodoris lochi*" is certainly not that species. I would use the name *Chromodoris* cf. *boucheti* for the species in your image. There is a mistake in the specific name in the combination "*Glossodoris cruentus*". The name should be *cruenta* because *Chromodoris* is feminine.

Any chance of coming down to Darwin to visit me during/after your diving trip to Indonesia? Great stuff. Keep it up. -

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