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Adaptations of Marine Animals
Exploratory Project 1: Sphaeroma structural distribution analysis

Introduction

Sexual dimorphisms between males and females are found in many animal species. A much less common reproductive adaptation is the distinct size, morphology, behavior, and genetic characteristics apparent in the males of the marine isopod *Paracerceis sculpta*. *P. sculpta* occurs in the northern Gulf of California where it burrows into certain sponges. This adaptation manifests itself in three different male morphs. The first morph is the alpha male which builds a burrow and establishes a harem. The alpha male prevents other alpha males from entering his burrow thereby preventing other alpha males from mating with his harem. The beta male morph imitates a sexually mature female isopod both morphologically and behaviorally in order to invade the harem and mate. The gamma male imitates a juvenile isopod to gain admission to the harem and mate. All three morphs are genetically distinct and have similar reproductive success leading one to believe that the adaptation is an evolutionarily stable strategy (Shuster, 1987; Shuster, 1989; Shuster and Wade, 1991; Sassman and Shuster, 1997).

The introduced invasive burrowing marine isopod *Sphaeroma quoyanum* establishes itself in a diverse range of media. Dock floats, drift wood, sandstone, and mudstone are some of the most common media *S. quoyanum* has invaded to date. It has been postulated that the adaptation occurring in *P. sculpta* may also occur to some extent in other isopods. This exploratory project will examine the distribution of male and

female sizes in *S. quoyanum* in a Hayne's Inlet in the Coos river estuary in order to determine if the reproductive adaptation present in *P. sculpta* is present in *S. quoyanum*.

Methods

This is the second part of a two part project started in spring of 2005 at the Oregon Institute of Marine Biology. *S. quoyanum* was collected from Hayne's Inlet approximately two kilometers north of North Bend along highway 101 in Coos County, Oregon. This site is characterized by mud flats in the low intertidal moving towards mudstone cobble in the high intertidal. Samples were collected during an outgoing tide in the high intertidal. During the period of the study *S. quoyanum* occurred in densities of approximately 40 individuals per decameter cubed. Cobble were collected and frozen upon returning to the lab. The isopods were sexed, measured, and compiled into two size distribution histograms.

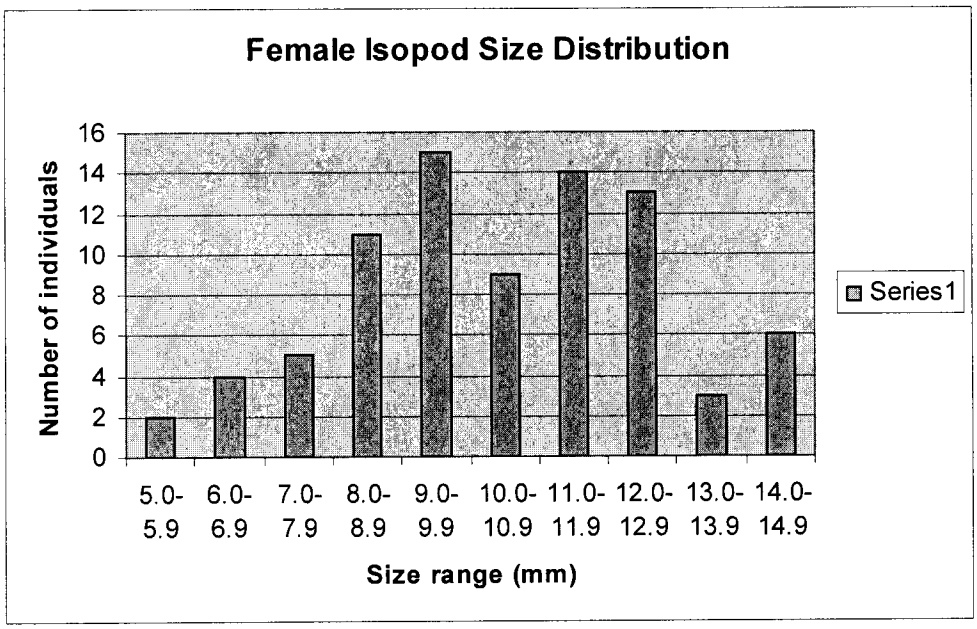
Results

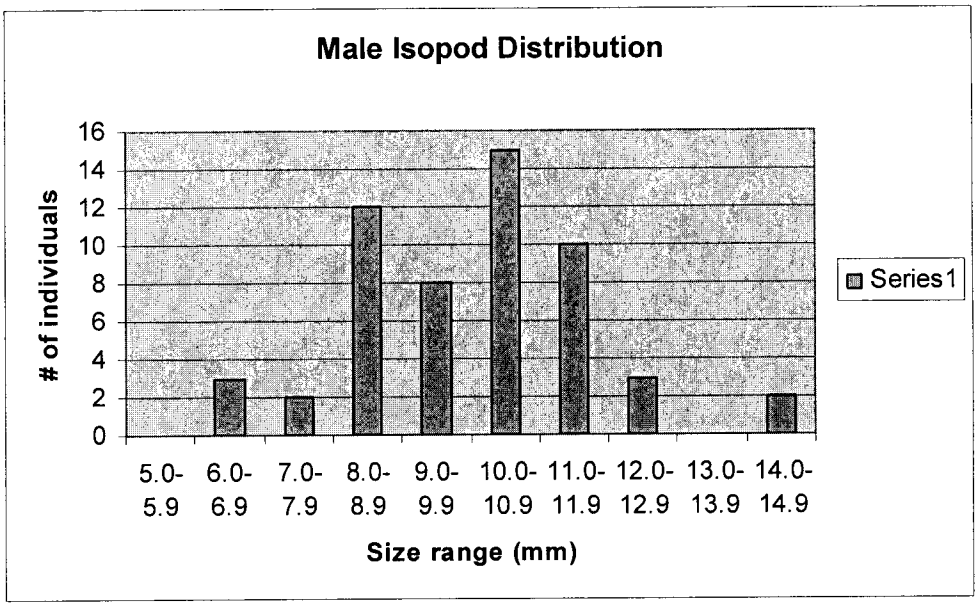
137 individuals were included in this study. Size distribution histograms were constructed for 82 females and 55 males. The sizes ranged from 6 to 14 millimeters for males and 5 to 14 for females. The results are given in Tables 1 and 2 showing female and male size distributions respectively.

Discussion

The hypothesis that *S. quoyanum* exhibits a similar reproductive adaptation as *P. sculpta* cannot be clearly proven or refuted at the conclusion of this study. It is important to note that what follows will be mainly speculation, as may be expected with a short exploratory project such as this study. The distribution histogram for the male isopods exhibits a weakly bi-modal distribution with peaks around 8 and 10 millimeters. The

female isopod size histogram may also exhibit a bi-modal distribution with peaks around 9 and 11 millimeters. The general trend of females being larger than males is interesting. This trend suggests that *S. quoyanum* may be much less of a harem forming isopod than *P. sculpta.* In this case the bi-modal distributions may be the result of an insufficiently large n value in which case the female and male histograms could be an incomplete part of a normal distribution. The possible presence of a bi-modal distribution in both males and females is an intriguing study project for future research. In order to determine whether the reproductive adaptation exhibited in *P. sculpta* exists in *S. quoyanum* the sample size in this experiment should be significantly larger and time at which sampling takes place should occur over the entire year in order to account for possible seasonal variability.


Female Isopod Size Distribution
Number of individuals
16
14
12
10
8
6
4
2
0
5.0-5.9
6.0-6.9
7.0-7.9
8.0-8.9
9.0-9.9
10.0-10.9
11.0-11.9
12.0-12.9
13.0-13.9
14.0-14.9
Size range (mm)
Series1


Male Isopod Distribution
# of individuals
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9.0-9.9
10.0-10.9
11.0-11.9
12.0-12.9
13.0-13.9
14.0-14.9
Size range (mm)
Series1

References:

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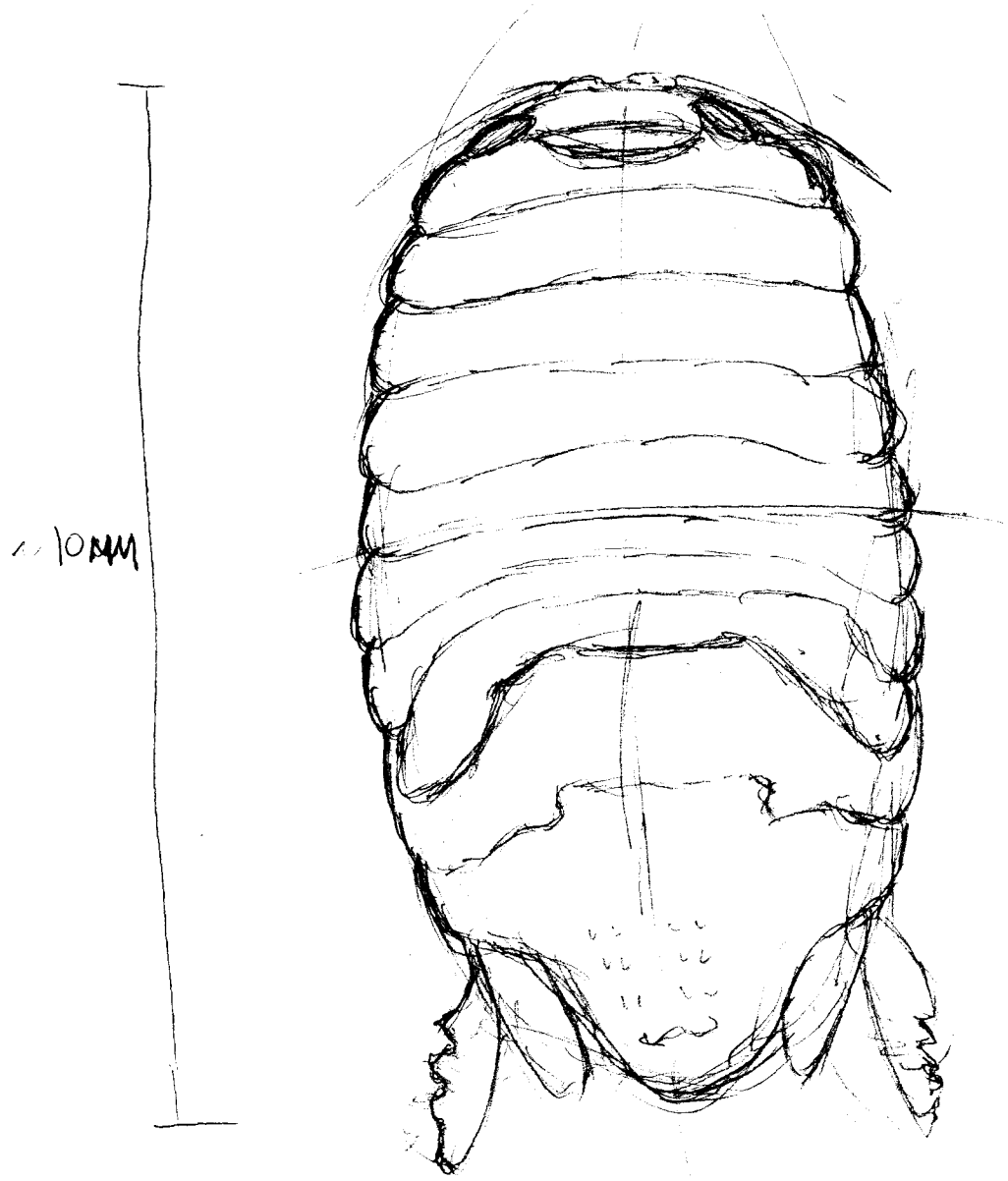

PENES => SEX DISTINGUISHING CHARACTERISTIC

PENES FOUND ON THE MIDDLE VENTRAL ABDOMEN

SPHAEROMA QUOYANUM