VARIATIONS IN APPENDAGE SETAL COUNTS IN ZOEA LARVAE OF FOUR PORCELLANID CRABS (DECAPODA ANOMURA) FROM OREGON

BY

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INTRODUCTION

Descriptions of crustacean larvae have commonly included setation formulae for the appendages of different stages. These setation counts are frequently used to differentiate larval stages of a species, to distinguish between species and to compare species in attempts to infer relationships. The number of specimens used for such counts and the extent of variation within populations is less often given. Recent studies, for example those of Knight (1970) and Ingle & Rice (1971), have included information on variation found in setal counts which raises questions concerning the reliability of such counts as specific distinguishing characteristics, or as reliable characteristics for separating stages.

We have completed a study of larval development in four species of porcellanid crabs, Petrolisthes eriomerus Stimpson, 1871, Petrolisthes cinctipes (Randall, 1839), Pachycheles rudis Stimpson, 1859, and Pachycheles pubescens Holmes, 1900, common in the intertidal area along the west coast of North America. The larvae of these species are conspicuous and often abundant members of the inshore plankton, and reliable means of distinguishing them would be valuable for other studies we are conducting. All species were hatched and reared in the laboratory from Oregon ovigerous females and local plankton material was also available. During the study of this material, it became apparent that many morphological characters, and particularly the setation of larval appendages, varied considerably between individuals of the same species and stage and to some degree even within a single individual. Variability was most frequent and of greatest magnitude in the setation of the two pairs of maxillae, which appeared to be especially suitable for a study of setal count variation. Consequently, an attempt was made to quantitatively analyze this variability in three of the species studied, Pachycheles pubescens, Petrolisthes eriomerus and Petrolisthes cinctipes, for which the greatest number

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of permanent appendage mounts had been made. Repeated counts were made, using phase microscopy, on each appendage until any discrepancy was resolved. The permanently mounted *Pachycheles pubescens* material used was of larvae taken from the plankton. The identity of the larvae was verified by comparison with laboratory hatched and reared larvae.

The permanently mounted material of the two *Petrolisthes* species was from larvae hatched and reared in the laboratory. The *Petrolisthes cinctipes* larvae were reared at a salinity of 33% in a water bath varying in temperature between 12° and 15° C. The *Petrolisthes eriomerus* larvae used were also reared at 33% and 15 ± 0.02° C. The sea water used for rearing was filtered upon collection through a filter with 30 μ pore size. The larvae were fed *Artemia* nauplii hatched from eggs obtained from central California. For each *Petrolisthes* species, the zoa I and zoa II used came from single, but separate broods.

Permanently mounted material of *Pachycheles rudis* larvae was not available for recounting. Originally, the range of counts made on 12 larvae of each zoal stage were recorded, but counts on individual larvae were not kept separated. The zoae used in the counts were both laboratory hatched larvae reared at 15° C and 33% and larvae from local plankton. The observed ranges for Oregon specimens were combined with those of Knight (1966) for larvae reared from southern California. The ranges given for this species are thus derived from populations at widely separated parts of the geographic range. Observations on the maxillipeds, which show less variation than the maxillae, are included for comparisons.

Differences observed between zoal stages and between species in the frequencies of different setal counts on homologous lobes or setal groups of all four pairs of appendages were compared by means of the Chi-squared test. Because of limitations of the data, classes of setal numbers were combined in the contingency tables wherever necessary to bring the expected frequency of any count class to two or more. In most cases, narrow setal ranges or combination of infrequent with frequent categories produced two classes of setal numbers. Where only two classes of counts were involved in comparisons between two species or left and right sides, the Yates correction was used in determining the Chi-squared value.

**RESULTS**

Since some adult asymmetry is found throughout the Anomura, it is possible that consistent left-right setal count differences might occur on larval appendages. Such asymmetry would make it impossible to characterize a species by either left or right counts alone. Also unequal combinations of asymmetrical left and right counts would produce inaccurate count data. For this reason, setal counts were made on left and right maxillae I and maxillae II for both zoal stages of the three species. In a few cases, one member of an appendage pair was lost in dissection or one or more lobes were damaged. For this reason, the number of observations on paired lobes varies. The number of pairs of intact maxillae available