EFFECT OF IMPLANTATION OF ANDROGENIC GLAND ON THE RELATIVE GROWTH OF ABDOMEN IN OCYPODA PLATYTARSIS (M. EDWARDS)

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INTRODUCTION

CHARNIAUX COTTON (1957) demonstrated that the implantation of the androgenic gland from the male into the female of Orchestia gammarellus brings about the transformation of not only the ovary into the testis but also of the female secondary sex characters into those of the male. The slender claw of the female of Orchestia is transformed into the powerful claw characteristic of the male. It is now known that the androgenic gland can bring about similar transformation in other Malacostracan forms.

The transformation of the secondary characters implies a change in relative growth coefficients. It is well known that the external sex differences are related to differences in growth rates in the two sexes. As Teissier (1960) pointed out, the techniques for study of relative growth enable us to state exactly the periods when the action of internal factors condition secondary sex differentiation. Weymouth, Donald and Mackay (1936) have shown that the relative growth coefficient in the male abdomen is greater than that of the female specimens. A similar condition has been studied in Callinectes sapidus by Newcombe et al. (1949). Prasad and Tampi (1954) calculated the relative growth coefficients in the abdomen of Neptunus pelagicus. These studies relate to the growth differences in normal sexes and not in the process of sex transformation.

Charniaux Cotton (1957 a) observed that females of Orchestia into which androgenic gland was implanted progressively acquired the male secondary characters during the post-operative intermoult periods.

The present account is a quantitative study of sex transformation in Ocypoda platytarsis. The effect of implantation of androgenic gland into the female Ocypod has already been reported by the author (Sarojini, 1962).
In the present paper, the changes in relative growth coefficients during sex transformation resulting from implantation of the androgenic gland have been calculated, and these coefficients are compared with those of normal and female specimens.

**Material and Methods**

The specimens were collected locally near the mouth of the Vellar estuary at Porto Novo. To determine the relative growth coefficients in normal male and female, 40 male specimens and 35 female specimens were studied. For determination of relative growth coefficient during sex transformation, fifteen immature female specimens were implanted with androgenic gland and they were measured at intervals during the post-operative intermoult periods. The method of implantation, and the maintenance of the specimens have been described elsewhere (Sarojini, 1962). The width of carapace was taken as standard and represented on the abscissa in all cases. All measurements were taken with fine dividers and expressed in millimeters. The equation \( Y = b_x^a \) employed here was first described by Huxley (1932). The formula

\[
a = \left( \frac{\log 1 + v_y^2}{\log 1 + v_x^2} \right)^{1/4}
\]

given by Kermack and Haldane (1950) was also employed, and a close agreement was found between the results obtained by the two methods.

**Results and Discussion**

The results of the present analyses of growth are given in Table I.

The results of the analyses are given in Table I. The relative growth coefficient for normal male is 1.588; for the female specimens it is 1.1777.

It is observed that the growth rates also differ between the two sexes. The external sex differentiating characters are due to differential growth rates between the two sexes. The relative growth coefficient for the implanted specimens during the first post-operative intermoult period is 1.3; and during the second post-operative intermoult period \( a \) is 1.6 (Fig. 1). It will be seen that the growth coefficient increases by degrees. The difference in relative growth between normal males and the males resulting by transformation of female specimens is not significant.

The observations of Charniaux Cotton (1957) on *Orchestia* relate to the slender claw of the female which, as the effect of implantation of the androgenic gland, becomes transformed progressively into a powerful male
Androgenic Gland on Relative Growth of Abdomen in O. platytarsis

TABLE I

Variations in the relative growth coefficient of normal male, female and transformed female specimens of Ocypoda platytarsis

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number</th>
<th>Size</th>
<th>Relative growth coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal female</td>
<td>35</td>
<td>&gt; 40 mm.</td>
<td>1.177</td>
</tr>
<tr>
<td>Normal male</td>
<td>40</td>
<td>&gt; 40 mm.</td>
<td>1.588</td>
</tr>
<tr>
<td>Female transformed into male specimens</td>
<td>15</td>
<td>&gt; 35 mm.</td>
<td>1.6</td>
</tr>
</tbody>
</table>

I phase 1.3
II phase 1.6

't' for difference between normal male and female 0.9167; p 0.200.

Fig. 1. Graph to show relative growth of abdomen in: (A) Male normal; (B) Female normal; (C) Female with androgenic gland implanted into it.

claw during the post-operative intermoult periods. The transformed claw finally assumes the form of the claw of the normal male specimens.
In the present study the observations have been on the relative growth of the abdomen. During sex transformation the relative growth coefficient of the female changes and approximate to that of the normal male in the growth coefficient. The slight difference between the transformed female and normal male is not significant.

CONCLUSION

The observations discussed above indicate that due to the action of the androgenic hormone, the female secondary sexual characters acquire progressively the male form during the post-operative intermoult periods, by changes in the allometric coefficient.

SUMMARY

The coefficients for relative growth differ in the two sexes. The implantation of the androgenic gland into the female transforms into the male, and during this process the relative growth coefficient for the abdomen changes progressively during the post-operative intermoult periods. Finally the allometric coefficient assumes nearly the value characteristic for the normal male.

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REFERENCES