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Molting Hormone Dynamics in the American Lobster, *Homarus  
americanus* (Milne-Edwards) (Crustacea, Decapoda)

By

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DISSERTATION

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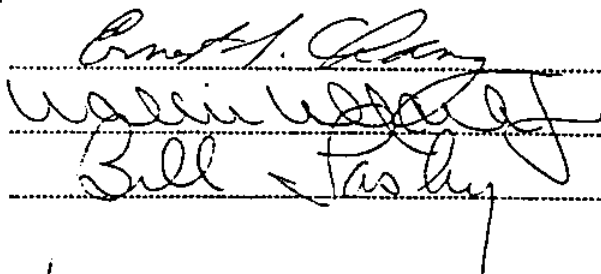
GRADUATE DIVISION

of the

UNIVERSITY OF CALIFORNIA

DAVIS

Approved:



The image shows three handwritten signatures in black ink, each written over a horizontal dotted line. The signatures are cursive and appear to be of the same person or a group. The first signature is at the top, the second is in the middle, and the third is at the bottom. The third signature has a long, sweeping tail that extends downwards.

Committee in Charge

1990

# ABSTRACT

Aspects of molting hormone dynamics were followed in the American lobster, *Homarus americanus*. Radioimmunoassay (RIA) measurements of hemolymph ecdysteroid (Ecd) titers showed more variability than that previously reported for other crustaceans. Male lobsters had significantly higher hemolymph Ecd titers in both late premolt and postmolt. The principal metabolites identified by high-performance liquid chromatography (HPLC)-RIA of hemolymph were highly polar EcDs that were excreted primarily in the urine. High polar metabolites consisted of 20-hydroxyecdysoneic acid, 20,26-dihydroxyecdysone, and conjugates of most of the different free EcDs. The active molting hormone, 20-hydroxyecdysone, was the predominate hemolymph metabolite only during the large final hemolymph peak that occurred in late premolt Stages  $D_2^2$  to  $D_3^1$ . Urine was the route of most of the measurable Ecd excretion for all molt stages although feces accounted for a larger percentage of the total excretion during mid-premolt (Stage  $D_1$ ). Fecal EcDs were principally apolar Ecd conjugates, with smaller amounts of high polar and free EcDs. Lobsters were shown to have an efficient "detoxification" mechanism for ingested EcDs which are absorbed by the midgut gland and converted to apolar conjugates prior to excretion in the feces without further absorption to the hemolymph. The apolar EcDs could account for nearly 50% of the total EcDs in the midgut gland in late premolt. The midgut gland proved to be the most important lobster tissue for the absorption and metabolism of EcDs as indicated by injections and in

vitro cultures with [ $^3\text{H}$ ]-ecdysone. Additionally, a binding protein for these metabolites in midgut glands was found which did not bind any of the free Ecds tested. Its function was hypothesized to be related to directed excretion of the apolar Ecd conjugates in the feces without absorption back into the body. Injection experiments utilizing [ $^3\text{H}$ ]-ecdysone demonstrated that lobsters may be able to regulate Ecd metabolism as a means of controlling circulating hormone titers. Evidence was also obtained suggesting that regulation of Ecd excretion rates could be another mechanism by which lobsters could control hormone titers.

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