

## Introduction

The present work on decapod larvae is a supplement to my publication on adult decapod crustaceans of the Atlantic coast of Canada (Squires, 1990), although the number of species treated is considerably less. Its primary purpose is to describe in detail larval stages of 12 species of decapod Crustacea taken from the plankton in Ungava Bay, northern Quebec, Canada. The decapod larvae presented in this report were collected on the MV *CALANUS* expeditions by M. J. Dunbar and E. H. Grainger and their associates at McGill University in Eastern Arctic Investigations of the Fisheries Research Board of Canada during 1947–51 in Ungava Bay (Dunbar and Grainger, 1952; Fontaine, 1955; Squires, 1957). Ungava Bay is a large bay, about 220 km across at its mouth and extending about 240 km in length, between approximately 58°N and 61°N latitude, and 65°W and 70°W longitude at Hudson Strait (Fig. 1). Stations where collections were made are listed in Table 1 and 9 and precise positions are available in maps in Dunbar and Grainger, 1952, and Grainger, 1954.

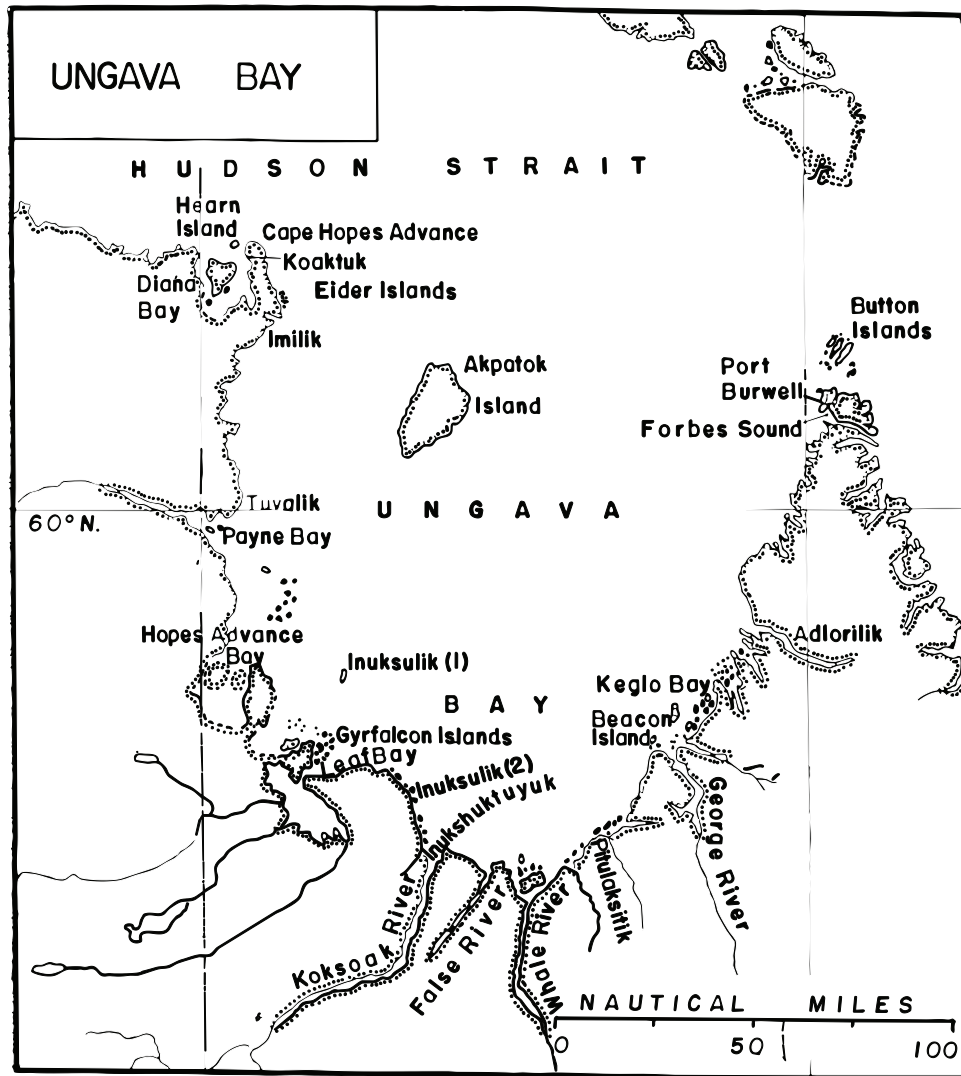


Fig. 1. Map of Ungava Bay from Dunbar and Grainger (1952).

Only 20 species of adult decapod crustaceans have been reported from Ungava Bay (Squires, 1966), some of which were taken in very small numbers. The number of species taken as larvae in the plankton were even fewer; only 12 species were found in about 11 000 specimens. In this instance the few species was an advantage since it allowed separation of larvae of closely related species somewhat easier than if there were many species in the plankton.

Larvae of most of these species have already been described from the eastern Atlantic or the eastern Pacific but not from the western Atlantic or the Arctic: the arctic conditions under which they live in Ungava Bay could be expected to affect them, especially with regard to their size at various stages (most of them are larger at corresponding stages than those of the eastern Atlantic). The present descriptions give some new information and may help in the identification of some confusing members of commonly occurring families in the western Atlantic. Among the Hippolytidae for example, there is confusion between the species *Spirontocaris phippsi* and *S. spinus*. Comparison of these larvae with those of the same species from the eastern Atlantic gives some striking differences that would make their identification difficult if based entirely on the descriptions formerly given in the literature.

Named specimens at each stage for the species are deposited at the Canadian Museum of Nature, Ottawa, and at the Atlantic Reference Centre, Huntsman Marine Science Centre, St. Andrews, N. B.

## Materials and Methods

Measurements of larvae were made in water in a petri dish resting on a square-millimetre grid. An estimate of length was made to the nearest mm where the larva lay on the slide. Total length (tl) referred to in this paper is taken from the tip of the rostrum to the tip of the telson, the latter exclusive of spines or setae (from the tip of the rostral spine to the tip of the dorsal spine in Spider Crab, (*Hyas coarctatus*) larvae).

I did some of the early work on these larvae from whole mounts (the mouthparts and other appendages dissected out and included with the whole specimen) in a Fisher-Littman well slide, stained after partial dehydration (in 70% alcohol) with Chlorazol Black E and mounted in Permunt after complete dehydration in Xylene. The slides were stored flat because the body parts would otherwise drift together in the medium. I did later work entirely from unmounted specimens stained with Acid Rose and examined with a dissecting microscope.

**Description of larvae of decapod crustaceans.** Although the morphology of mouth parts, etc., of decapod crustaceans is similar in the larvae as in the adults of shrimps (a generalized description of body parts is given in Squires (1990) but see also figures of each larval stage in this paper), there are differences in structure caused by growth and development from a mostly simple form in the larva to more complex forms as the larva moults and progresses through the developmental stages. In the present species there are usually four larval stages (only two in some) and a Megalopa which begins to look like the adult form in shrimps but less so in crabs.

**Stages of the larvae.** The stages of larvae in the species collected from Ungava Bay were characterized based on documented descriptions in literature as follows:

Stage I Zoea – the eye-stalks and eyes are attached to the carapace along one side. The telson is triangular with faintly visible and small uropods enclosed, and it is sometimes not clearly separated from the fifth abdominal somite.

Stage II Zoea – the eye-stalks and eyes are free from attachment except at their bases. The uropods are still enclosed but clearly visible and large in the telson which is roughly triangular in shape and separated from the fifth somite.

Stage III Zoea – the uropods are free from the telson which is still subtriangular in shape, but the inner branch or endopod of the uropod is small and undeveloped.

Stage IV Zoea – the uropods have both branches, the exopod and endopod, well-developed and separated from the telson. The edges of the telson are parallel.

Stage V and subsequent Zoeal Stages – these have additional features depending upon the species.

Megalopa – the larva has fully developed setose pleopods, the second maxilliped similar to that of the adult, and the antennal flagellum is well developed. In shrimps it may still moult through several stages before the juvenile stage is reached (Haynes, 1985).

**External morphology of the larvae.** As in the adults, the structures in larval decapod crustaceans include the following (as shown in the Figures according to the lettering):

- (a) the carapace, the anterior covering of the body including the rostrum which is the pointed anterior dorsal extension or spine. The carapace covers the head and the eight thoracic segments with various appendages. The abdomen is the narrow cylindrical tail-part of the body bearing the pleopods ventrally and the telson (t) posteriorly.
- (b) the eyes, the compound eyes are usually stalked attachments at the anterior end of the carapace.
- (c) the antennules, are the first pair of appendages with peduncle and two flagella. These are the sensory organs, bearing plumose setae and aesthetes (Gurney, 1942, p. 125).
- (d) the antennae, with scale (exopod) and one flagellum (endopod). These are also mainly sensory in function.
- (e) the mandible, the short and heavy appendage with grinding and biting surfaces for feeding.
- (f) the maxillule, this is the first of the series of accessories to mouthparts, contains two endites, proximal and distal (coxal and basal), and an endopod. The distal endite has two or more rows of short, sharp, spine-like setae at its leading edge for triturating food as well as pushing it into the mouth.
- (g) the maxilla, this has lobed endites, proximal and distal, as above, an endopod, and the scaphognathite (exopod) with long plumose setae and an anterior and posterior lobe. The scaphognathite acts as a water bailer, moving water over the gills.
- (h) the first maxilliped, this also is with endites, an endopod, epipod and long exopod, with long apical natant setae used for swimming.
- (i) the second maxilliped, this is with endopod, epipod and long exopod with long apical setae used for swimming.
- (j) the third maxilliped, this is with endopod, epipod and long exopod with long apical setae used for swimming.

Then follow the pereopods or legs – first pereopod (l), second pereopod (m), third pereopod (n), fourth pereopod (n') and fifth pereopod (n''). These may be budlike in early larval stages, and may or may not bear an exopod or epipod.

The next are the pleopods. The first and second pleopods (o, p, respectively) may be buds or non-existent in early stages of some species or may be unbranched (uniramous) or branched (biramous), sometimes bearing an appendix interna, a projection at the inner side of the endopod, in late larval stages.

Setae commonly occurring on the body and appendages are articulated at the base or sutured and may be slender, or thick and annulated and with or without small lateral projections or plumes (plumose), or they may be short, stout and spine-like, and sometimes referred to as spines. Spines are generally not articulated at base. (Various kinds of setae are elaborated by Pohle and Telford (1981)). The plumes are not put in on the setae in some of the drawings in this paper but are mostly mentioned in the text.