Remarks

Although Ungava Bay appears to have incursions of Atlantic water (Dunbar, 1951; Fontaine, 1955; Squires, 1957), species of larval decapods taken in plankton hauls near the shore are not greatly different in composition of species than from more Arctic areas such as Hudson Bay (Squires, 1967). The number of species of larvae taken was few, only slightly more than half the numbers of species of adults (12 out of 20) taken benthonically by the same expeditions (Squires, 1957, 1966), although the larvae of one of these species, *Sclerocrangon boreas*, is non-planktonic. On the other hand the number of specimens of larvae taken were appreciable, amounting to almost 11 000 (Tables 1–2), and 50–80% of the hauls took some decapods (Squires, 1957). The area may therefore be considered to be biologically productive in spite of the long winter season of ice cover and low ambient temperatures throughout the year. However, there appears to be moderation of temperatures by the incursions of Atlantic water and, in the inshore areas, by the influence of freshwater runoff from the large rivers such as the Koksoak, George and Whale Rivers (Fig. 1). Larvae were taken in larger numbers near rivers than elsewhere (Table 1). The appearance of *Pandalus borealis* and *P. montagui*, although few in numbers and from the eastern part of the bay, may be one of the best indications of Atlantic water incursions.

Argis dentata and *Lebbeus groenlandicus*, which have large robust larvae, occurred in greater numbers than other caridean shrimps in the plankton hauls (Table 2). However, more than half the specimens taken were larvae of *Hyas coarctatus*, a crab which produces large numbers of small eggs in a spawning.

Occurrences of larval stages

It is important to note only the larval stages that occurred in the plankton hauls of the *MV CALANUS* expeditions are described in this paper. Stage I Zoea of most species were present in the earliest (late-June) plankton hauls. A notable exception was *Pandalus borealis* which did not appear until mid to late-July. Some hipplolytid Stage II Zoea were also present in the earliest hauls, indicating that hatching of eggs had already occurred in early-June at the latest. *Lebbeus groenlandicus* had Stage II Zoea present from the earliest hauls and they continued to occur as late as early-August. Stage III Zoea did not appear until mid-July and Stage IV Zoea and Megalopa until August (an exception was *Eualus fabricii* which had Stage III Zoea present in June). In *Hyas coarctatus* the Stage I Zoea persisted from late-June until late-August, possibly indicating that hatching continued throughout the summer and Stage II Zoea appearing in August only.

Taxonomic considerations

In the genus *Eualus*, *E. fabricii* is easily separated from *E. gaimardi* (with dorsolateral spines on abdominal somite 5 only) by the presence of dorsolateral spines on somites 4 and 5 in zoeal Stages I–IV (Haynes, 1981; Table 6). Stage I Zoea of *Eualus macilentus* are much smaller than in these species (Ivanov, 1971): no larvae were taken in Ungava Bay although adults were present (Squires, 1957). Comparison with *E. pusiolus* (Pike and Williamson, 1961) is given in Table 7. The latter species does not extend as far north as Ungava Bay but is common in the Newfoundland area where there is an overlap in the distribution of both species (Squires, 1990).

Characteristics of *Lebbeus groenlandicus* compared with *L. polaris* indicate that the most recognizable difference is in the number of telson spines at similar larval Stages (Table 8), namely 11 + 11 in the former and 9 + 9 in the latter. Also the former is larger than the latter at similar larval Stages.

Spirontocaris phippsi and *S. spinus* are somewhat similar in size and appearance but may be separated by the following features (Table 9): telson spines in the former are not greatly different in size from each other while in the latter the centre pair is very small. Also, numbers of setae on the scaphognathite in *S. phippsi* are greater than in *S. spinus* at the same zoeal Stage.

A summary of characteristics of larvae of *Pandalus borealis* and *P. montagui* (Table 4) shows a significant difference in size at similar zoeal Stages. Also antennal scale setae and scaphognathite setae are more numerous in *P. borealis* than in *P. montagui* at similar zoeal Stages. Incidentally P. borealis larvae appear smaller at earlier Stages than its congener, P. eous (formerly referred to as *P. borealis*) of the Pacific (Squires, 1992). Although other pandalids were not taken in Ungava Bay, *Pandalus propinquus* and *Dichelopandalus* are included in the summary (Table 5) from relevant literature for comparison with the two former species.

Comparison of *Argis dentata* and *Crangon septemspinosa* (Table 7) shows that they are greatly different in size and development at similar zoeal Stages. *C. septemspinosa* does not occur north of the Straits of Belle Isle but there is considerable overlap with the distribution of *A. dentata* which extends as far south as the Bay of Fundy, Canada (Squires, 1990).

Pagurus pubescens, the only hermit crab that occurs in Ungava Bay, is compared with *P. acadianus* (Table 11) since there is an overlap of the distribution of both species south of the Straits of Belle Isle (Squires, 1990). *P. acadianus* is somewhat smaller than *P. pubescens* at the same stage, and has a styliform instead of a bifid antennal flagellum.

A similar situation applies with two species of Hyas (Table 12), where *H. coarctatus* only occurs in Ungava Bay (Pohle, 1991 believes these larvae to belong to the subspecies *H. c. alutaceus*). Its larvae are somewhat larger than those of *H. araneus* in Europe (Christiansen, 1973) at the same stage, and it has a greater number of setae on the lobes of the scaphognathite.

There may be some question as to whether *H. c. alutaceus*, a Pacific species, extends across the Arctic and into the Northwest Atlantic. Adult specimens were taken in the Beaufort Sea at Franklin Bay (Squires, 1968) but not further east in surveys of 1960–65. The distribution of larvae eastward is mediated against by westward currents along the coast (Grosvenor and Darley, 1963). Nor were any taken further eastward at the Queen Elizabeth and nearby islands during 1962 (Squires, 1969).

Evolutionary considerations

Various authors indicate that species of decapods show evolutionary advancement by loss of larval stages or abbreviated development, and loss of appendages. In the present group of species, therefore, the less highly evolved appear to be the pandalids with the genus *Pandalus* retaining exopods on three of the pereopods and having several larval Stages. Among the hippolytids, however, the genus *Eualus* also retains an exopod on three pereopods, but the genus *Spirontocaris* has an exopod on two pereopods, and the genus *Lebbeus* has no exopod on any pereopod. *Lebbeus* also has more abbreviated development, the species *L. groenlandicus* having only three zoeal Stages instead of four as in other species. Species in the family of crangonids appear to be the most advanced among these caridean shrimps: no exopods are present on the pereopods and there is abbreviated development as in *Argis* with only three zoeal Stages. In one species, *Sclerocrangon boreas*, there is a further adaptation in which the larvae do not hatch into the plankton but remain clinging to the mother until they reach a settling stage, possibly the first juvenile.

The anomurans or hermit crabs, and the brachyurans, the true crabs, show more advanced evolutionary characteristics such as a reduced third maxilliped as well as no exopods on pereopods, and the brachyurans, *Hyas* spp., have in addition a modified antenna with reduced endopod and exopod.