

Aspects of the biology of *Mysis oculata* on the west coast of Iceland

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The life history of *Mysis oculata* was studied in Skerjafjord on the west coast of Iceland in 1985–1986. The mysid had a one year life cycle. Newly released juveniles were found in May; they grew up and matured during the summer and reached the immature stage by September–October. Breeding females occurred in the samples from January to April and the maximum number of larvae carried by a female was 87. The marsupial incubation time was estimated to be about 110–120 days. The daily growth rate of juveniles was 0.08 mm during the summer months, while in early winter sexually maturing individuals were growing at a rate of 0.05 mm per day. The maximum size of males and females was 19–20 mm and 22–23 mm respectively.

1. Introduction

Mysis oculata (Crustacea, Mysidacea) is an arctic and subarctic coastal species, probably being circumpolar in distribution (Holmquist 1958, Mauchline & Murano 1977). In Icelandic waters *M. oculata* has been recorded from all around the coast (Stephensen 1938) and recently a closely related species, *M. litoralis*, has also been reported from the south coast of Iceland (Astthorsson 1987a). Both *M. oculata* and *M. litoralis* are morphologically close to *M. relicta*, a glacial relict mysid, which is common in the freshwater lakes of northern Europe and North America (see e.g. Tattersall & Tattersall 1951, Holmquist 1959, Väinölä 1986).

Information on the biology of *M. oculata* is mainly confined to the work of Geiger (1969), who presented the size structure of both *M. ocu-*

lata and *M. litoralis* from the Siberian continental shelf. No information appears to be available on the breeding season, the production of larvae, or growth of *M. oculata*, even though extensive studies have been made on related *Mysis* species (e.g. Ladurantaye & Lacroix 1980, Sell 1982, Salemaa et al. 1986).

The present paper reports on the life cycle, breeding, and growth of *M. oculata* in Skerjafjord, a short shallow fjord near Reykjavik, on the south-west coast of Iceland (64°07'N, 21°57'W; Fig. 1).

2. Material and methods

The animals were sampled with a push-net at approximately monthly intervals (May 1985–April 1986) during low tide periods and fixed in formalin. During the study period, weekly tempera-

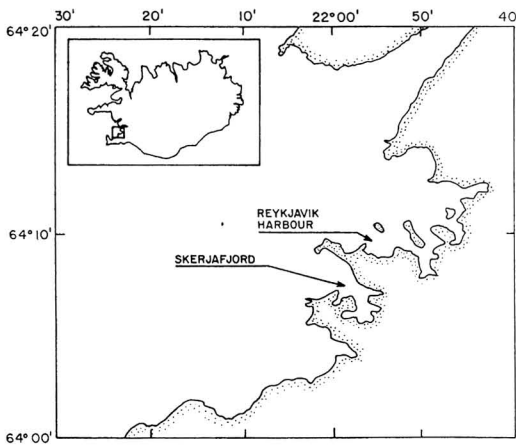


Fig. 1. The sampling site for the population study of *Mysis oculata* in Skerjafjörður and of the temperature measurements in Reykjavik harbour.

ture measurements were also taken in Reykjavik harbour (Fig. 1). In the laboratory, length measurements and the classification of animals and eggs into developmental stages were carried out in accordance with Mauchline (1980).

3. Results

When the study commenced in May 1985 the population of *M. oculata* consisted mainly of newly released juveniles ranging in length from 3.0 to 5.0 mm. One immature female and two females with empty marsupia were also found in this sample (Fig. 2). On 6 July and 3 August the population still consisted only of juveniles. By September some of the animals were developing secondary sexual characteristics. On 16 October all of the animals had become immature and similarly in November the population consisted only of immature females and immature males.

By December–January the water temperature was reaching the annual low of 1–2°C. The first breeding females were collected on 10 January. By then the females of *M. oculata* ranged in length between 18.7 and 20.9 mm (Fig. 2, Table 1). Only mature animals were taken on 25 February and all of the females in the sample were now carrying larvae in their marsupia. In the last sample, from

Table 1. The mean brood size (M) of *Mysis oculata* on the west coast of Iceland, standard deviation (S), and the number of females examined (N).

Length of female (mm)		Jan.	1986 Feb.	April
18.1–19.0	M	43		
	S	—		
	N	1		
19.1–20.0	M	57.8	36.1	32.0
	S	24.1	11.4	17.0
	N	5	9	2
20.1–21.0	M	68.5	45.5	51.7
	S	26.2	13.3	12.0
	N	2	27	3
21.1–22.0	M		48.7	33
	S		8.9	—
	N		13	1
22.1–23.0	M		47.3	45.7
	S		15.7	24.7
	N		3	2

25 April, some breeding females were still present in the population while all the males seemed to have died off. A new generation of 2–3 mm juveniles had also appeared in the population in April (Fig. 2). On the west coast of Iceland *M. oculata*, therefore, is semelparous and has a life span of approximately one year. At a water temperature of about 1–4°C during the breeding period (Figs. 2 and 3) the incubation time is estimated to be about 110–120 days.

The number of larvae per brood of *M. oculata* is shown in Table 1. The largest broods of all were 87 eggs of stage I carried by 20.0 and 20.9 mm females collected in January. The broods increase with the size of the females, but for females of a given size class they decrease as the development proceeds. In January all the females were carrying eggs of Stage I, while in April most were carrying larvae of stage II. Eggs of stage I had a diameter of 0.7–1.0 mm, the eyeless larvae (stage II) ranging in length from 1.9–2.1 mm, while the eyed larvae (stage III) were 2.5–2.8 mm long.

At water temperatures of between 9–12°C

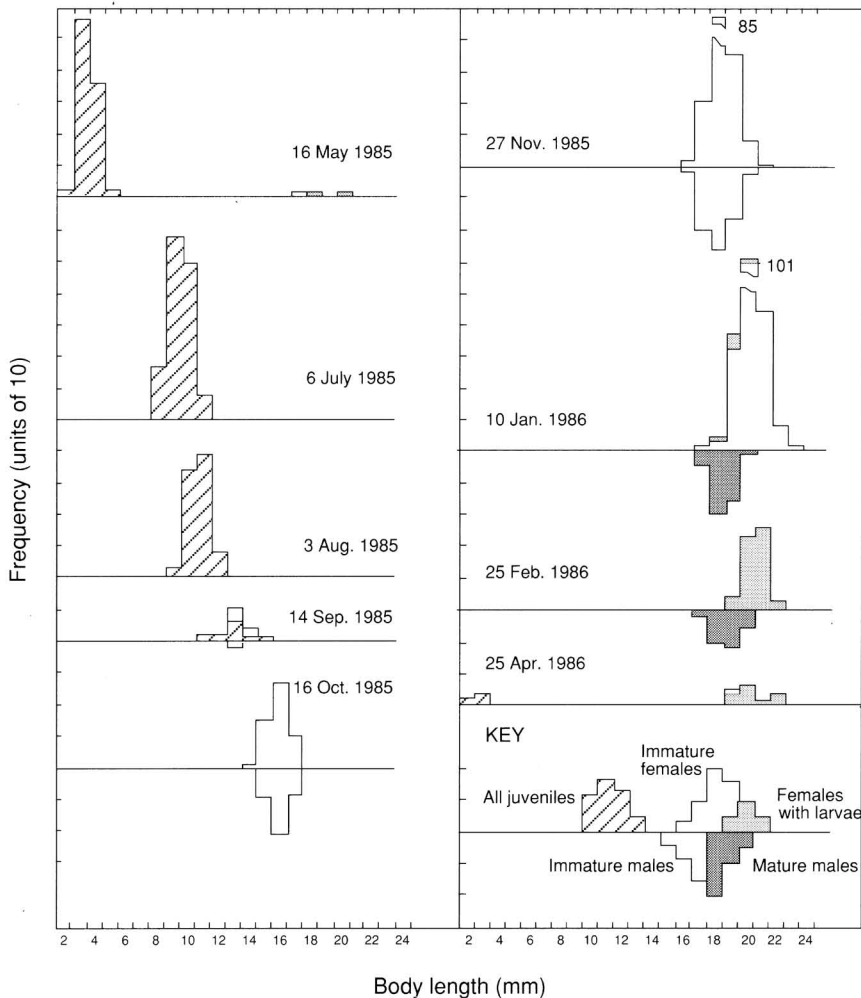


Fig. 2. Length frequency distribution of *Mysis oculata* in Skerjafjord, April 1985 to March 1986. The vertical scale is marked in units of 10.

from May to the middle of September the juveniles gradually increase in length and grow at a rate of approximately 0.08 mm per day (Fig. 3). By October–November the animals were between 17 and 19 mm in length and maturing sexually. The water temperature had decreased to approximately 6°C and their daily growth was about 0.05

mm. Males and females were of the same size until November. Thereafter the males underwent very limited growth, while the females continued a slow growth even at the low winter temperatures (Figs. 2 and 3). The maximum size of the males was 19–20 mm, while that of the females was 22–23 mm

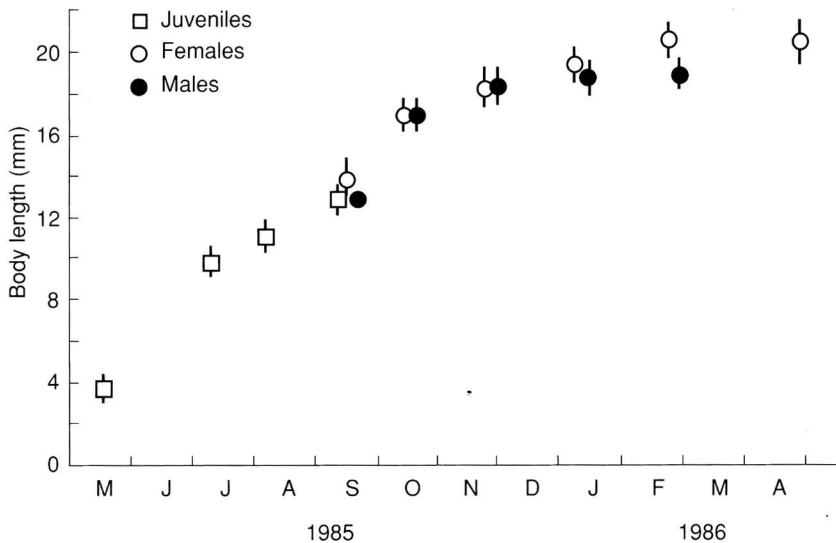


Fig. 3. Seasonal variations in mean body length and standard deviations of juvenile, male and female *Mysis oculata* in Skerjafjord.

4. Discussion

Geiger (1969) reported on the length distribution and development stage of both *M. oculata* and *M. litoralis* from the Siberian continental shelf in the Arctic Ocean. The samples, which were taken in August and early September, suggested that there both species had a two year life cycle. In the Saguenay fjord (at 48°N, near Quebec, Canada) Ladurantaye & Lacroix (1980) reported that *M. litoralis* generally has a one year life cycle, although some of the animals might survive until the following year. In the present study there was no indication of individuals of *M. oculata* living longer than about one year (Figs. 2 and 3). The available information on other mysid species in Icelandic waters similarly suggests that most of them have a life span of one to two years (Astthorsson 1984, 1987b). The longer life span of *M. oculata* in the Arctic may possibly be attributed to slower growth and development at lower environmental temperatures. However, it should be pointed out that the data presented by Geiger (1968) came only from the autumn and

confirmation of the suggested two year life span is therefore required.

The duration of the marsupial development of *M. oculata* in Skerjafjord was estimated to be approximately 110–120 days. In Canadian waters the larval development of *M. litoralis* lasts about 180 days (Ladurantaye & Lacroix 1980) while in the subarctic waters north and east of Iceland the marsupial development of *M. mixta* takes about 150 days (Astthorsson 1984). These differences in development time are probably mainly due to the combined effect of environmental temperature and egg size (see Wittmann 1984).

The mean growth rate of juvenile *M. oculata* in south-west Iceland was calculated as approximately 0.08 mm per day at 9–12°C during the summer months (Fig. 3). This is a daily growth rate somewhat lower than the range of 0.11–0.14 mm reported for juvenile *M. litoralis* in the Saguenay fjord (Ladurantaye & Lacroix 1980). The daily growth rate of juvenile *M. oculata* in Skerjafjord is also somewhat lower than that reported by Astthorsson (1987b) for juvenile *Praunus flexuosus* (0.13–0.16 mm) from the same area.

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