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On Realized Fecundity of Northern Shrimp (*Pandalus borealis*)
at Flemish Cap During Spring-Summer 1996

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Abstract

Study of number of eggs laid down by females of northern shrimp on pleopods at Flemish Cap Bank (absolute individual realized fecundity) showed that it had been fluctuating between 40 and 2290, being 1021-2290 in female with recently laid down eggs and making up 1428 eggs on the average. This is as twice as less than in shrimp of comparative size from the waters of West Spitsbergen and is compared to that of shrimp from the Barents Sea. Great number of dead eggs was found in layings. Losses for the time of bearing in pleopods reached 80%. It has been suggested that reproduction northern shrimp populations at Flemish Cap for the account of their own reproductive potentials was limited, and they recruited by an outward transportation of larvae.

Introduction

Relation of number of eggs on northern shrimp pleopods to shrimp sizes in different locations of their habitat has been studied by Nilssen, 1990; Nilssen, Hopkins, 1991. The papers by several scientists who studied reproductive biology of northern shrimp from the Barents Sea (Bryazgin, 1981; Berenboim, 1992; Brenboim, Sheveleva, 1989) were of great interest for our work. Methods of evaluation of shrimp reproductive potential were used by the above-mentioned authors which allowed them to conclude about the extent of selfreproduction of some shrimp population.

Material and Methods

Material was collected on 27th March, 1996 (46°49 N; 45°41 W, 270-275 m; 22 females, 11 of which had eggs on their pleopods) and on 17th August, 1996 (44°08 N; 46°06 W, 325 m; 21 females, 13 of which bore eggs on their pleopods). Length of shrimp carapace was measured from orbits to rear edge along dorsal side to the nearest 0,1 mm (Burukovsky, 1992). Number of eggs on pleopods that one may consider as absolute individual realized fecundity (hereinafter realized fecundity) in contrast to number of oocytes in mature gonads which we call absolute individual potential fecundity (Burukovsky, 1993) was determined as follows:

Eggs taken off pleopods were weighed in torsion balance after their light drying up on filter paper. Then 500 eggs were sampled from total number and after their similar drying up were also weighed in torsion balance. Fecundity was calculated basing on the results of solving a corresponding proportion. If there observed small number of eggs, all of them were calculated.

Stages of maturity of gonads in females were determined by five-mark scale (Burukovsky, 1992).

Stages of embrional development of eggs were also determined by five-mark scale (Burukovsky, 1992) as follows:

1 Stage. Eggs semiopaque, yolk homogeneous, without trace of celldivision.

2 Stage. Eggs semiopaque, embrional stria of crescent form is wisible. Yolk is of 3/4 of eggs volume.

3 Stage. Yolk is of 1/3-1/4 of eggs volume. The rest is occupied with the embryo. Eye rudiment as a narrow little dash.

4 Stage. This stage differs from the previous one by presence of a well developed eye. Yolk volume is somewhat lesser than at the previous stage.

5 Stage. Inside egg membrane completely developed larva at the point of hatching. The remaining yolk is enclosed inside carapace.

Results

Length of females with eggs on their pleopods varied between 22 mm and 33 mm. Their absolute realized fecundity fluctuated within 40 and 2290 eggs. Egg size at initial stages of embryogenesis were 1,3-1,4x1,0-1,1 mm, i.e. roughly the same as in *P.borealis* from the Barents Sea (Berenboim, 1992). In females with recently laid down eggs realized fecundity fluctuated within 1021 in an individual of 25,5 mm carapace

length and 2290 in a female of 28,5 mm. A part of eggs in all individuals and all eggs in some of them were whitish-dull and opaque in contrast to normal eggs lightly amber-coloured and semi-opaque in preserved individuals. Basing on description by Bryazgin (1981) and Berenboim (1992) we considered those eggs as to become dead in the process of laying down or egg incubation. However, number of dead eggs in the layings was not taken into account in this paper. Their presence was only stated.

On March the overwhelming majority of females (96%) was at II stage of maturity, and 2/3 of them bore eggs on their pleopods. All of them had inside their eggs embryos that were ready to hatch. Two females bore on their pleopods only dead eggs. In two females among 11 under examination up to 50% of eggs ready to hatch was dead. Number of eggs with embryos ready to hatch (final realized fecundity) fluctuated within 40 and 910, being 276 eggs on the average.

In August a certain number of pre-spawning individuals without eggs on their pleopods (approximately 10%) was present in the sample. However, the overwhelming majority of females had gonads at II stage of maturity and recently laid down eggs on pleopods. Some part of them was also dead. Number of eggs (initial realized fecundity) varied between 1021 and 2290 eggs, being 1438 eggs on the average (Fig. 1). As a result, average loss of eggs in the process of embryogenesis was near 80%. Real losses may be even more, if we will take into account a certain number of dead eggs in layings.

In Isfjord (West Spitsbergen) number of recently laid down eggs on pleopods of individuals of comparable sizes was approximately as twice as more than in shrimp from Flemish Cap Bank (Nilssen, 1990, fig. 9). In the Barents Sea females with eggs had the length of 19-31 mm and number of eggs at the initial stage of embryogenesis of 1,2-1,3x1,1 mm (Berenboim, 1992), i.e. they are quite comparable to those from Flemish Cap Bank. Initial realized fecundity was on the average 1531 (569-2658 eggs) in the Barents Sea, being final one 1107 (678-1930) eggs (Berenboim, 1992). That number was considerably higher than number found at Flemish Cap Bank in summer 1996. Survival of embryos was also significantly higher: not less than 57% (Berenboim, 1992), while it was about 20% at Flemish Cap in summer 1996 (assuming value of survival to be inverse to that of losses of embryos in the process of embryogenesis).

Basing on the above stated, one may suggest that reproduction of northern shrimp population at Flemish Cap for the account of own reproductive potential was significantly limited. It was presumably formed of the larvae inflow with current transportation.

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Trend of fluctuations of realized fecundity for the time of bearing in pleopods

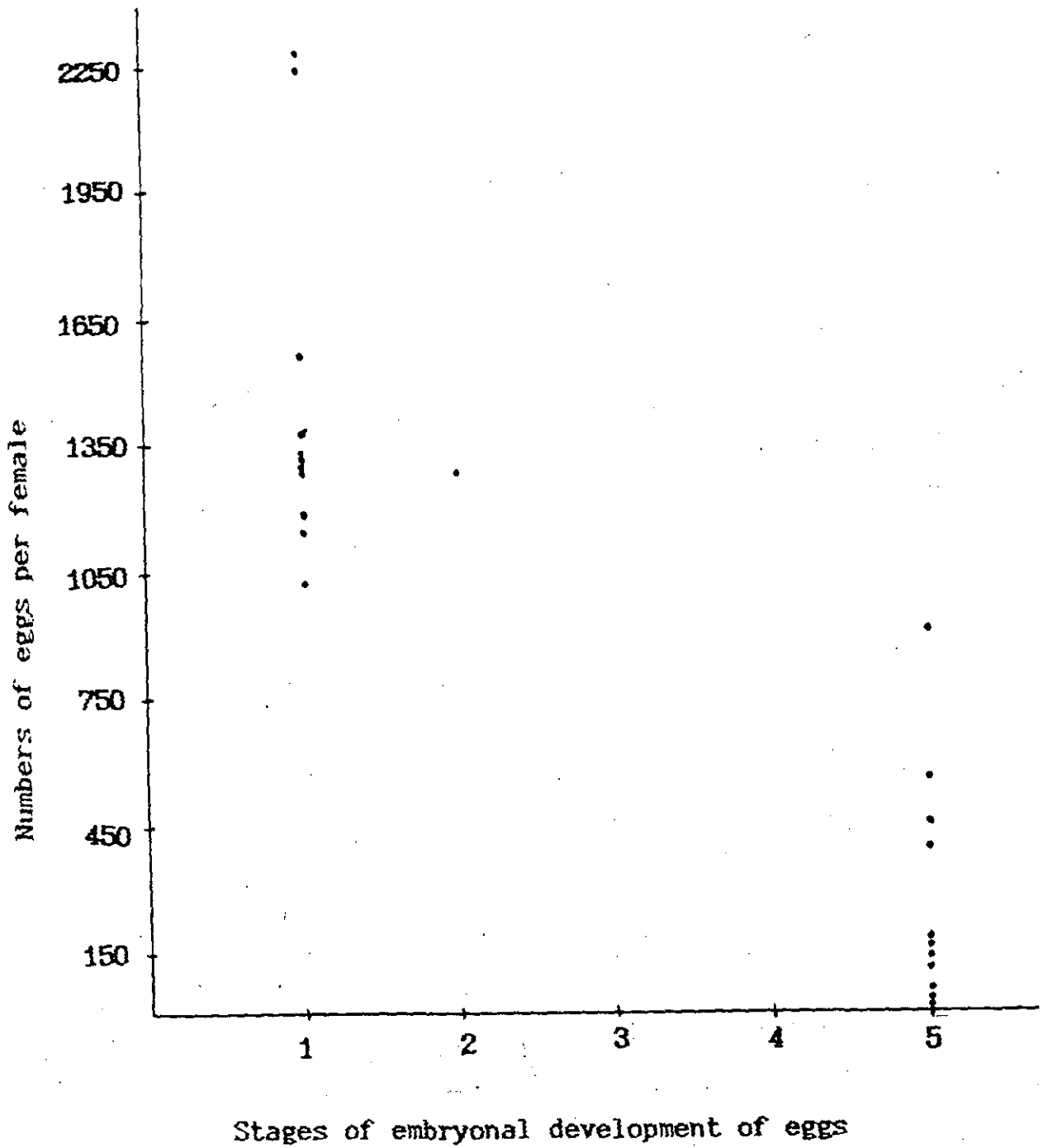


Fig.1