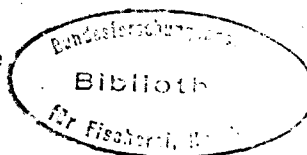


This paper not to be cited without prior reference to the author

International Council for the
 Exploration of the Sea



C.M. 1969/K:16
 Shellfish and Benthos
 Committee

On the Biology of *Crangon crangon* (L.) in the Western Baltic

by H. Dornheim

This paper is a summary of a thesis done by the author in the Fischerei-biologische Abteilung des Instituts für Meereskunde, Kiel, in 1964-1968. The complete dissertation will shortly be published in the DWK-Reports. 35642 adult *Crangon crangon* caught in 52 samples in the inner and outer Bay of Kiel with push-net and a little beam-trawl were examined; the investigations of larvae are based on 14405 specimens in 262 samples, caught with a Hensen-egg-net (120), an otterboard plankton net (64) and a ring-trawl (78) (Fig. 1). The hydrographic condition of the investigation area is characterized by temperatures up to 20°C during summer and down to the freezing point during winter in coastal waters. The salinity of the coastal area fluctuates between 16 and 20 ‰ and often can be less.

The main results are:

- 1.) *Crangon crangon* may be caught in the Bay of Kiel from April/Mai to October/November close to the shore in a depth of 0,2 - 0,5 m with the push-net, and in a depth of about 4 m by beam-trawl, whilst in the other months, in greater numbers, solely by beam-trawl in a depth of 1 - 4 m. Night-catches are greater than day-catches.
- 2.) As a result of length measurements (from the tip of the antenna to the end of the telson) of 3647 males and 5109 females it is shown that in contrast to the North Sea (Havinga (5), Tiews (12), Boddeke (2)) only very few males with a length of over 40 mm (max. 47 mm) and females of over 50 mm (max. 60 mm) occur in the western Baltic.
- 3.) Exact separation of the sexes under a dissecting microscope is possible by external characters at rather small size of the shrimps. a) The length of the endopodite of the first pleopod (above a length of 35 mm). North Sea: above 40 mm (Tiews (12)), above 35 mm (Boddeke (1)). b) The formation of the appendix masculina on the endopodites of the second pleopod already appears at a length of 18 mm. North Sea: 24-26 mm (Tiews (12)). c) Also above 18 mm in length (North Sea: above 30 mm (Tiews (12))) both the number of segments of the outer branch of the first antenna as well as its maximum diameter is clearly different in males and females. d) The covering of the outer branch of the first antenna with olfactory hairs (more than 40 mm). North Sea: more than 35 mm (Tiews (12)).
- 4.) The majority of the females become mature at a length of 34-35 mm (rarely at 27 mm); for males approximately 27 mm. North Sea: compare Tiews (13).
- 5.) Seasonal appearance of the egg-bearing females, of the pelagic larvae and of the pre-adults indicates that *Crangon crangon* in the western Baltic, in contrast to the North Sea (Hrenbaum (4), Havinga (5), P.F. Meyer (10), Tiews (12)), spawns only in summer and lacks the winter breeding period.

- 6.) The number of spawnings per year was estimated by ascertaining the state of maturity of the ovaries of 1050 females. At the same time egg-bearing and non-egg-bearing females were separated; the former were further subdivided according to the state of development of their eggs. The results confirm the absence of the winter reproduction period. Spawning occurs three times during the reproduction period (North Sea: two or three times: Havinga (5), P.F. Meyer (10), Tiewes (12); from two to five times: Meixner (7,8)).
- 7.) By the Petersen method growth and age were determined on 4905 females and 3259 males. According to this the sexes begin to grow differently only after they have attained a length of 24 - 26 mm (North Sea: same size (Tiewes, 12)). One year old females are approximately 37 mm long, males of the same age approximately 32 mm (North Sea: different results: Ehrenbaum (4), Havinga (5), P.F. Meyer (9), Lloyd and Yonge (6), Tiewes (12), Boddeke (3), Meixner (7,8)). The relationship of growth in summer to that in winter in both sexes is approximately 2 : 1.
- 8.) With a normal life expectancy of presumably 20 months (North Sea: three years: Ehrenbaum (4), Havinga (5), Tiewes (12); Bristol Channel more than three years: Lloyd and Yonge (6)), females and males reach maturity shortly before the end of the first year (North Sea: after one year: P.F. Meyer (9), Tiewes (12); approximately two years: Havinga (5), Lloyd and Yonge (6)).
- 9.) The sex ratio of males to females is, on the year's average of 9244 Crangon crangon above 18 mm in length, about 5 : 7.
- 10.) In case of 71 Crangon crangon the number of eggs was counted. According to this females with a length of 35 mm produce on average 620 eggs, of 40 mm 1400, of 45 mm 1830 and of 50 mm 2700. To show the relationship between the number of eggs and the length linear and potential equations were calculated. The conclusion from these relationships is that Crangon crangon in the western Baltic produce considerably more eggs than those of the same size in the North Sea. As a result of their smaller average size (43 mm), the specimens from the Baltic, despite their considerably greater relative fertility, lay substantially fewer eggs (1630) than those from the North Sea (6430 eggs: average length 72 mm, Havinga (5); further investigations necessary).
- 11.) On the basis of the average size of 224 larvae in the stages of development I - V from the western Baltic, stage I (2,6 mm) is revealed to be larger than that of the North Sea (2,2 mm, converted result of Ehrenbaum (4)). The stages III (3,6 mm), IV (4,1 mm) and V (4,9 mm) are shown to be, however, increasingly smaller than the stages in the North Sea (III: 4,0 mm, IV: 4,6 mm, V: 5,6 mm, converted results of Ehrenbaum (4)). Further investigations are needed.
- 12.) The larval surveys confirmed the conclusions on the time and duration of the reproduction period, on the number of spawnings per season and on the distribution of adult Crangon crangon in the various parts of the Bay of Kiel.
- 13.) The population in the western Baltic shows a substantially smaller larvae production than that in the North Sea. In summer 1966 between

- (10) Meyer, P.F., 1935 Ein Beitrag zur Frage der Laichperiodizität bei der Nordseehrabbe (Granat) Crangon vulgaris Fabr..
Zool. Anz., 109, 25-32
- (11) Plett, A., 1965 Über das Vorkommen von Garnelenlarven (Crangon crangon L.) vor der deutschen Küste in den Jahren 1963 und 1964.
Arch. Fischereiwiss., 16, 54-66
- (12) Tiews, K., 1954 Studien zu der Büsumer Garnelenfischerei, ihren biologischen Grundlagen und ihrer wirtschaftlichen Struktur.
Dissertation, Univ. Kiel, 1-146, published (1954) in Ber. Dtsch. Wiss. Komm. Meeresforsch., N.F., 13, 255-269
- (13) - " - 1967 Synopsis of biological data on the common shrimp Crangon crangon (Linnaeus, 1758).
FAO, FR:BCSP/67/SS/1, 1-8:7

Dr. H. Dornheim

Bundesforschungsanstalt für Fischerei,
Institut für Seefischerei, Hamburg

