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The population structure of Assiminea grayana Fleming, 1828 (Gastropoda, Assimineidae), in the South-West Netherlands

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INTRODUCTION

As part of an investigation on the ecology of gastropods in the South-West Netherlands the population structure of *Assiminea grayana* Fleming, 1828, was studied. This small prosobranch mollusc lives in brackish areas and although it has no gills and may be considered as adapted to living on land, it is restricted to the intertidal area of salt-marshes. The species is locally very common, and may reach densities of tens of thousands per square metre.

From January 1967 to January 1968 *A. grayana* was sampled from the salt-marshes of the Emanuël-Zimmerman polder along the Western Scheldt estuary (fig. 1). Chlorinity at the sampling site is between 6 and 14$^{o}/_{oo}$ at high tide, dependent on river discharge (De Pauw, 1975). The sampling site was situated in a *Plantaginetum*-vegetation.

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MATERIAL AND METHODS

Each month four random samples were taken to a depth of 4 to 5 cm with a corer (area 0.005 m^2). In order to separate living molluscs from empty shells a variation on Reisinger's (1954) method for the collecting of bottom-dwelling Turbellaria was used (Bilio, 1964). In short the procedure was as follows. The samples were put into beakers and the vegetation was cut off. Then they were covered with a layer of clean sand and water was added until 3/4 of the beaker was filled. The animals crept out of the sand and gathered on the glass or on the underside of the water-surface from which they were collected each day. After four days all animals had crept out of the sand. The animals were counted and the height of the shell was measured to the nearest 0.5 mm, using a calibrated micrometer eye-piece in a binocular microscope. The height-frequency distributions were separated into generation-groups by plotting the cumulated frequencies on probability paper (Harding, 1949; Harris, 1968).

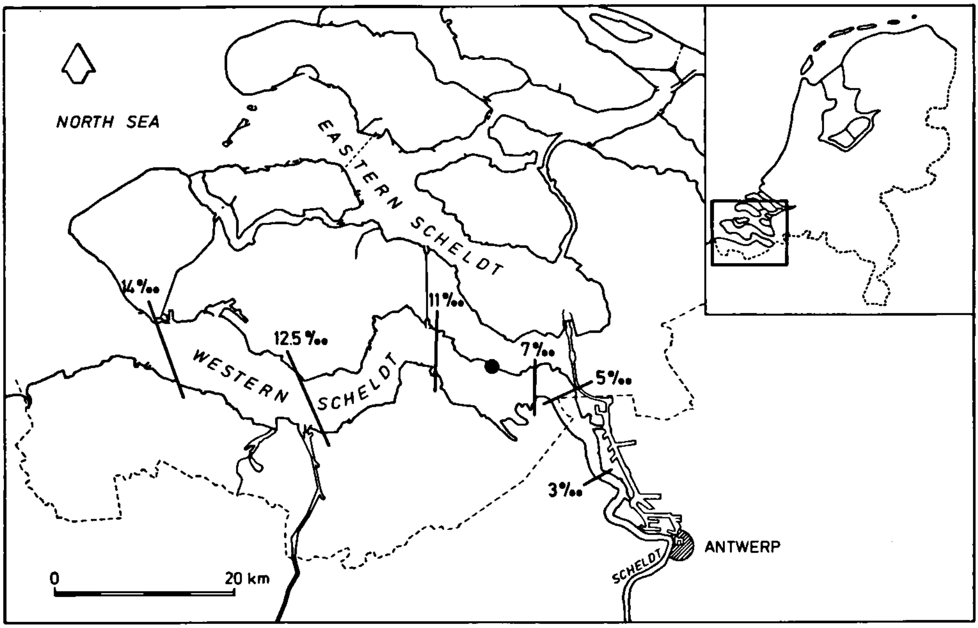

Fig. 1. Position of the salt-marshes of the Emanuël-Zimmerman polder along the Western Scheldt (●). Chlorinities at high tide during average river discharge are indicated.

RESULTS AND DISCUSSION

In winter and spring the population of *A. grayana* consisted of two clearly distinguishable generations (fig. 2). The one hatched in the previous year (1966) formed about 80% of the population during the winter (fig. 3). In May this generation only formed a little over 50% of the population. This was probably due to high mortality during the last part of the winter and early spring. In the course of spring it became difficult to differentiate between the 1965 and 1966 generation, owing to the increase in average height of the 1966 generation, matching the 1965 generation height. In this way the two generations became indistinguishable, as was also shown for *Hydrobia ulvae* (Pennant, 1777) (Rothschild, mentioned in Fretter & Graham, 1962). In July the first representatives of the new generation were found. From September onwards the number of this generation increased rapidly, and in October the major part of the population belonged to this new generation (fig. 3).

In February and March 1967 numbers were very high and consisted mainly of animals from the 1966 generation (table 1). In the course of the following months numbers decreased markedly. This can be explained by a high mortality towards the end of the winter, mainly among the animals of the 1966 generation (table 1), and by migration out of the area during the reproductive season, which started in the period April-May. In summer numbers were very low, but started to increase in autumn when the new larvae settled on the salt-marsh. The number of animals at the sampling site in January 1968 was about as large as in the previous winter.

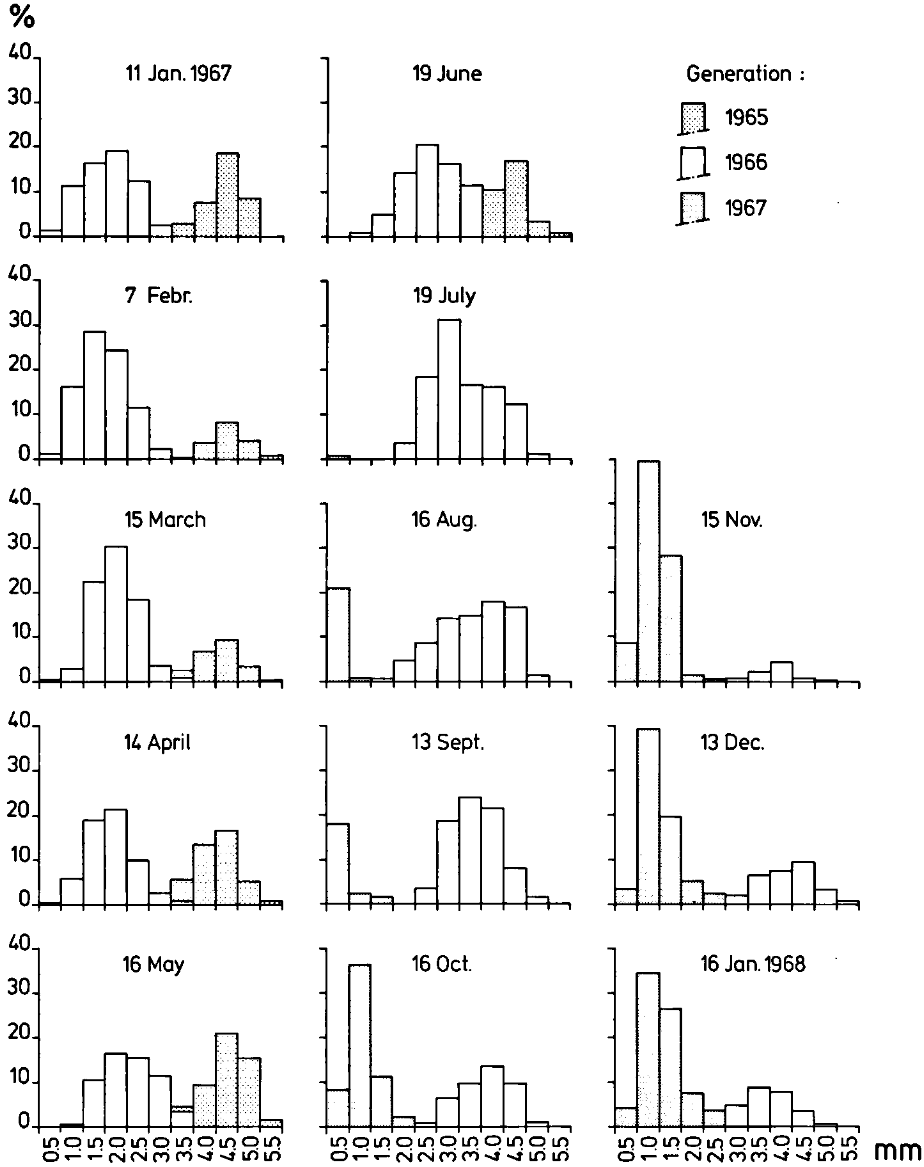

Fig. 2. Height-frequency distribution of *Assiminea grayana* collected in the salt-marshes of the Emanuël-Zimmerman polder in 1967.

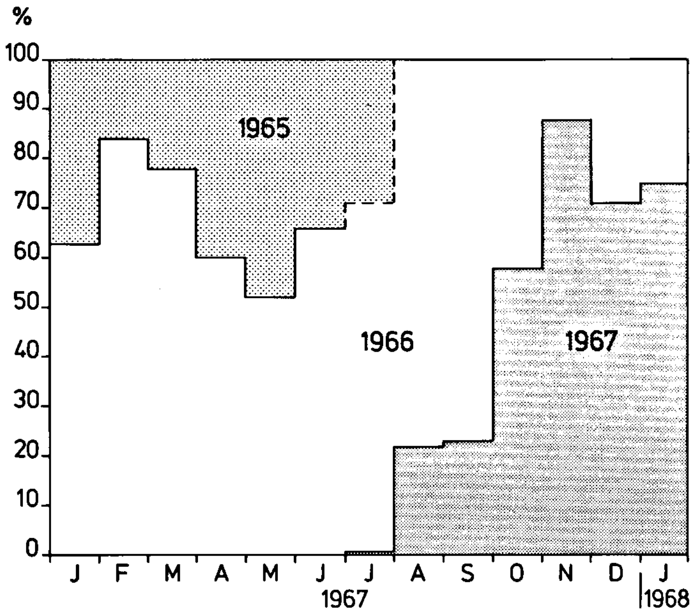

Fig. 3. Generation frequency distribution of *Assiminea grayana* collected in the salt-marshes of the Emanuël-Zimmerman polder in 1967. The years refer to generations.

Table 1
Numbers and mean shell-height of three generations of *Assiminea grayana* from the salt-marshes of the Emanuël-Zimmerman polder in the course of 1967.

Date		numbers per m^2				A	B	mean shell-height (mm)		
		total	1965	1966	1967			1965	1966	1967
11 Jan.	1967	19600	7250	12350		150	12	4.5	1.7	
7 Febr.	,,	41000	6550	34450		319	145	4.6	1.6	
15 March	,,	39550	8400	31150		301	38	4.3	1.9	
14 April	,,	27600	11050	16550		170	87	4.2	1.7	
16 May	,,	16650	8000	8650		103	64	4.6	2.2	
9 June	,,	9150	3100	6050		101	22	4.2	2.4	
19 July	,,	9300		9250	50	69	32		3.2	0.5
16 Aug.	,,	11700		9150	2550	109	32		3.5	0.3
13 Sept.	,,	6900		5350	1550	75	18		3.5	0.5
16 Oct.	,,	19850		8300	11550	144	59		3.8	0.9
14 Nov.	,,	25750		3150	22600	197	90		4.1	1.1
13 Dec.	,,	15400		4500	10900	127	10		4.1	1.1
16 Jan.	1968	38300		9500	28800	+	+		3.7	1.2

A: highest number out of four monthly samples.

B: lowest number out of four monthly samples.

+: only one sample has been taken.

During the winter months an accumulation of animals was observed at the sampling station, which was not caused by the settling of larvae (fig. 2). It was probably due to migration by floating, especially during stormy weather. In this way animals of lower parts of the marsh were transported to higher reaches. A similar phenomenon was observed for *H. ulvae* (see Chatfield, 1972; Fretter & Graham, 1962). The distribution of animals over the sampling site was very patchy, as shown by the differences between the four monthly samples (table 1). This was partly due to the heterogeneity of the sampling site within very short distances, and partly to clustering of animals. It is thus understood, that not too much emphasis should be laid on the mean numbers as mentioned in table 1.

Since the animals normally start reproducing in the middle of April, and as it may be three to seven weeks before the first eggs hatch, depending on the time the egg-capsules are flooded at spring-tide, the first animals of the new generation will be born somewhere between the middle of May and the middle of June (Sander, 1950; Sander & Siebrecht, 1967; Seeleman, 1968). As animals of the 1965 generation could still be clearly distinguished in June 1967, and have lived longer yet, it may be presumed that the maximum life-span of the species is about 1.5 to 2 years. It is not known whether the animals of the older generation reproduce again. Since generations of over one year of age become indistinguishable, it is impossible to determine the true maximum life-span for a field population.

SUMMARY

- Population structure and life-cycle of *Assiminea grayana* are described, based on size frequency-distribution histograms of samples from a salt-marsh along the Western Scheldt estuary.
- Generations of previous years could be distinguished until June, later on they merged to form one inseparable group.
- Highest numbers were found in winter, numbers decreased at the end of the winter, mainly due to mortality, and in spring, mainly due to migration.
- First representatives of the new generation were found in July. In October the main part of the population consisted of this new generation.
- At least part of the individuals may live for two years.

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SAMENVATTING

De populatieopbouw en de levenscyclus van *Assiminea grayana* worden beschreven met behulp van lengte-frequentieverdeling histogrammen van monsters genomen op een schor in de Westerschelde. Tot in juni konden de verschillende generaties uit voorgaande jaren worden onderscheiden, later bleek dit niet meer mogelijk. De hoogste aantallen slakken werden in de winter aangetroffen; de aantallen namen tegen het einde van de winter voornamelijk af door sterfte, en in de lente vooral door migratie. De eerste exemplaren van de nieuwe generatie werden in juli gevonden. In october bestond het grootste deel van de populatie uit deze generatie. Tenminste een aantal individuen zou twee jaar oud kunnen worden.