

## A simple method for size classification of gastropod populations

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Up to now size classification of gastropod populations is normally achieved by measuring the height of the shells (Chatfield, 1972; Den Hartog & De Wolf, 1962; Vlasblom, 1971). This method is very time consuming, especially for very small snails, since all the shells have to be measured individually with a marking gauge or by using a binocular microscope with an ocular with a calibrated micrometer. With the method presented in this paper it is possible, at least for *Hydrobia ulvae* (Pennant), to achieve size classification of complete populations very quickly. The method is based on the same principle as the successive sieving technique as applied in soil science for grain-size determination.

The sieving system (fig. 1) is composed of 13 sieves, each fitted in a perspex holder ( $\emptyset$  7.5 cm) with a screw-thread attachment. The sieves consist of perforated brass plates. The diameter of the perforations of the sieve in the upper compartment is 3 mm and decreases with 0.2 mm per compartment to 0.6 mm in the lowest compartment. The upper compartment can be closed by a lid, the lower one is a reservoir.

The animals, preserved in 70% ethanol, were dried on a petri dish at about 30° C. Then the shells were transferred to the upper compartment of the sieving equipment with a small soft brush. After closing the lid the apparatus was shaken for at least five minutes in a laboratory reciprocating shaker (Marius B.V., Utrecht, type 73 SL). After unscrewing of the equipment the number of shells in each compartment was determined.

Since the height of *H. ulvae* is greater than the width, this sieving procedure results in a classification based on the width of the shells. Whether the width is proportional to the height and thus can be related to the size classification, was checked by comparing the height and width of an at random chosen number of gastropod shells. The dimensions of these shells were determined by the classical method of measurement with a binocular microscope.

For a sample of *H. ulvae* from the Eastern Scheldt the height varied between 0.8 mm and 5.4 mm, and the width between 0.6 mm and 2.6 mm ( $n = 46$ ). A correlation analysis

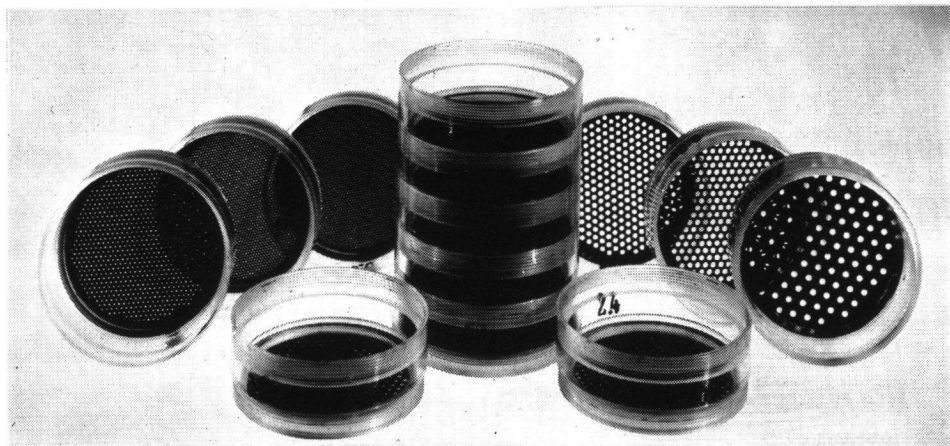


Fig. 1. Apparatus to determine the size classification of a gastropod population (partly assembled).  
Foto R.H.G. Kleingeld.

at the 0.05 confidence level demonstrated a correlation between the height (1) and width (b) of the shells according to the formula  $1 = 2.215 b - 0.620$  (fig. 2). Also for samples from the Wadden Sea, the Western Scheldt and the Wash (East England) a correlation between the height and width could be assessed (table 1). These results clearly demonstrate that the size classification of a population of *H. ulvae*, which is normally obtained by measuring the height of the shells, can also be determined by measuring the width of the shells. Equipment which effectively separates a population in width classes therefore can be used for size classification.

Table 1

Location	n	r	$t_r$
Eastern Scheldt	46	0.95	20.46
Wadden Sea	73	0.98	38.40
Wadden Sea	58	0.89	14.62
Wadden Sea	67	0.99	47.62
Wadden Sea	70	0.98	37.94
Wash (East England)	61	0.98	41.19
Western Scheldt	75	0.84	13.42

Table 1. Correlation between height and width of the shell of *Hydrobia ulvae*.  
n, number of shells; r, correlation coefficient;  $t_r$ , Student's t for r.

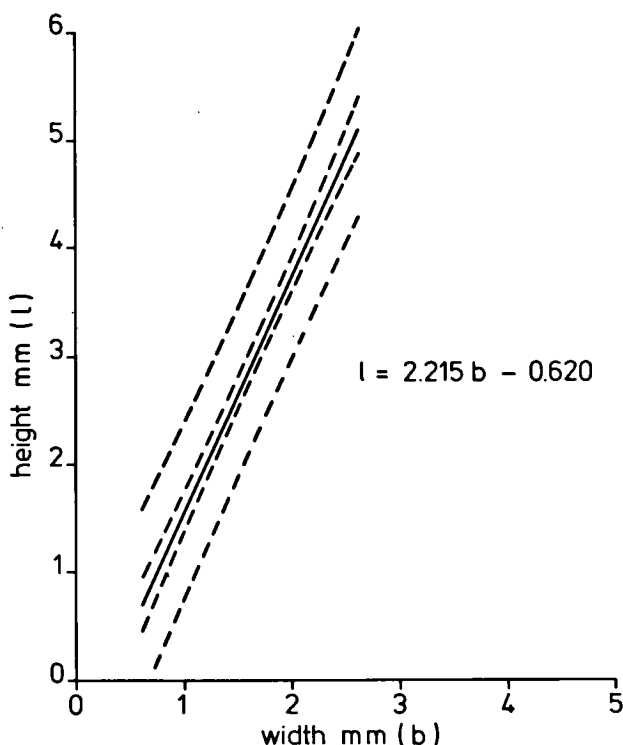


Fig. 2. Relation between height ( $l$ ) and width ( $b$ ) of *Hydrobia ulvae* from the Eastern Scheldt ( $n = 46$ ) with the 95% confidence levels of  $l$  and  $\bar{l}$ .

The width distribution of 75 *H. ulvae* was determined three times with the sieving equipment as described in this paper. The width distribution of this group of shells was also determined microscopically. Statistical analysis demonstrated that the width distributions as obtained with these two different methods appeared to be the same (table 2).

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Table 2

Width interval (mm)	1.6-1.8	1.8-2.0	2.0-2.2	2.2-2.4	2.4-2.6	2.6-2.8	2.8-3.0	$\chi^2$	p
n - microscope	2	3	6	21	22	15	6		
n - sieving I	2	2	9	13	23	16	10	7.66	> 0.05
n - sieving II	2	3	8	11	27	13	11	11.00	> 0.05
n - sieving III	2	3	10	18	18	13	12	10.42	> 0.05

Table 2. Comparison between the width distribution of 75 *Hydrobia ulvae* determined microscopically and the width distribution of the same animals determined by sieving (I, II and III).

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## SAMENVATTING

Een methode wordt beschreven om door middel van zeven een gastropodenpopulatie in grootte-  
klassen in te delen. Dit is mogelijk omdat voor het bepalen van de grootteverdeling van een *Hydrobia*  
*ulvae*-populatie, de breedte van de schelp even goed gebruikt kan worden als de lengte.