

## REMARKS ON THE ECOLOGY OF CHTHAMALIDS IN THE LIGURIAN SEA

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Résumé — On rapporte quelques données sur la distribution, l'installation, la mortalité, les périodes de maturité féminine, les périodes de présence des embryons, l'accroissement et la longévité des trois espèces de Chthamalidae (Crustacea, Cirripedia) présentes le long des côtes liguriennes: *Euraphia depressa* (Poli), *Chthamalus stellatus* (Poli) et *Ch. montagui* Southward.

Summary — Data concerning distribution, settlement, feminine maturation, presence of embryos, growth and longevity were recorded in three Chthamalids living along Ligurian shore: *Euraphia depressa* (Poli), *Chthamalus stellatus* (Poli) and *Ch. montagui* Southward.

By several years some investigations on Chthamalids are in progress on rocky shores near Genoa (Nervi and Quarto) in order to get data about population biology. Three species live in the Ligurian sea: *Euraphia depressa* (Poli), *Chthamalus stellatus* (Poli) and *C. montagui* Southward; the latter has been recently described (Southward 1976) and recognized on Ligurian coast only in 1979-80 (Crisp, Southward and Southward 1981; Relini 1980, 1981).

In this paper I refer about investigation carried out at Genoa Nervi from January 1981 to February 1982. Four small areas (20 X 30 cm) of rocky surface were chosen with the following characteristics:

	Horizontal distance from water edge	Vertical distance from median sea level	Inclination	Exposure	Note
A	4 m	40 cm	30°	South	Partially shaded near rocky pool
B	2 m	5 cm	horizontal	Zenith	near rocky pool
C	0.5 m	2 m	vertical	North	
D	3 m	1 m	10°	South	

In each zone species composition, recently settled, dead and disappeared individuals were recorded monthly; basal diameter and opercular openings were measured each three months in situ. Maturity of ovaries and developmental stages of embryos were evaluated in the laboratory by samples monthly collected on rocky surface close to the investigation areas.

**Tab. 1 - Species composition recorded at the beginning and at the end of investigation.**

	A		B		C		D	
	March '81	Feb. '82	March '81	Feb. '82	March '81	Feb. '82	March '81	Feb. '82
Ch. m.	137 (71.0)	167 (75.9)	361 (87.2)	488 (90.0)	472 (87.7)	503 (87.8)	392 (61.3)	412 (65.5)
Ch. s.	5 ( 2.6)	6 ( 2.7)	50 (12.0)	53 ( 9.8)	23 ( 4.2)	32 ( 5.5)	168 (26.0)	157 (25.0)
E. d.	50 (26.3)	47 (21.4)		1 ( 0.1)	43 ( 8.0)	38 ( 6.6)	79 (12.0)	60 ( 9.5)

The numbers in brackets are per cent value.

In all zones, *Ch. montagui* increased in number, *Euraphia depressa* decreased while *Ch. stellatus* remained remarkably constant. It is interesting to note that in 1974 the same area A was colonized by 78 *E. depressa* and 19 *Ch. sp.*; zone B by 175 *Ch. sp.* and 1 *E. depressa*, i. e. the the species *E. depressa*; certainly identified also in past years, was more abundant. Monthly records of settlement are shown in Table 2.

**Tab. 2 - Individuals monthly settled (first number) and died (number in brackets).**

		M '81	A	M	J	J	A	S	O	N	D	J	F '82
A	Ch. m.	8 (1)	5 (1)	5	(1)	(5)		9 (3)	7 (2)	8	6	7 (1)	(2)
	Ch. s.								1				
	E. d.	1			(2)	(3)		(1)	2 (1)			2	
B	Ch. m.	14 (3)	6 (4)	4 (3)	(12)	(13)		27 (14)	29 (14)	27 (6)	34 (11)	26 (13)	(36)
	Ch. s.	3		3 (3)		(5)		3	3 (3)	2 (2)	10	7	(12)
	E. d.										1		
C	Ch. m.	11	8 (6)	9 (4)	(6)	(5)		23 (9)	20 (8)	22 (7)	12 (3)	6 (3)	(18)
	Ch. s.			2	(1)	(2)		3 (2)	3 (3)	3	6	2 (1)	(1)
	E. d.		(1)			(1)		1	1 (3)	(1)	(1)		
D	Ch. m.	12	12 (5)	10	(3)	(5)		13 (6)	20 (8)	10 (2)	13 (4)	13 (22)	(16)
	Ch. s.		3			(2)		4 (3)	6 (3)	2 (3)	1 (1)	(9)	(6)
	E. d.				(1)			1 (2)	(2)	(2)	1	1 (14)	

In general settlement occurred from March to May and mainly from September to January. *Ch. montagui* showed the highest number; *E. depressa* the lowest. The number of spats decreased with the increasing distance to sea, i. e. the turn over of Chthamalids population is much more rapid close to the water edge. The deads were found all months long but the highest number of dead barnacles was found during January and February in zones closer to the sea probably in connection with strong wave action; on the contrary in the farthest zones mortality was higher in Summer probably owing to high temperature and lacking of sea water supplies for long periods.

*E. depressa* showed ripe eggs in all months; fertilized eggs and later embryonic stages were found from June to September. In *Ch. montagui* and *Ch. stellatus* fertilized eggs were present all year long except October and November, while later embryonic stages occurred from February to September. In the same individual it is possible to find contemporarily different developmental stages of embryos: for instance, following the classification of Crisp (1954), the stages I, X, XII. The period in which embryos were found, that means reproduction in progress, did not agree with settlement period. Thought the data are too scanty to allow a definite conclusion, this discrepancy could be explained by two hypothesis to be verified: 1) a wider breeding period in Chthamalid groups living in much more suitable micro-environments; 2) a longer planctonic life in relation with unfavourable sea conditions.

In general the growth rate of the shell of these barnacles resulted very low, with considerable individual variation, a feature which appears to be common in Cirripedia, and is probably largely due to environmental differences (Crisp 1954). *Ch. montagui* and *Ch. stellatus* reached 2-2.5 mm of basal diameter in three months and 3.5-4 one year later. During the second year the diameter could arrive up to 8 mm, but generally was no more than 5-6 mm. In one year an *E. depressa* of 2 mm could reach 6 mm. The largest sizes recorded in the three species at Nervi were the following: *Ch. montagui* 11/4.6 mm (basal diameter/opercular diameter), *Ch. stellatus* 10.2/4 mm, *E. depressa* 13.2/6 mm. It seems probable that more than three years are necessary to reach such sizes. Sometimes the sizes of barnacles decreased because of abrasion of the shell. It was observed that these Cirripedia live more than ten years; few of them have been followed during such a long period, because a lot of Chthamalids were destroyed by wave action, which sometimes was so strong as to break the rock on which barnacles were settled. Chthamalids population at Nervi seems to be affected much more by physical factors than by biotic ones.

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