

**THE DAILY INTAKE AND DEGREE OF ABSORPTION OF THE  
SEA URCHIN PARACENTROTUS LIVIDUS FED UPON  
CAULERPA TAXIFOLIA (CHLOROPHYTA), CYSTOSEIRA  
COMPRESSA AND HALOPTERIS SCOPARIA (FUCOPHYCAE)**

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The tropical green alga *Caulerpa taxifolia* (Vahl) C. Agardh was introduced into the Mediterranean sea in 1984 (MEINEZ and HESSE, 1991), where it forms very dense populations in the infralittoral zone, in particular between Nice and Menton (Alpes-Maritimes, France). *Caulerpa taxifolia* is toxic due to the production of some toxic terpenoids (GUERRIERO *et al.*, 1992 ; LEMEE *et al.*, 1993). The alga's toxicity changes greatly according to the season : in March-April, it is at its weakest and is most toxic from July to November (LEMEE *et al.*, 1993). During the hot season the sea urchin *Paracentrotus lividus* (Lamarck, 1816) notably avoids *Caulerpa taxifolia* ; on the other hand, during the cold season, the urchin is likely to feed upon the alga; however, the gonads of urchins fed upon *Caulerpa taxifolia* are found to be significantly less developed when compared with those of urchins fed upon a control alga (LEMEE *et al.*, 1994). The purpose of these experiments is to understand the reasons for these observations.

The experiments were carried out in aquariums, between the months of March and May 1994. The temperature of the water in the aquariums was constantly adjusted to correspond with the temperature of the sea in the region of the Alpes Maritimes. The algae offered to the urchins (*C. taxifolia*, *Cystoseira compressa* (Esper) Gerloff and Nizamuddin, *Halopteris scoparia* (Linnaeus) Sauvageau) were gathered less than one week beforehand (except for experiment 2). The intake was measured by the daily weighing of the algae (measurements adjusted to take into account any growth of the algae). The degree of absorption was measured by calculating the difference between the intake and the faecal weight.

In all the experiments the urchins display phases of 1-3 days of feeding divided by phases of fasting lasting 1-2 days. These phases explain the significance of the standard deviations (Table 1). The intake of urchins fed upon *Caulerpa taxifolia* is significantly lower than those of urchins fed upon *Cystoseira compressa* and especially *Halopteris scoparia*, two algae considered to be moderately or strongly preferred, respectively by *Paracentrotus lividus*. The degree of absorption is found to be between 0 and 7% for urchins fed upon *Caulerpa taxifolia* as opposed to between 7 and 34% for urchins fed upon the two other algae. Furthermore, if *Caulerpa taxifolia* is freshly gathered (experiments 1, 3 and 4), all urchins feeding upon it are found to be dead within 14 to 18 days after the beginning of the experiment. On the other hand, there is no mortality for the urchins fed upon *Caulerpa taxifolia* conserved for longer than 15 days in an aquarium (experiment 2). However, the intake and the degree of absorption (this in particular) remain low.

Algae offered	Experiment N°	Dates	Daily Intake		degree of absorption %
			Mean	Standard deviation	
<i>Caulerpa taxifolia</i>	1	March 25 - April 4	8	6	0
	2	April 18 - May 19	41	32	2
	3	April 10 - April 22	13	19	0
	4	May 6 - May 20	42	38	7
<i>Cystoseira compressa</i>	5	March 25 - May 19	89	55	34
	6	April 18 - May 19	59	45	7
<i>Halopteris scoparia</i>	7	March 25 - May 19	134	96	23
	8	April 18 - May 19	121	77	13

Table 1 : Intake (in mg of dry weight/day/individual) and the degree of absorption (as a % of the mass ingested) of *Paracentrotus lividus*.

In the cold season, when *Caulerpa taxifolia* is at its least toxic, *Paracentrotus lividus* will feed upon the alga. However, the intake and the degree of absorption (this in particular) are very low, which explains the observed mortalities, as well as the underdevelopment of the gonads reported by LEMEE *et al.* (1994). Furthermore, the conservation in an aquarium of *Caulerpa taxifolia* probably alters its chemical composition and hence this parameter must therefore be taken into account in the experimental protocols.

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