



First assessment of *Microcosmus sabatieri* (Tunicata: Ascidiacea) small-scale artisanal fishery in the South Aegean Sea (Eastern Mediterranean)

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Abstract: The small-scale artisanal fishery of the edible tunicate *Microcosmus sabatieri* was studied in the South Aegean Sea. Mean abundance was 156 ± 53 ind.20' dive⁻¹ and the pattern of distribution was even. Size-frequency analysis indicated a mode around 10 cm at all surveyed islands; nevertheless, significant differences on mean size of the ascidians were observed, as average size decreased eastwards, probably related to increased demand.

Résumé : Première évaluation de la petite pêche artisanale de *Microcosmus sabatieri* (Tunicata : Ascidiacea) du sud de la Mer Egée (Méditerranée orientale). La petite pêche artisanale du tunicier comestible *Microcosmus sabatieri* a été étudiée dans le sud de la Mer Egée. L'abondance moyenne est de 156 ± 53 ind.20' plongée⁻¹ et leur distribution est régulière. L'analyse des fréquences de taille indique un mode proche de 10 cm pour l'ensemble des sites ; toutefois, des différences significatives de la taille moyenne sont observées, celle-ci diminuant vers l'est, probablement en relation avec la demande croissante.

Keywords: Fisheries • Density • Population structure • Ascidiacea • Aegean Sea • *Microcosmus sabatieri*

Introduction

The ascidian *Microcosmus sabatieri* Roule, 1885 is one of the 37 benthic invertebrate species commercially exploited in the Aegean Sea as human food (Chintiroglou et al., 2005). It is a traditional gastronomic delicacy in the South

Aegean (Dodecanese complex) with a constant presence on local markets. *M. sabatieri* lives firmly attached on various hard substrates and on biogenic detritic substratum down to 200 m depth (Monniot & Monniot, 1987). It is widely distributed throughout the Aegean (Koukouras et al., 1995) being one of the most conspicuous and abundant species on rocky cliffs (Antoniadou et al., 2006). It is harvested by diving and also randomly collected by various fishing gear from deeper waters. It is commercialized and consumed as fresh or processed product, named as "spinialo". Official

data on *M. sabatieri* landings are missing, as is any regulation of its fisheries. This locally important commercial species is poorly studied (Beccero & Turon, 1992; Vafidis et al., 2007). Thus, the present work aims to assess the structure of *M. sabatieri* populations at the main fishing grounds of the species.

Materials and methods

The study took place in the South Aegean, a part of the Aegean characterized by warm and saline oligotrophic waters (Voultsiadou et al., in press). Sampling was carried out by diving, in September 2005, at 9 coastal stations randomly dispersed at 5 islands of the Dodecanese (Fig. 1), in depths between 30 and 50 m. A combination of in-situ counting and random collection of *M. sabatieri* specimens took place. Population density was estimated through fishing effort as the number of specimens collected per 20 min dive, i.e. ind.20⁻¹ (Vafidis et al., 2007). Randomly placed frames (20 random frame samples, 0.5 x 0.5 m each) were used to calculate Morisita's index (I') and estimate the spatial distribution of populations (Antoniadou et al., 2006). All the collected specimens were measured to the nearest mm (total length of the tunic, Lt) and length-frequency distributions were calculated (1 cm size classes). The modal length was identified applying the Battacharya and the NORMSEP analyses using a FISAT software package (Gayanilo & Pauly, 1997). The null hypothesis of

no significant differences in Lt among stations and islands was tested with analysis of variance (Underwood, 1997).

Results

Overall, 1,513 specimens were collected and measured. Mean density ranged from 85 to 228 ind.20⁻¹, with a mean value of 156 ± 53 ind.20⁻¹ (Fig. 1). The pattern of distribution was even at all stations ($I' = 1.07$ -1.21). Size-frequency histograms revealed a similar pattern among stations. Lt ranged from 2 to 19 cm, with one mode at 10 cm (Fig. 2). No significant differences in Lt were found between the stations of Tilos ($F = 1.47$, $p = 0.227$) and Symi ($F = 0.59$, $p = 0.44$), in contrast to Astypalea Island, in which significantly smaller specimens were caught at station 2 ($F = 13.9$, $p < 0.05$). Significant Lt differences were also found among islands ($F = 12.29$, $p < 0.05$). Accordingly, *M. sabatieri* populations can be separated into three categories: 1- small sized, Chalki & Symi populations, 2- intermediate sized, Astypalea & Tilos populations, and 3- large sized, Kandelioussa population.

Discussion

The fishery of *M. sabatieri* in the Aegean goes back to the middle of 1800, when sponge-fishing was developed at the islands of Kalymnos and Symi. Sponge fishermen collected

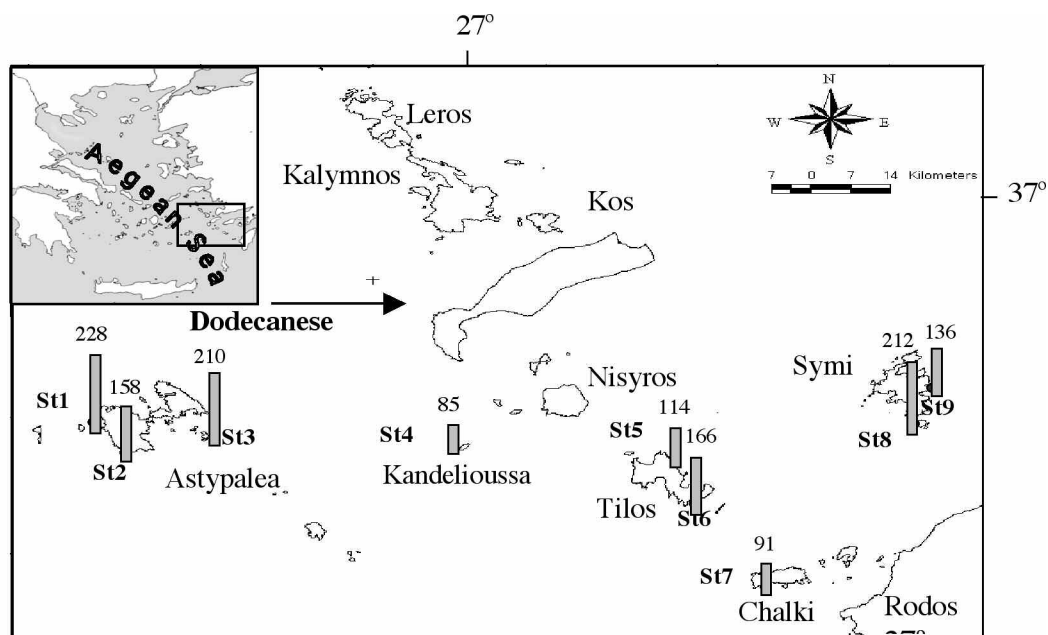


Figure 1. *Microcosmus sabatieri*. Sampling stations and abundance (ind.20⁻¹) in the Dodecanese area.

Figure 1. *Microcosmus sabatieri*. Stations d'échantillonnage et abondances (ind.20⁻¹) dans la région du Dodécanèse.

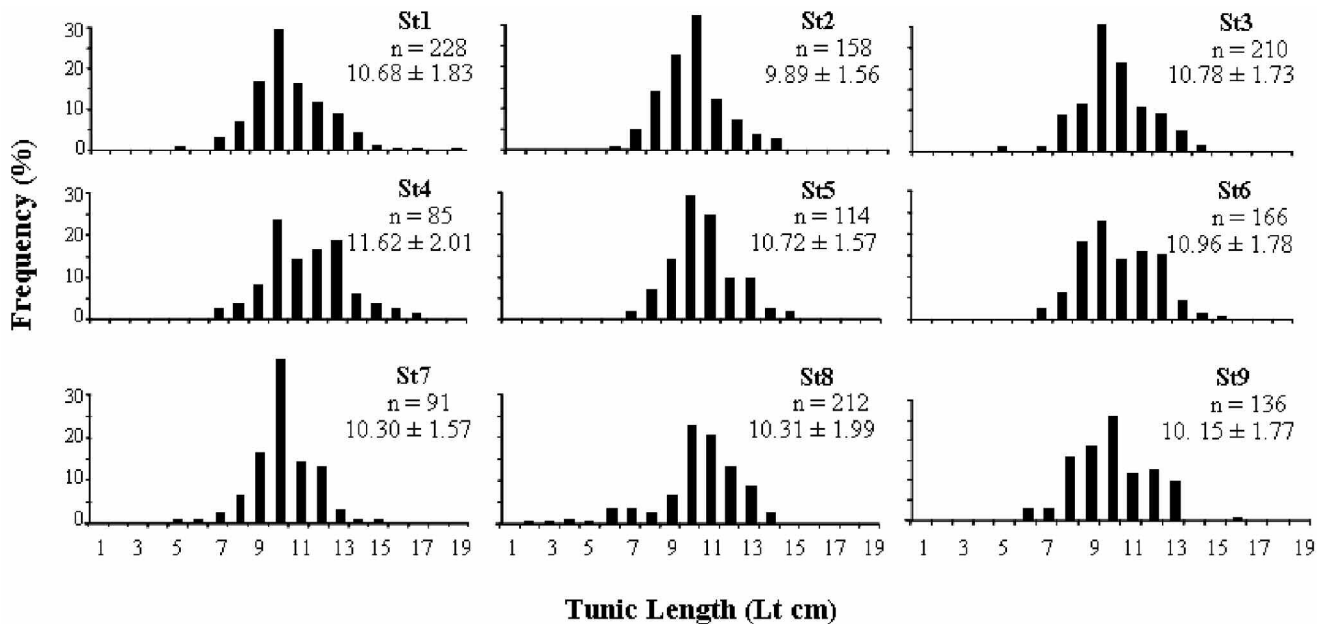


Figure 2. *Microcosmus sabatieri*. Size class distribution (tunic length in cm) at the sampling stations. n = number of measured individuals.

Figure 2. *Microcosmus sabatieri*. Distribution des classes de taille (longueur de la tunique en cm) aux différentes stations; n = nombre d'individus mesurés.

M. sabatieri as a by-catch until 1986, when a devastating epidemic event destroyed sponge fishing grounds. Thereafter it was treated as a target species. Today around 35 vessels harvest and process *M. sabatieri*, all harbored at Kalymnos Island and operating all over the Dodecanese, with a mean annual production estimated at 576-768 t.year⁻¹ (data derived from the Sponge-Fishermen Union of Kalymnos).

Dense populations of the species were present at all surveyed islands. The differences observed may be attributed to the concurrent exploitation of bath sponges (*Hippospongia communis* (Lamarck, 1814) and *Spongia officinalis* Linnaeus, 1759) that still remain the preferential target species. All surveyed populations were evenly dispersed, in agreement with similar data from the north Aegean (Antoniadou et al., 2006), suggesting that the observed pattern is a constant structural character of *M. sabatieri* populations. A wide spectrum of sizes constitutes total catch, but the bulk of specimens had a tunic length around 10 cm. This size is much less than the maximum one reported for the species, sometimes over 20 cm (Monniot & Monniot, 1987), a fact indicative of the existing fishing pressure in the Dodecanese. The intensity of harvesting is higher around Symi, where the product is largely consumed; thus, the observed eastward decrease in mean size may be related to the increased demand at Symi.

So far, the fishery of *M. sabatieri* in the Aegean has been practiced in a sustainable way, since the fishermen avoid collection during the reproduction period, which occurs in winter, because the presence of gonads in spawning stage gives a black undesirable color to the processed product. Also, *M. sabatieri* is collected by a highly selective non-destructive method and the population explored is in a restricted range (- 60 m) of the depth distribution of the species; so the unexploited deeper population could enhance the current exploited stock. However, since the demand of the product is currently increasing and available data for the species are scarce, it seems necessary to gather relevant data to manage its fishery. Moreover, *M. sabatieri* is an ecosystem-engineering species and its commercial exploitation, besides the direct loss could also have cascade effects on its associated community (Voultsiadou et al., 2007).

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