FISH VISUAL CENSUS IN SHALLOW MEADOWS OF MEDITERRANEAN SMALL-SIZED SEAGRASSES

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Abstract

The abundance of six nectobenthic fish was estimated by visual censuses along transects of different length (*i.e.*, 5x2, 10x2 and 25x2 m) in shallow seagrass beds of *Cymodocea nodosa* and *Zostera noltii*. Four species (*Symphodus ocellatus, Diplodus annularis, Sarpa salpa, Sparus aurata*) were underestimated using the shortest transects, while *Symphodus cinereus* and *Mullus surmuletus* were unaffected by transect length. The precision of the estimates tends to decrease with the transect length. Transects of 25x2 m permit to optimise sampling effort and precision, but those of 10x2 m may represent an acceptable compromise.

Key words: Fish visual census; Cymodocea nodosa; Zostera noltii; Sardinia Island.

Introduction

In the Mediterranean Sea, underwater visual censuses have been used to study fish assemblages in vegetated habitats (algae and the seagrass *Posidonia oceanica*), rocky substrates and bare sands (1; 2). The specific technique (*e.g.*, strip transect) and the sampling area employed usually depend on the habitat, the environmental conditions and the aim of the research (3). Recently, an increasing attention was paid to fish assemblages of small-sized seagrasses (*Cymodocea nodosa* and *Zostera noltii*), which mainly colonise sheltered embayments and coastal lagoons (4). In such systems, Guidetti & Bussotti (4) studied the seasonal dynamics of the fish fauna and recorded juveniles of several species, stressing the potentially important role that such habitats could exert compared to the little information so far available.

In this note, fish abundance estimates obtained using transects of different length in shallow mixed meadows of *C. nodosa* and *Z. noltii* are compared to optimise sampling effort and precision.

Materials and methods

The study was carried out in August 2000 in the Gulf of Olbia (NE Sardinia, Italy, 40°55.5' N, 09°34.4' E), where *Cymodocea nodosa* and *Zostera noltii* form widespread beds in shallow areas. Visual censuses were made along random transects of 5x2 m, 10x2 m and 25x2 m. Transect width was maintained equal to 2 m, as this measure is considered the most suitable for visual census in Mediterranean seagrass systems (1; 2; 4). Twenty replicates per transect type were done considering six common nectobenthic fish in this habitat: *Symphodus cinereus, Symphodus ocellatus, Mullus surmuletus, Diplodus annularis, Sarpa salpa* and *Sparus aurata*. Fish density (no. ind. 100 m^{-2}) was estimated by counting each specimen to a max of 10 fish, whereas abundance classes (see 3) were used for schools. Differences in mean fish abundance obtained along transects of different length were tested by analysis of variance. SNK test was employed for post-hoc comparisons. The Standard Error (Standard Deviation/$\div$n) was then used to evaluate the methodological precision.

Results and discussion.

The mean fish abundances estimated using transects of different length are shown in Fig. 1. In Table 1 are summarised the results of ANOVAs for effects of 'transect length'. Mean abundances of *Symphodus cinereus* and *Mullus surmuletus* (Fig. 1a and c, Table 1) appeared to be unaffected by the type of transect used. *Sparus aurata* was never observed by using the shortest transects, while no significant differences were detected using transects 10 or 25 m long (Fig. 1d, Table 1). Average densities of *Symphodus ocellatus, Diplodus annularis* and, even more, *Sarpa salpa* (Fig. 1b, e and f) obtained along transects 5 m long were lower than those estimated along transects of 10 or 25 m (Table 1). For five species out of six (*i.e., S. cinereus, S. ocellatus, D. annularis, M. surmuletus* and *S. salpa*) standard errors of means tend to decrease with the transect length. As regards S. aurata, instead, similar standard errors were obtained using transects 10 or 25 m long.

Table 1. Summary of ANOVAs for effects of transect length
*(A: 5x2 m; B: 10x2 m; C: 25x2 m) on fish abundances. P: significance level (n.s.: not significant; *: p<0.05; **: p<0.01).*

Species	F test	P	SNK test
Symphodus cinereus	0.29	n.s.	-
Symphodus ocellatus	5.46	**	A<B=C
Mullus surmuletus	1.08	n.s.	-
Diplodus annularis	3.10	*	A<B=C
Sarpa salpa	7.06	**	A<B=C
Sparus aurata	4.79	*	A<B=C

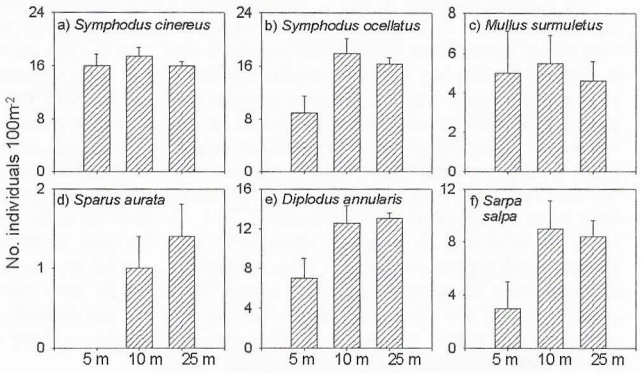

Fig. 1. Mean abundance (SE) of the six fish species estimated using transects of different length.

In a previous study on fish assemblages of *C. nodosa* and *Z. noltii* (4), larger transects (25 x 6 m) than those tested here were used. Nevertheless, the authors recommended the use of narrower transects chiefly to increase the methodological efficiency in censusing shy and cryptic species, as well as juvenile fish. The results reported here suggest that transects of 25x2 m allow to optimise sampling effort and precision. However, transects of 10x2 m could represent an acceptable compromise to limit damages to the meadows caused, for instance, by experimental manipulations involving canopy removal.

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References

1 - Harmelin-Vivien M.L. and Francour P., 1992. Trawling or visual censuses? Methodological bias in the assessment of fish populations in seagrass beds. *P.S.Z.N. I: Mar. Ecol.*, 13: 41-51.

2 - Guidetti P., 2000. Differences among fish assemblages associated with nearshore *Posidonia oceanica* seagrass beds, rocky-algal reefs and unvegetated sand habitats in the Adriatic Sea. *Est. Coast. Shelf Sci.*, 50: 515-529.

3 - Harmelin-Vivien M.L., Harmelin J.G., Chauvet C., Duval C., Galzin R., Lejeune P., Barnabé G., Blanc F., Chevalier R., Duclerc J. and Lasserre G., 1985. Evaluation visuelle des peuplements et populations de poissons: methodes et problemes. *Rev. Ecol. (Terre Vie)*, 40: 467-539.

4 - Guidetti P. and Bussotti S., 2000. Fish fauna of a mixed meadow composed by the seagrasses *Cymodocea nodosa* and *Zostera noltii* in the Western Mediterranean. *Oceanol. Acta.*, 23: 759-770.