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FIRST RECORD OF *CORIS JULIS* IN THE MIRAMARE NATURAL MARINE RESERVE

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ABSTRACT

Since 1975, counts of fish fauna have been regularly carried out in the Miramare Natural Marine Reserve by the visual census technique. During these years, it has been possible to observe the evolution of the ecosystem. In September 2006, the first sighting of *Coris julis* occurred, a species never previously observed in the protected area. The presence of this species was also reported in the summer 2007 census.

Key words: *Coris julis*, Miramare Natural Marine Reserve, first report

PRIMA SEGNALAZIONE DI *CORIS JULIS* NELLA RISERVA NATURALE MARINA DI MIRAMARE

SINTESI

Dal 1975 all'interno della Riserva Naturale Marina di Miramare sono stati effettuati regolarmente conteggi delle specie ittiche presenti con la tecnica del "visual census". In questi anni è stato possibile osservare l'evoluzione dell'ecosistema. Nel Settembre del 2006 è avvenuto il primo avvistamento di *Coris julis*, una specie mai osservata prima all'interno dell'Area Marina Protetta. La presenza di questa specie è stata segnalata anche nel monitoraggio dell'estate 2007.

Parole chiave: *Coris julis*, Riserva Naturale Marina di Miramare, prima segnalazione

INTRODUCTION

The geographical position of the northern end of the Gulf of Trieste, where the Miramare Marine Protected Area (MPA) is situated (Fig. 1), and its environmental factors make this area an important observatory for biodiversity. Observation and monitoring stations have been established not only within the protected area, but also at other important coastal stations in the Gulf of Trieste, as well as in agreement with Slovenian scientific staff (NIB, Marine Biology Station of Piran). The check lists of species associations are compared in order to obtain evaluations of the spatial and time changes since 1975 (Bussani & Feoli, 1975). During these years, it has thus been possible to record the new occurrences of these species in the Miramare Natural Marine Reserve and in the Gulf of Trieste in the database of the "Littoral Observatory" (O.d.L. – Osservatorio del Litorale) (Castellarin *et al.*, 2001).

Many species and associations differ in their distribution: in substantial regressions (*i.e.* *Fucus virsoides*), although in rapid reappearance as well (*i.e.* *Cymodocea nodosa* or *Cystoseira* spp.). In many cases, these dynamics are likely caused by meteorological and climate factors that can influence water replacement in the persistence of high temperatures in some portions of the water column by the presence and/or development of planktonic spores, eggs, larvae and juveniles coming from the eastern coast.

In September 2006, the first sighting of *Coris julis* was made, a species never previously observed in the protected area (Castellarin *et al.*, 2001), as the water temperature during the winter is too low for its requirements. The presence of this species was also reported during the summer 2007 census.



Fig. 1: Map showing locations of the Miramare Natural Marine Reserve and Piran.
Sl. 1: Zemljevid z označenima lokacijama Naravnega morskega rezervata Miramare in Pirana.

MATERIALS AND METHODS

The area considered in this study is the Miramare Natural Marine Reserve (Fig. 1) in the Gulf of Trieste, which is the northernmost part of the Adriatic Sea. The area is 30 ha wide with 1.8 km long coastline.

The technique of visual census was used to obtain a continuous characterization of the fish community and its modifications inside the protected area and at several points of the Gulf of Trieste. The fieldwork was carried out with the aid of scuba diving and snorkelling: data were collected *in situ* using the transect technique and point visual, non-destructive diving visual census methodology (Harmelin-Vivien *et al.*, 1985; Vacchi & La Mesa, 1999; De Girolamo & Mazzoldi, 2001). The monitoring activity by visual census inside the Protected Area began in 1975, when the first compilation of the list of species living in the area was developed (Bussani & Feoli, 1975; Bussani, 1976; Castellarin *et al.*, 2001). The studies carried out after 1983 (Morin & Spoto, 1984), report that since that year, from April to October, at least three monitoring activities a month were performed. In fact, for some years, the continuation of studies during the winter was not reported: this factor is considered to be irrelevant for the aim of this study owing to the temperature ranges between summer and winter, typical of the Trieste Gulf. The temperature data from 1977 to 2007 were collected with the OCEAN SEVEN 316 CTD multiparameter probe (temperature accuracy of 0.003°C and resolution of 0.0005°C) at the C1 station located along the boundary of the Miramare Marine Protected Area at 45°41'58" N, 13°42'21" E.

RESULTS

Coris julis (Fig. 2), a single male specimen, was first observed in the Miramare Marine Reserve in September 2006. With three observation activities for each day of monitoring, the frequency of this species in 2006 was 18 sightings out of the 90 observations performed. In the winter months, however, its presence was not recorded. In 2007, including all monitoring activities performed to date (January to May), a total of 19 sightings out of 36 observations were recorded.

C. julis is a fish belonging to the Labridae family, living in the Mediterranean Sea and along the North African and European Atlantic coasts. This species is hermaphrodite protogynic and reproduces during the summer, laying spherical pelagic eggs. This species eats invertebrates such as sea urchins, small shellfish and other organisms, which it finds by digging in the sand. Its range is in the coastal area, from the surface to a depth of 120 meters, although it is found usually at about 60 meters. *C. julis* is easily approached while diving, also because it finds food in the sediment moved by the divers. It prefers habitats rich in seaweed and prairies of *Posidonia oceanica*, but the main limiting factor for its distribution is the temperature. It can live in a temperature range from 6.7 to 28.4°C, but its ideal range is between 17.6°C and 27.8°C. At night and mainly during the winter it seems to live under the sand, with only its head protruding. Its preferred salinity ranges between 28.5 and 39 psu, but it more commonly occurs between 31.4 and 38.1 psu (www.fishbase.com). Even though the area considered in this study belongs to the Mediterranean



Fig. / Sl. 2: *Coris julis* (Linnaeus, 1758). (Photo / Foto: E. Balasso)

Sea, the northern Adriatic is a unique entity considering that it has temperature and salinity values different from the rest of the Mediterranean Sea. This occurs because the Adriatic Sea is a muddy-sandy plain, with a sea bottom that in the Gulf of Trieste does not exceed 25 meters in depth. This low depth favours strong water heating during the summer (the temperature can reach 27–28°C) and strong water cooling during the winter, with values that usually fall under 8°C.

As mentioned above, the main obstacle to the arrival of thermophilic species is the significant temperature range that brings the winter temperature below 6.5°C. Therefore, a contextual analysis of the information was necessary before reporting, considering the historical series of the number of days/year, from 1930 to 1995, when values under 6.5°C were recorded in the Gulf of Trieste by the Sta. Molo Sartorio (Stravisi, 1983; Stravisi, 2000; Orel & Zamboni, 2001; Odorico *et al.*, 2006). The frequency of these events of water cooling actually shows a significant decrease, mainly in the last 40 years. From 1935 to 1964, the water column temperature dropped below 6.5°C for an average of 13 days/year. In comparison, between 1965 and 1974, this occurred only 1 day/year. In the period of 19 years from 1975 to 1994, the water column cooling dropped under 6.5°C for an average of 3 days/year. The data collected in C1 from 1977 to 2007 showed that in the last 7 years the temperature in January and February has not fallen below 7°C.

In the Gulf of Trieste, *C. julis* has never been seen prior to 1998, even in Piran that is located in its southern part (L. Lipej, *pers. comm.*). The last visual census study performed in three Slovenian Marine Protected Areas related the density of *C. julis* in Fiesa-Pacug (unprotected area) of 0.08 (± 0.21)/100 m² (Lipej *et al.*, 2003).

DISCUSSION

The prediction of Grainger (1992) is apparently becoming a reality in the Adriatic Sea: that the foreseen global warming would make southern species extend their range northward. This hypothesis is supported by many monitoring activities in the Adriatic Sea, where it is reported that the warm water species were recently found in greater numbers in the northern sectors and also that some species have been found occurring for

the very first time (Dulčić *et al.*, 1999; Dulčić & Grbec, 2000).

The first observation of *Coris julis* in the Miramare Natural Marine Reserve in September 2006 also supports the hypothesis of the expansive northward movement of thermophilic species and changes in marine biodiversity studied in the northern Adriatic Sea (Dulčić *et al.*, 2004). The data previously reported are in fact also in accordance with the study carried out in 2004 regarding the new species recorded on the other side of the Adriatic Sea, whereby the northward spread of thermophilic species has been considered as an indirect indication of the Adriatic and Mediterranean water warming (Dulčić *et al.*, 2004).

Moreover, the frequent observations performed along the Trieste coast and the collaboration with Slovenian scientific staff (Castellarin & Odorico, 1999) over the years have already facilitated the survey of species that slowly move from Croatian and Slovenian coasts to the Italian coasts. The updating of the flora-fauna census performed in the Miramare Natural Marine Reserve in 1995 (Odorico, 1995) recorded the first observation of *Haliclona mediterranea*, which occurred in June 1994, and this had been related to the development of Coralligenous by the rocks. Only one year later, in 1995, during the study on the "Effects of full fishing prohibition on the fish population in the Miramare Marine Reserve" (De Girolamo *et al.*, 1996), *Tripterygion delaisi* was also included in the flora-fauna census.

The historical series of data surveyed over the years have allowed monitoring of the ecosystem evolution, with continuous comparisons among individual years. We concentrate on the studies "Monitoraggio Biologico e Visual Census anno 2000" (Odorico *et al.*, 2000) and "Report Interno per il Ministero dell'Ambiente, 2002" (Castellarin, 2002), where the historical data were integrated with the monitoring activities in the field (visual census, checks on steady stations, microspecimens and videotranssect) and with the information achieved by surveying the chemical-physical data.

It is necessary to consider that in last year the first sighting occurred in September, whereas in 2007 it occurred in May, which is much earlier. With future surveys it will be possible to understand whether *C. julis* is a species living in the protected area of Miramare or if it is a chance observation of a single specimen that had migrated northwards.

PRVI PODATEK O POJAVLJANJU KNEZA *CORIS JULIS* V NARAVNEM MORSKEM REZERVATU MIRAMARE

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POVZETEK

V Naravnem morskem rezervatu Miramare na Tržaškem poteka štetje ribje favne z vizualno tehniko štetja že vse od leta 1975. V teh letih je bilo mogoče opaziti določene spremembe v ekosistemu. Septembra 2006 je bil v rezervatu prvič opažen knez *Coris julis*, vrsta, ki tu prej ni bila še nikoli registrirana. Sicer pa je bilo pojavljanje kneza za beleženo tudi med štetjem ribje favne poleti 2007.

Ključne besede: *Coris julis*, Naravni morski rezervat Miramare, prvo pojavljanje

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