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First record of *Predaea ollivieri* (Nemastomataceae, Rhodophyta) in Apulia (Southern Italy)

Abstract

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The first records of *Predaea ollivieri* from the Apulian coasts are reported. Such records extend the distribution area of this Mediterranean species to the southern Adriatic Sea, where it was previously known only from Yugoslavia and the Gulf of Trieste, and to the northern Ionian Sea. A brief description of vegetative, female and cystocarpic characters of Apulian specimens is given too.

Introduction

The genus *Predaea* G. De Toni (Nemastomataceae, Rhodophyta) includes species distributed throughout tropical and warm-temperate regions of both Northern and Southern hemispheres (De Toni 1936; Feldmann 1942; Børgesen 1950; Dawson 1960; Kraft & Abbott 1971; Yoshida 1980; Kraft 1984; Kajimura 1987; Millar & Guiry 1989; Verlaque 1990; Kajimura 1995; Ballantine & Aponte 1997; Conde & al. 1998).

At present 14 species of *Predaea* are known, mainly distributed in subtropical seas (Kraft & Abbott 1971), three of them occurring in the Mediterranean Sea: *Predaea ollivieri* Feldmann, *P. pusilla* (Berthold) Feldmann and *P. pusilla* f. *alboranensis* Conde & al.

During a campaign of macroalgae collection aiming at enriching the seaweed collection of the Department of Biology and Plant Pathology, University of Bari, Italy, some thalli of *P. ollivieri* along the Apulian coasts were collected. The finding of this species, not reported in the recent check-list of the benthic marine flora of the Apulian coast (Cormaci & al. 2001), represents the first record of this species from the Apulia.

Materials and methods

Sampling was carried out in two Apulian sites (Porto Badisco, Otranto, Ionian Sea, 40°04'45" N, 18°29'12" E; Cala Incina, Monopoli, Adriatic Sea, 40°58'48" N, 17°15'34" E).

Samples were preserved in 4% formalin-seawater. Sections of thalli were cut by hand

and observed under an Olympus BH-2 microscope. Some sections were coloured with aniline blue and hydrochloric acid 0.5%.

A dry specimen is kept in the herbarium of the Department of Biology and Plant Pathology (Fig. 1).

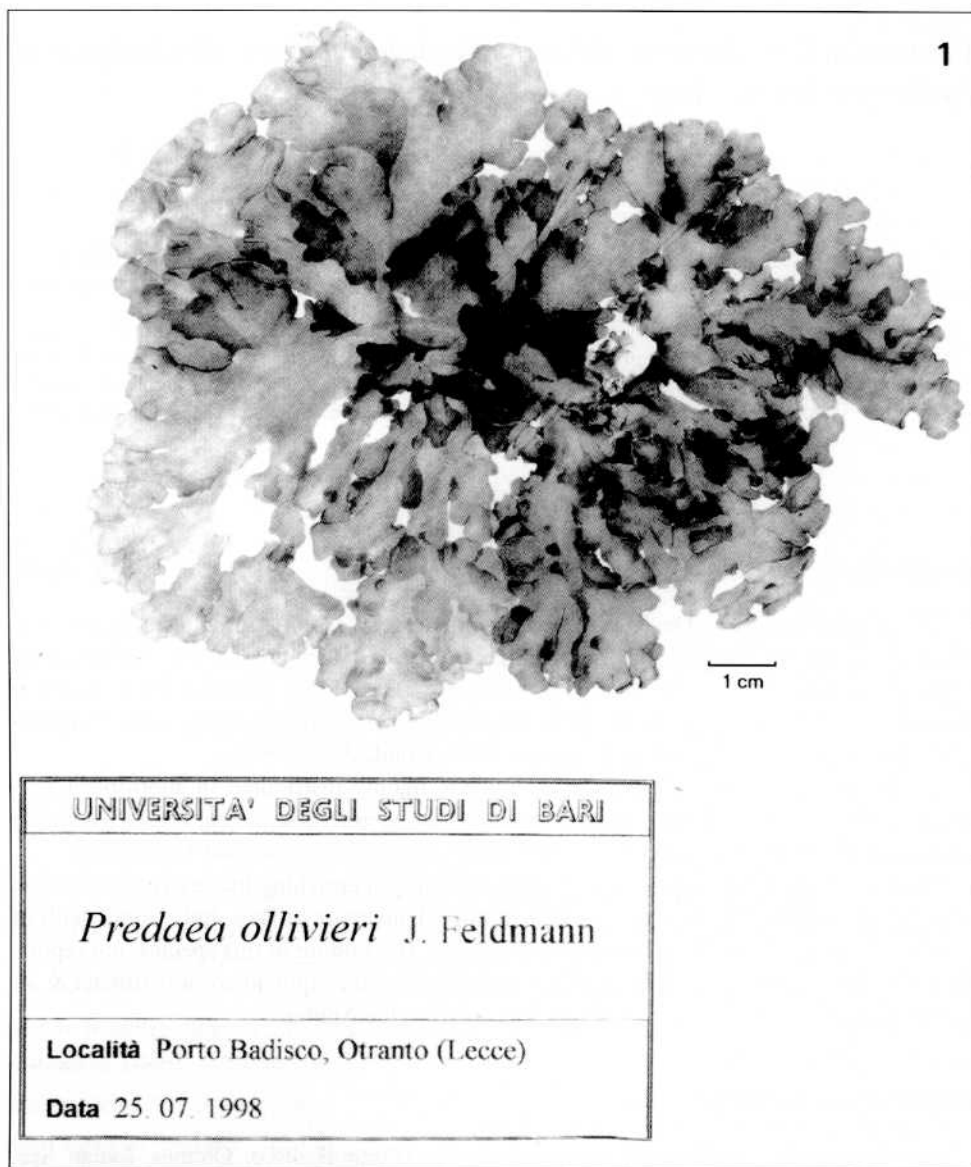


Fig. 1. *Predaea ollivieri* J. Feldmann. Habit of the herbarium specimen collected at Porto Badisco, Ionian Sea.

Observations and discussion

The first thallus of *Predaea ollivieri* was collected on 25/vii/1998 in the inlet of Porto Badisco at a depth of about 6 m. The alga was attached to the substratum, inside a small sea-bottom shaded hollow. Another sample of *Predaea* was collected on 2/viii/1998 at Cala Incina on a vertical shaded cliff at a depth of about 5 m.

Porto Badisco is a small inlet south to Otranto, between the "Palascia" lighthouse and Otranto Cape. The inlet has a sandy bottom, the coast is rocky, of biogenous origin, and the cliff lies on a step at about 7-12 metres. From the edge of this step a depth of about 25 m is reached. There are also many crevices sometimes becoming caves (such as that of "Diavolo" at the north side of the inlet).

Between the towns of Polignano a Mare and Monopoli, transversely to the Bari-Brindisi coast, at Cala Incina there is an erosive groove that slopes down to the sea from the land, forming a gorge 30-50 m wide, with cliffs up to 15-20 m high.

The heteromorphy genus *Predaea* is characterized by a compressed, gelatinous, flabellate or variously lobed gametophyte, attached to the substratum by a short stipe provided with a holdfast. Spermatangia cut off from outer cortical cells, clustered or digitate, producing subspherical spermatia. The tetrasporophyte, observed only in culture (Athanasiadis 1988; Millar & Guiry 1989) is filamentous, much branched and becoming crustose, with erect filaments producing cruciately or zonately divided tetrasporangia and also monosporangia.

Classification of different species belonging to this genus is based on the following characters: habit of the thallus, branching of cortical filaments, shape of the outer cortical cells, site of origin of the gonimoblast, presence or absence of vesicular cells, number of carpogonial branch cells, number and placement of the nutritive cells on cells immediately contiguous to auxiliary cells, presence or absence of bisporangia (Verlaque 1990; Kajimura 1995).

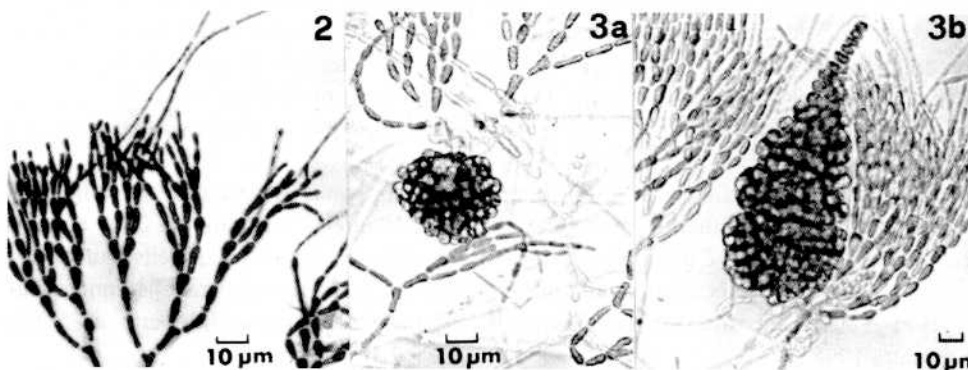
The position of the gonimoblast initial on the connecting filament or on the auxiliary cells is one of the most important characters for the classification of the *Predaea* species. According to the original diagnosis (Feldmann 1942) the gonimoblast of *Predaea ollivieri* is localized laterally, on the auxiliary cells. Afterward Ercegovic (1949) described the new species *Yadranelia adriatica* that is very similar to *P. ollivieri* except for the gonimoblast formed on the connecting filament. Kraft & Abbott (1971) concluded that, differently from what stated by Feldmann (1942), the gonimoblast of *P. ollivieri* develops on the connecting filament instead of on the auxiliary cells.

Consequently, *Yadranelia adriatica* became a later synonym of *P. ollivieri*. Such conclusions were also reached by Verlaque (1990) who confirmed the origin of the gonimoblast of *P. ollivieri* from the connecting filament. The origin of gonimoblast from the auxiliary cell reported by Feldmann (1942) for *P. ollivieri* should be considered either a misinterpretation of the character in specimens of *P. ollivieri* or observations made by Feldmann on specimens belonging to the other species of *Predaea* [*P. pusilla* (Berthold) Feldmann] occurring at Banyuls (Athanasiadis, 1988; Verlaque, 1990).

Plants of *Predaea ollivieri* collected in Apulia are dark red, soft and gelatinous, 4-5 cm high. Thalli are subcylindrical in the basal part and compressed in the apical one, 3-10 mm broad, abundantly branched with subdichotomous to irregular lobes. Fronds are fan-

shaped, with more or less flattened and lobed apices and a short stipe 1-2 mm long. Thallus organization was multiaxial, with loose medullary filaments composed of cylindrical cells, to 70 μm long and 4 to 6.5 μm broad, giving rise to subdichotomous cortical filaments of equal length composed of cylindrical to moniliform cells, 8 to 33 μm long and 3 to 6 μm broad (Fig. 2). Outer cortical cells were occasionally converted into hyaline hairs were observed. Vescicular cells are lacking.

All the examined samples were female gametophytes. Bi-celled carpogonial branches were produced on inner cortical cells. Auxiliary cells occupied an intercalary position on cortical filaments. Cells contiguous to the auxiliary ones bore 3-15 rounded cells which could be considered as nutritive cells. Gonimoblasts initiated from the connecting filament near to the auxiliary cells; the carposporophyte developed on the side opposite to auxiliary cells, but always on a lateral swelling of the connecting filament. Mature gonimoblasts were subspherical to oval (Figs. 3a, 3b). Neither tetrasporophytes nor spermatangial branches were observed.



Figs. 2, 3a, 3b. Cortical filaments bearing hyaline hairs. Subspherical (3a) and oval (3b) habits of mature gonimoblasts.

Athanasiadis (1988) obtained from carpospores of *P. ollivieri*, cultured, under both long- and short-day conditions, acrochaetioid filaments producing tetrasporangia-like structures, zonately or irregularly divided. In the same cultures, tufts up to 2 mm long of individuals bearing spermatangia were obtained, but neither carpogonial branches nor auxiliary cells were observed. The vegetative structure of the thallus of the fertile male individuals was analogous to the cortex of the female gametophytes of *Predaea*.

According to Athanasiadis *P. ollivieri* could be either dioecious such as *P. feldmannii* (Kraft & John 1976; Lemus & Ganesan 1977), *P. tokidae* and *P. bisporifera* (Kajimura 1987) or monoecious and protandrous such as *P. weldii* (Kraft 1984) where various diminutive males to larger monoecious gametophytes have been observed in collected samples.

The small size of the spermatangial plants can explain their absence in our field collections.

P. ollivieri is known only from the Mediterranean Sea. In particular, its distribution area includes Spain (Ballesteros 1983, 1985, 1989; Conde & al. 1998), Corsica (Coppejans

1979), France (Feldmann 1942; Guglielmi 1969), Greece (Athanasiadis 1987, 1988), Turkey (Cirik 1978), Yugoslavia (Ercegovic 1949) and Italy (Funk 1955; Cinelli 1971; Giaccone & al. 1972; Giaccone & Rizzi Longo 1976; Furnari & al. 1977; Cormaci & Furnari 1979; Battiato & al. 1980; Giaccone & al. 1985; Furnari & al. 1999) (Fig. 4).

On the basis of the present work, the known geographical distribution of *P. ollivieri* in the Mediterranean Sea is expanded to the southern Adriatic Sea and to the northern Ionian Sea.

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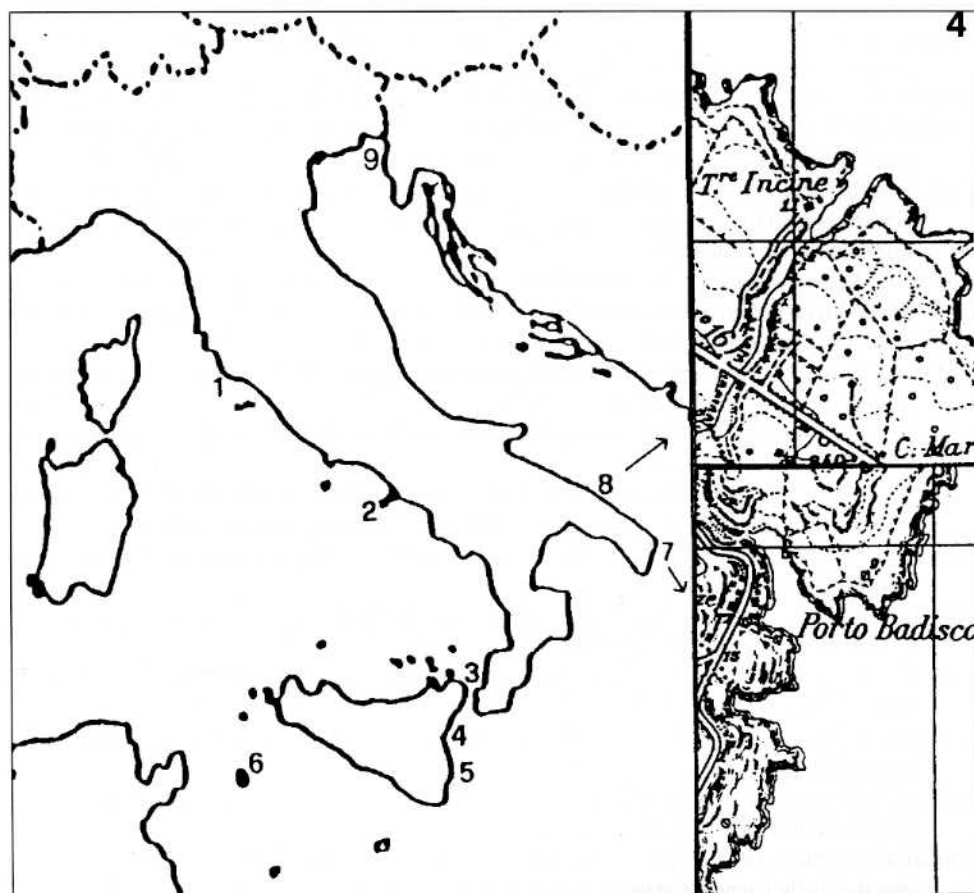


Fig. 4. Distribution of *Predaea ollivieri* in Italy. 1: Leghorn - 2: Gulf of Naples - 3: the Straits of Messina - 4: Catania and Ciclopi Islands - 5: Peninsula of Maddalena, Syracuse - 6: Pantelleria Island - 7: Porto Badisco, Otranto, new record - 8: Cala Incina, Monopoli, new record - 9: Gulf of Trieste.

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