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Occurrence of the lessepsian species *Portunus pelagicus* (Crustacea) and *Apogon pharaonis* (Pisces) in the marine area of Rhodes Island

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Abstract

A large number of Red Sea species are colonizing the eastern Mediterranean Sea via the Suez Canal, mainly following the Anatolian coasts and spreading westwards. Portunus pelagicus is one of the most common Red Sea swimming crabs, first recorded in the Levantine Basin in 1898. Four specimens of P. pelagicus were collected in different marine areas of Rhodes Island from 1991 to 2000, while three specimens of the lessepsian fish Apogon pharaonis, first recorded in the Mediterranean in 1947, were caught during 2002 in the NW coast of Rhodes. The sub-tropical character of the marine area around Rhodes seems to facilitate the propagation of lessepsian species. These migrants have reached the island at different velocity and degree of establishment of their populations. The occurrence of the blue swimmer crab P. pelagicus and of the bullseye cardinal fish A. pharaonis increases the number of the decapod Crustacea and fish species of Red Sea origin observed in Greek waters.

Keywords: Mediterranean; Pisces; Crustacea; *Portunus pelagicus; Apogon pharaonis; Apogon nigripinnis*; Lessepsian migration.

Introduction

The term 'lessepsian migration' is used to describe the immigration of Red Sea biota into the Mediterranean Sea after the opening of the Suez Canal, in 1869. It is a 'phenomenon of unidirectional and successful biotic advance from the Red Sea to the Eastern Mediterranean' (POR, 1978).

Lessepsian species (also called Erythrean invaders) belong mainly to fish, decapod crustacea, molluscs and polychaetes, a large number of which establish populations in the Eastern Mediterranean, usually following the coasts of Israel, Lebanon, Syria, Cyprus and Asia Minor (POR, 1978).

Some lessepsian migrant species reach the SE Aegean Sea and especially the marine region around the island of Rhodes, which belongs to the 'Lessepsian Province', according

to Por (1990). Rhodes Island, in particular, is located in a peculiar oceanographic position between the SE Aegean Sea and the Levantine Sea. The pelagic and subtropical character of this region (SIOKOU-FRANGOU & PAPATHANASSIOU, 1989; PANCUCCI-PAPADOPOULOU *et al.*, 1999) seems to facilitate the spreading of lessepsian species.

In this work the first records of the presence in Greek waters of the lessepsian blue swimmer crab *Portunus pelagicus* (Linnaeus, 1758) (de LESTANG *et al.*, 2003) and of the lessepsian bullseye cardinal fish *Apogon pharaonis* Bellotti, 1874 (GOLANI *et al.*, 2004) is reported. These records increase the number of crustaceans and fish of Red Sea origin, which occur in the area.

Materials and Methods

Portunus species was identified following the key of NOËL (1992) and *Apogon* species according to the description of GON (1986). The specimens studied are stored at the Hydrobiological Station of Rhodes.

***Portunus pelagicus* (Linnaeus, 1758)**

Four adult specimens were collected in the marine area of the island of Rhodes. The first specimen (N. 1) was a male, found in August 1991 in a fish-pond at the aquaculture installations in Plimmiri (SE coast of Rhodes), the second one (N. 2) was a female, caught in March 2000 just outside of Rhodes town (Karakonero, NE coast), by trawl-net at 20m depth on a sandy-muddy bottom. Two more females (N. 3 and 4), one ovigerous, were caught in the Gulf of Trianda (NW coast of Rhodes), in a fishing net, at 2m depth, on a sandy-muddy substrate rich in algae and *Posidonia oceanica* (Fig. 1).

***Apogon pharaonis* Bellotti, 1874**

Four specimens were collected during 2002 by different trawl-nets, in the Trianda Gulf, at 20m depth, about 100m off the coast of Kritika (Fig. 1).

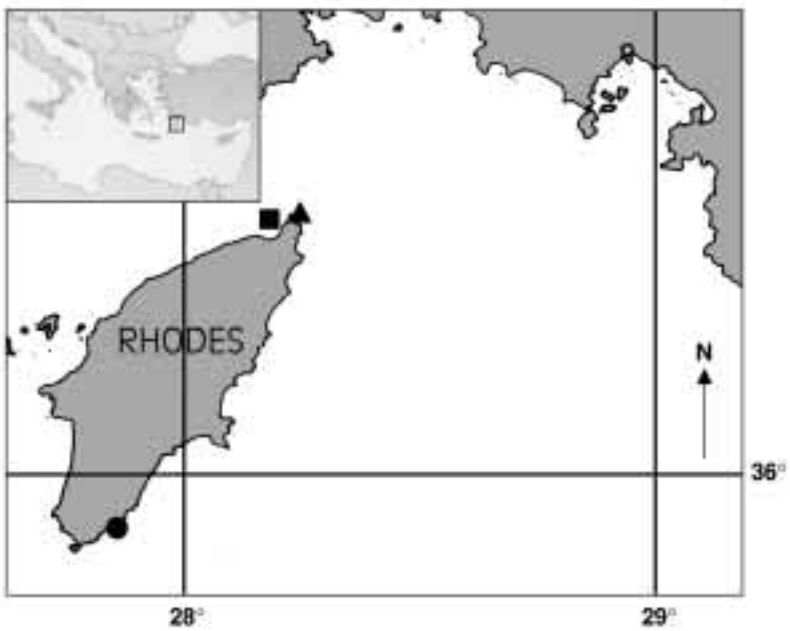

Fig. 1: Map of Rhodes Island showing the sampling locations (■ Gulf of Trianda, ▲ Karakonero, ● Plimmiris).

Results

Portunus pelagicus

Material examined

The carapace length ranges from 73.2 to 84.3mm, while the carapace width ranges from 160.6 to 187.8mm. The first pereiopod P1 is longer than the carapace width, particularly in the male specimen, due to the evident higher length of its chela and merus (Table 1).

Description

The antero-lateral margin bears nine teeth, the last tooth being the largest. All the specimens present a bidentate front. The cheliped merus bears a distal spine on the posterior margin and 3 or 4 spines on the anterior margin. Colour in fresh female specimen: carapace and legs show yellow-whitish spots and lines on a reddish-brown background, the dactyls of chelipeds are reddish-brown, the fingers in the second, third and fourth pereiopods are reddish at the edge and light blue on the surface (Fig. 2).

Apogon pharaonis

Material examined

Four specimens as follows: 1 spm, 87.5 TL, 75mm SL, 18g, 1 spm, 80.1mm TL, 67.1 SL, 11.5g, 1 spm, 96mm TL, 80mm SL, 25g, 1 spm, 84mm TL, 76mm SL, 13g. Morphometric characters were measured on two specimens (Table 2).

Fig. 2: A live female of *Portunus pelagicus,* dorsal view (Carapace width: 170.7 mm).

Table 1
Measurements carried out on the four *P. pelagicus* specimens collected in Rhodes Island (L= Length, W= Width, in mm).

	1 Male	2 Female	3 Female ovigerous	4 Female
Carapace L	73.2	80.4	84.3	79.6
Carapace W	160.6	169.2	187.8	170.7
P1 L	249.0	194.9	200.9	186.8
P1 L/Carapace W	1.55	1.15	1.07	1.09
Chela L (P1)	113.5	92.5	92.2	84.9
Carpus L (P1)	38.8	36.1	34.7	38.7
Merus L (P1)	96.7	63	74	63.2
Orbit L	14.4	12.6	19.9	14.9
Carapace frontal margin L	24.0	15.4	33.9	25.1
Carapace antero-lateral margin L	52.2	57.5	60.2	52.2
Carapace postero-lateral margin L	54.9	57.5	64.5	58.8
Spines on anterior merus margin of P1 (Right)	4	3	3	3
Spines on anterior merus margin of P1 (Left)	3	4	3	3

Table 2
Morphometric characters of two *A. pharaonis* specimens collected in Rhodes Island (in mm).

Measured characters	1	2
Total length (TL)	87.5	80.1
Standard length (SL)	75.0	67.1
Max. body depth (H)	33.5	26.6
Min. body depth (h)	11.6	10.5
Head length	33.4	30.1
Eye diameter	8.5	7.4
Preorbital distance	8.5	7.7
1st Dorsal length	16.3	14.3
2nd Dorsal length	18.3	15.1
Anal length	17.7	15.0
Pectoral length	16.1	13.9
Ventral length	17.1	14.9
Predorsal length	35.1	31.4

Description

D1: VII, D2: I+9, A: II+8, P: 15, V: I+5, LL: 27, scale rows above: 2, scale rows below: 5-6. Three black vertical bars are observed on a brown gold background in fresh specimens. There is a characteristic black circular spot surrounded by a yellow ring in the middle of the first bar (Fig. 3).

Three specimens, maintained in the Aquarium of the Hydrobiological Station of Rhodes, are carnivorous (mussels, shrimps, squids) and hardy. Being a nocturnal species (TORTONESE, 1986), it prefers to retreat and hide in small caves, under the rocks and in empty shells.

Fig. 3: A live specimen of *Apogon pharaonis* (80 mm SL).

Discussion

The geographical distribution of the blue swimmer crab *P. pelagicus* comprises the Red Sea and the Indo-West Pacific Ocean. It was first recorded in the Mediterranean Sea at Port Said, Egypt, in 1898 (GALIL & ZENETOS, 2002) and, later, at Palestine (FOX, 1924), Mediterranean coasts of Turkey, Lebanon, Syria (HOLTHUIS & GOTTLIEB, 1958; KOCATAS, 1981), Cyprus (DEMETROPOULOS & NEOCLEOUS, 1969) and Italy, eastern Sicily (ARIANI & SERRA, 1969; ZIBROWIUS, 1992; GALIL *et al.*, 2002).

The Portunidae *Liocarcinus (Macropipus) arcuatus* (Leach, 1814), *Liocarcinus (Macropipus) corrugatus* (Pennant, 1777), *Liocarcinus (Macropipus) depurator* (L., 1758), *Portunus hastatus* (L., 1767), *Callinectes sapidus* have already been reported in the marine area of Rhodes (Lewinshon, 1976). Furthermore, another portunid, *Bathynectes longipes* (Risso, 1816), was collected by the authors during the winter of 2002 in the specific waters. All these portunids have also been listed for other regions of the Aegean Sea (KOUKOURAS *et al.*, 1992).

The presence of *P. pelagicus* in Rhodes constitutes a new record for the island and the Aegean Sea. It should be mentioned that 42 decapod crustacean species of Indo-West Pacific origin exist in the Mediterranean (GALIL *et al.*, 2002). Six of them occur along the coasts of Rhodes Island, namely the penaeids *Marsupenaeus japonicus* (Bate, 1888), *Trachysalambria palaestinensis* (Steinitz, 1932), *Metapenaeopsis aegyptia* Galil and Golani, 1990, *Metapenaeopsis mogiensis consobrina* (Nobili, 1904), the portunid *Charybdis longicollis* Leene, 1938 and the leucosid *Ixa monodi* Holthuis and Gottlieb, 1956 (KEVREKIDIS & KEVREKIDIS, 1996; KEVREKIDIS *et al.*, 1998; KEVREKIDIS & GALIL, 2001; GALIL & KEVREKIDIS, 2002), while the alphaeid *Alphaeus rapacida* de Man, 1908 has been recorded in the SW Aegean Sea (PANCUCCI-PAPADOPOULOU, pers.

comm.). Including the present record, the lessepsian decapods listed in Greek waters amount to 19% of the total number of erythrean decapods present in the Mediterranean. Although the geographical distribution of the blue swimmer crab *P. pelagicus* is increasing, its abundance in the region of Rhodes still seems limited, while it is commercially valuable on the eastern coasts of the Mediterranean (GALIL *et al.*, 2002).

The species of Indo-Pacific and Red Sea origin *Apogon pharaonis* was first recorded as *Apogon taeniatus* in the Levant Basin along the coasts of Palestine in 1947 (HAAS & STEINITZ, 1947). Successively the geographical distribution of the species, known as *Apogon nigripinnis* Cuvier, 1828, extended to the coasts of Lebanon, Syria, Cyprus and SE Turkey (GOLANI, 1998a), where it is common, but without commercial importance. According to GOLANI *et al.* (2004), the species *A. nigripinnis* present in the Mediterranean should be referred to as *Apogon pharaonis*. In relation to Rhodes, the specimens were collected in a fishing area regularly inhabited by other lessepsian fish species, namely *Sargocentron rubrum* (Forsskål, 1775), *Siganus luridus* (Rüppell, 1828) and *S. rivulatus* Forkssål, 1775, *Stephanolepis diaspros* (Fraser-Brunner, 1940), *Sphyraena chrysotaenia* Klunzinger, 1884, *Pteragogus pelycus* Randall, 1981 and *Fistularia commersonii* Rüppell, 1835 (PAPACONSTANTINOU, 1990; CORSINI & ECONOMIDIS, 1999; CORSINI *et al.*, 2002). The Mediterranean counterpart *A. imberbis* (L., 1758) is also present in the same area. A total number of 59 lessepsian fish species have colonized the eastern Mediterranean (GOLANI *et al.*, 2002; GOLANI, 2002; GOREN & ARONOV, 2002; GOLANI & FINE, 2002). Including the record described in the present work, the number of Red Sea fishes recorded in Greek waters is now 17, representing 28.8% of the total number of Erythrean invader fishes recorded in the Mediterranean. Thirty Red Sea fish species have been listed along the Mediterranean coasts of Turkey until 1994 (GUCU *et al.*, 1994; GOLANI, 1998b) and this number is evidently larger than the number of lessepsian fishes reported at that time in Rhodes and in general in the SE Aegean Sea.

Similarly to other Red Sea crustaceans and fishes, the two species described in this work were first collected in Greek waters many years after their first occurrence and successive extension in the Levant. On the contrary, there are lessepsian species, which reached the area of Rhodes relatively quickly after their first appearance in the eastern Mediterranean, for example *M. mogiensis consobrina* (KEVREKIDIS *et al.*, 1998), *Sargocentron rubrum* (LASKARIDIS, 1948), *Upeneus moluccensis* (Bleeker, 1855) (SERBETIS, 1947), *P. pelycus* (CORSINI & ECONOMIDIS, 1999) and *F. commersonii* (CORSINI *et al.*, 2002), the last two of which have established important populations within a very short time. On the other hand, a large number of Red sea species, that have already entered and are well distributed in the Levant, have not been recorded in the area of Rhodes. Many biotic and/or abiotic factors may influence this different trend, for example the temperature regime and the thermal tolerance of the colonizing species, the food availability, the competition with indigenous species, the local pathogens and the suitable substrata (GOLANI, 1998a), the extension of the spawning season, the aggressive behaviour of the new species and their food preferences. Free niches already existing or created by over-fishing of local species may also be occupied by the colonizers.

The occurrence of a new species in the coastal area of Rhodes and the Dodecanese islands is generally noted by fishermen and usually this means that their population is already large. The presence of other lessepsian species may be ascertained only through a comprehensive and regular study of the resources along the coasts, also including habitats fished infrequently, where a species of low density may go undetected, even though it is a regular inhabitant (GOLANI *et al.*, 2002).

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