



TROPHIC NICHES OF TWO PREDATOR FISH COHABITING IN THE ALGERIAN COASTAL ECOSYSTEM: *SCORPAENA PORCUS* (LINNAEUS, 1758) AND *SCORPAENA NOTATA* (RAFINESQUE, 1810)

MOKRANE Zakia^{a*}, KACHER Mohamed^a and ZEROUALI-KHODJA Fatih^b

^aEnssmal. National School of Marine Science and Coastal Management, Laboratory of Conservation and Valorization of Marine Resources, B.P. 19 University Campus of Dely Ibrahim, 16320 Algiers, Algeria; ^bFsb-Usthb. Fisheries Laboratory, N° 32 El-Alia, Bab Ezzouar 16111, Algiers, Algeria

*Corresponding author. Email: mokrane.zakia@gmail.com

<https://orcid.org/0000-0002-0772-2861>

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Abstract. The diet of adult specimens of black scorpionfish *Scorpaena porcus* (Linnaeus, 1758) and small red scorpionfish *Scorpaena notata* (Rafinesque, 1810), collected from the Algerian coast was studied using different coefficients and trophic indexes. The inventory of ingested prey indicates that the focal species have a diverse diet that covers different zoological groups. Their feeding spectrum is mainly composed of brachyuran crabs and other crustaceans such as isopods and shrimp. Fish and molluscs are only occasionally ingested. The vacuity coefficient average exceeded the estimated rate of 40%. The observed monthly fluctuations revealed a seasonal alimentary rhythm. The foraging activity of the two scorpionfish decreases in summer, during gonad maturation. This decrease is highlighted by the increase in the vacuity coefficient and the decrease in the repletion index. Despite a similarity in the food bolus, the two co-occurring fish exhibit a specialized diet. This was observed especially in mature individuals. In conclusion, our results demonstrated a very strong overlap of niches between two scorpionfish species.

INTRODUCTION

The continental margin of Algeria harbours significant but incompletely studied fishery resources. This is the case for the majority of coastal species, among which figure the black scorpionfish *Scorpaena porcus* (Linnaeus, 1758) and the small red scorpionfish *Scorpaena notata* (Rafinesque, 1810) of the Scorpaenidae family.

The study of the eating habits of fish allows us to deepen our knowledge of their biology and ecology. In fact, food can explain certain biological and physiological processes linked to growth and reproduction. Therefore, the study of the diet of *S. porcus* and *S. notata* from the Algerian coast was carried out on a large number of specimens, using different trophic coefficients and indices. In the western Mediterranean, they inhabit mainly coastal waters, from the surface to 150 m depth. In certain coastal biotopes, such as rocky reefs and seagrass beds (*Posidonia oceanica*), Scorpaenidae are among the most important fish families in terms of biomass (Harmelin-Vivien et al. 1989).

Some aspects of the biology of *S. notata* and *S. porcus* have been studied in the Mediterranean basin, such as growth (Bradai and Bouain 1990), diet (Harmelin-

Vivien et al. 1989; Morte et al. 2001; Rafrafi-Nouira et al. 2016), gonad morphology (Muñoz 2001), fertility and cycle reproduction (Sabat 2005). In Algeria, particularly in the Algiers region, apart from the studies by Mokrane and Zerouali-Khodja (2011) and Mokrane et al. (2015), the target species have only been the subject of a few studies which only cover distinct aspects of their biology and, to our knowledge, there is also a lack of information on the feeding habits. In fact, as part of the work (Mokrane and Zerouali-Khodja 2011; Mokrane et al. 2015), an overview of the food composition of scorpionfish on the Algerian coast was carried out separately and in a preliminary manner. Furthermore, these authors have approached the feeding behaviour of these two species independently of each other and without taking into account the criterion of area or geographical distribution of these species or of their prey. The similarities existing between these species as well as the differences make it possible to draw a comparative picture of the different trophic niches of *Scorpaena* species co-occurring in the same habitats. Therefore, the aim of this study is to compare the feeding strategy of the two closely related species *S. porcus* and *S. notata* inhabiting similar habitats along the Algerian coast.

MATERIALS AND METHODS

From 2011 to 2013, a batch of 282 individuals of *S. porcus* and a batch of 484 individuals of *S. notata*, all of different lengths were collected. These samples come from the landings of trawlers and gillnets in the ports of the central region of Algeria (Bouharoun, Algiers, Tamentfoust and El Marsa) whose fleets frequent the same fishing areas. The sites have different characteristics and topography. The details on the specimens taken from each species grouped into size classes and by season are given in the following table (Table 1).

Using qualitative and quantitative analysis methods for characterizing trophic behaviour (Rosecchi and Nouaze 1985), several comparisons were made to distinguish the variability between the two species. From a qualitative point of view, a systematic inventory of the ingested prey was established. Depending on the state of digestion, the prey has been identified at different taxonomic levels. From a quantitative point of view, the composition of the diet of the two scorpionfish was determined on the basis of the frequency of occurrence F (%), the numerical composition Cn (%) and weight Cp (%), the feed coefficient of Hureau (Q) and the relative importance (IRI) for the different prey consumed. The different indices used are:

- ◆ F (prey frequency): percentage of stomachs containing a prey category relative to the number of full stomachs examined.
- ◆ Cn (percentage in number): ratio expressed as a percentage between the total number of individuals of a prey and the total number of prey.

- ◆ Cv (Emptiness Index): ratio expressed as a percentage between the number of empty stomachs and the total number of stomachs examined.
- ◆ IR (Fullness Index): ratio between the weight of the stomach and the total weight of the individual expressed as a percentage.
- ◆ Cp (percentage by weight): ratio expressed as a percentage between the total weight of individuals of a prey and the total weight of the prey recorded.
- ◆ Q (Hureau coefficient (1970): $Cn \times Cp$.
- ◆ IRI (Relative Importance Index (Pinkas et al. 1971): $(Cn + Cp) \times F$.

According to the values of Hureau coefficient Q (1970) the preys are classified as preferential ($Q > 200$), secondary ($Q = 20-200$) and accidental ($Q < 20$).

Similarity index: The progressive grouping of individual size classes according to the similarities of stomach contents was carried out by a classification method. This index only applies to relative abundances (Krebs 1998). It varies from 0 (no similarity) to 1 (perfect similarity) and the similarity threshold is arbitrarily set at $Imh = 0.6$ by Horn (1966). This index has been used by several authors for the study of trophic ontogeny but also to assess competition between predators (Potier *et al.* 2007). In this work, the Horn-Morisita similarity index (Imh) was used:

$$Imh = 2 * \sum (P_{ij} * P_{ik}) / (\sum P_{ij}^2 + \sum P_{ik}^2),$$

with Imh the Horn-Morisita index, and P_{ij} and P_{ik} the numerical percentage of prey i , respectively, of individuals (size classes j and k).

Table 1. Details on the collected specimens of each species grouped into size classes and by season.

| A | | | | B | | | |
|-------------------------------|--------|------|-------|-------------------------------|--------|------|-------|
| Effective of <i>S. porcus</i> | | | | Effective of <i>S. notata</i> | | | |
| Size class (cm) | Female | Male | Total | Size class (cm) | Female | Male | Total |
| [10–12] | 4 | 1 | 5 | | | | |
| [12–14] | 10 | 3 | 13 | | | | |
| [14–16] | 8 | 7 | 15 | [4–6] | 2 | 7 | 9 |
| [16–18] | 21 | 24 | 45 | [6–8] | 15 | 20 | 35 |
| [18–20] | 33 | 28 | 61 | [8–10] | 5 | 1 | 6 |
| [20–22] | 39 | 16 | 55 | [10–12] | 59 | 12 | 71 |
| [22–24] | 30 | 21 | 51 | [12–14] | 158 | 19 | 177 |
| [24–26] | 12 | 7 | 19 | [14–16] | 128 | 7 | 135 |
| [26–28] | 5 | 1 | 6 | [16–18] | 44 | 4 | 48 |
| [28–30] | 3 | 0 | 3 | [18–20] | 3 | 0 | 3 |
| [30–32] | 6 | 3 | 9 | [20–22] | 2 | 0 | 2 |
| Winter | 32 | 25 | 57 | Winter | 114 | 11 | 125 |
| Spring | 65 | 31 | 96 | Spring | 240 | 52 | 292 |
| Summer | 42 | 35 | 77 | Summer | 26 | 6 | 32 |
| Autumn | 32 | 20 | 52 | Autumn | 34 | 1 | 35 |
| Grand total | 171 | 111 | 282 | Grand total | 414 | 70 | 484 |

RESULTS

Qualitative diet composition

The two species of scorpionfish studied have a fairly wide feeding spectrum and predation behaviour that is both benthic and pelagic. The diet of *S. notata* is very diverse. The prey observed belong to different taxonomic groups (Table 2). In 484 stomachs examined (including 289 complete), there were 248 prey items comprising

24 taxa belonging to 20 families. Of these 24 species, 17 are crustaceans, 14 of which are brachyuran crabs. The results of the *S. porcus* prey inventory are shown in Table 2. This species also has a fairly wide feeding spectrum and predation behaviour both benthic and pelagic. The total number of prey items recorded in the 282 stomachs examined is 296, represented by 47 taxa in 26 families. Among these, 34 are crustaceans, of which 21 are brachyuran crabs.

Table 2. Inventory of prey of *S. notata* and *S. porcus*.

| Class | Order | Family | Prey of <i>S. porcus</i> | Prey of <i>S. notata</i> |
|----------------|-----------------------|----------------|---|--|
| Malacostraca | Decapoda Natantia | Penaeidae | * | <i>Parapenaeus longirostris</i> |
| | | Pandalidae | <i>Plesionika edwardsii</i> <i>Plesionika</i> sp. | * |
| | | Pasiphaeidae | <i>Pasiphaea</i> sp. | * |
| | | Alpheidae | * | <i>Alpheus glaber</i> |
| | | Processidae | <i>Processa</i> sp. <i>Processa canaliculata</i> | * |
| | Decapoda Reptantia | Xanthidae | <i>Eriphia verrucosa</i> <i>Pilumnus hirtellus</i> <i>Pilumnus</i> sp. | <i>Pilumnus hirtellus</i> <i>Pilumnus</i> sp. |
| | | Gonoplacidae | <i>Goneplax rhomboides</i> | <i>Goneplax rhomboides</i> |
| | | Galatheididae | * | <i>Galathea dispersa</i> |
| | | Inachidae | * | <i>Inachus dorsettensis</i> |
| | | Leucosiidae | * | <i>Ebalia tumefacta</i> |
| | | Portunidae | <i>Thalamita poissonii</i> <i>Liocarcinus</i> sp. <i>Liocarcinus corrugatus</i> <i>Portunus corrugatus</i> <i>Polybius henslowi</i> | * |
| | | Pirimilidae | <i>Pirimela</i> sp. | * |
| | | Pinnotheridae | <i>Eucrate</i> sp. | * |
| | | Palicidae | <i>Palicus</i> sp. | * |
| | | Corystidae | <i>Corystes cassivelanus</i> <i>Corystes</i> sp. | * |
| | | Pisidae | <i>Pisidia</i> sp. <i>Pisidia longimana</i> | * |
| | | Macropipidae | <i>Macropipus tuberculatus</i> <i>Macropipus depurator</i> | * |
| | | | <i>Asthenognathus</i> sp. | * |
| | Isopoda | Sphaerominae | <i>Sphaeroma serratum</i> | * |
| | Amphipoda | Gammaridae | Undetermined | * |
| | Stomatopoda | Squalidae | Undetermined | <i>Squilla mantis</i> |
| | | Nephropidae | * | <i>Nephrops norvegicus</i> |
| | Mysidacea | Mysidae | <i>Leptomysis mediterranea</i> | * |
| Actinopterygii | Perciformes | Mullidae | <i>Mullus barbatus</i> | * |
| | | Cepolidae | <i>Copula rubescens</i> | * |
| | | Blenniidae | <i>Blennius basiliscus</i> <i>Blennius</i> sp. | * |
| | | Gobiidae | Undetermined | * |
| | Scorpaeniformes | Scorpaenidae | <i>Scorpaena porcus</i> <i>Scorpaena</i> sp. | * |
| | Pleuronectiformes | Scophthalmidae | * | <i>Lepidorhombus</i> sp. |
| Thaliacea | Pyrosomida | Pyrosomatidae | <i>Pyrosoma</i> sp. | * |
| Cephalopoda | Sepiolida | Sepiolidae | <i>Sepiola</i> sp. | * |
| | Octopoda | Octopodidae | <i>Octopus vulgaris</i> | * |
| Bivalvia | Pectinina | Pectinidae | <i>Pecten</i> sp. | Undetermined |
| Gastropoda | Heterobranchia | Pyramidellidae | <i>Turbonilla lactea</i> | |
| Polychaeta | Undetermined | | | * |

Quantitative aspect

Variation in the vacuity and repletion index

– **Vacuity index (CV %):** This index shows a significant annual variation for the two scorpionfish. In *S. porcus*, the minimum relative values of the emptiness coefficient are observed during winter for both sexes, precisely in December (12.5%); concerning the optimal values, they are noted in summer with rates higher than 66%. On the other hand, in *S. notata* the relative minimum values are observed during autumn (31.8%) in both sexes, precisely in November, and the optimal value is noted in the spring period with rates above 50% (Figure 1a).

– **Fullness index (IR %):** Depending on the sex, the fullness index does not show large variations in the two scorpionfish. In *S. porcus*, the lowest values (2.04%) observed in summer correspond to the period of sexual maturation during which mature females seem to decrease their trophic activity or when the development of the gonads compresses the stomach. In spring, this index increases and reaches its maximum value (2.77%), indicating a resumption of trophic and energy activity. On the other hand, the lowest value of the IR observed for *S. notata* presents the lowest value observed in spring

(0.72%); in summer, this index increases and reaches its maximum value (2.52%) thus indicating a revival of food activity (Figure 1b).

Diet compositions

Almost all prey categories are consumed by each of the studied species (Tables 3 and 4). Pyrosomes, polychaetes and other Reptantia have been ingested only by *S. porcus*, so the latter's diet is more diverse than that of the other scorpionfish.

The gut content of both species is dominated by brachyurans; however, some differences in the distribution of frequency of occurrence values are noted; these are $F = 50.58$ and 52.63 in *S. notata* and *S. porcus*, respectively. Among the species that most marked this category are *Goneplax rhomboides* and *Pilumnus hirtellus*.

The secondary preys are represented by Natantia for both species in addition to the fish noted in *S. porcus*. The accidental preys are marked by non-significant differences in the distribution percentages of the food bolus between the two scorpionfish (according to the non-parametric Chi2 test, at the 5% threshold).

Table 3. Comparison of the diet of *S. porcus* and *S. notata*.

| Group of prey | <i>S. porcus</i> | | | <i>S. notata</i> | | |
|-------------------------------|------------------|--------|---------|------------------|---------|---------|
| | F (%) | Q (%) | IRI (%) | F (%) | Q (%) | IRI (%) |
| Other Reptantia | 4.51 | 8.62 | 26.49 | * | * | * |
| Brachyura | 52.63 | 1434.5 | 4004.5 | 40.58 | 3372.14 | 4782.9 |
| Natantia | 27.07 | 105.11 | 580.37 | 12.32 | 22.94 | 136.57 |
| Other Crustaceans | 25.03 | 38.49 | 188.16 | 0.72 | 1.53 | 2.4 |
| Fish | 16.54 | 198.99 | 540.03 | 3.62 | 12.52 | 26.39 |
| Pyrosoma | 9.77 | 14.6 | 99.4 | * | * | * |
| Mollusca | 5.26 | 12.53 | 40.31 | 1.45 | 0.16 | 1.82 |
| Polychaeta | 2.26 | * | * | * | * | * |
| Various (indeterminate preys) | 18 | 54.36 | 267.86 | * | * | * |

* – Absence of prey.

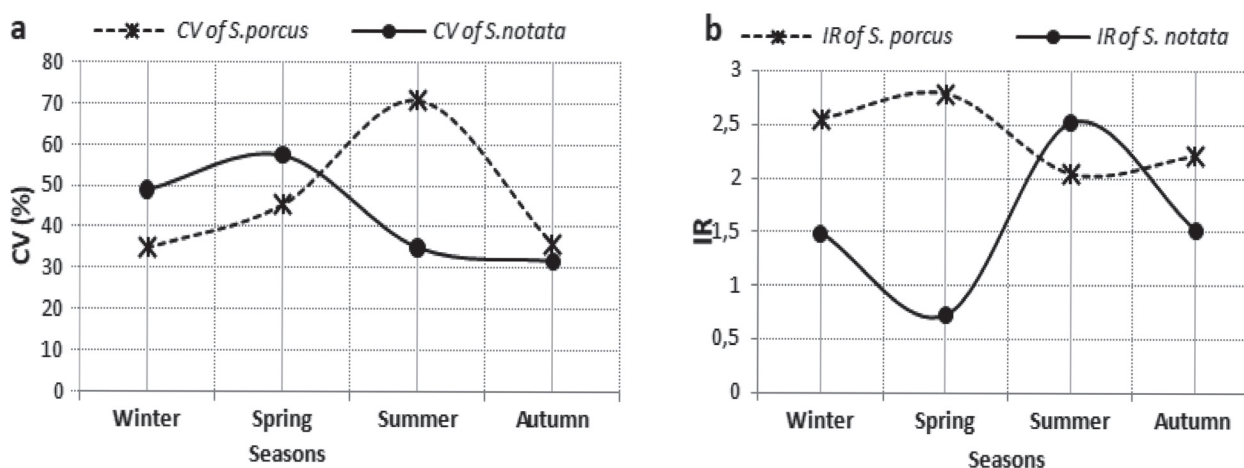


Figure 1. Variation in the vacuity index (CV) and repletion index (IR) of the two scorpionfish.

Table 4. Classification of the prey of *S. porcus* and *S. notata* according to the Hureau coefficient.

| | According to the Hureau coefficient (Q) | |
|-----------------|---|------------------|
| Group of prey | <i>S. porcus</i> | <i>S. notata</i> |
| Brachyura | Preferential | Preferential |
| Other Reptantia | Accidental | Preferential |
| Natantia | Secondary | Secondary |
| Fish | Secondary | Accidental |
| Mollusca | Accidental | Accidental |

Variation by sex

Analysis of the Hureau coefficient (Q) values calculated for each group of prey according to sex, reveals that males ingest the same species as females but with some differences in abundance. Brachyurans represent the main prey for both sexes. In *S. porcus*, fish and pyrosomes are few in females but fairly represented in males; on the other hand, in *S. notata* the other reptantia and fish are few in males but fairly represented in females (Figure 2).

Seasonal variations

The diet of the two target scorpionfish shows a seasonal variation in weight and number for some prey and not for others (Table 5); the Brachyuran crabs dominate during the four seasons (more than 40% of the prey for each season).

In summer, fish show a relatively large Hureau coefficient in the diet of the black scorpionfish compared to other seasons ($Q = 733.79$), which can be explained by the preference of this species to young fish (Bleniidae, Gobiidae) which are more abundant during this period. The other prey classified in Reptantia, Natantia, molluscs, polychaets and pyrosomes show no temporal variation in the trophic behaviour of the target species, they are only occasionally ingested.

Degree of inter-specific diet similarity (Horn-Morisita index (Imh))

◆ Between species (*S. porcus* and *S. notata*)

In order to simplify this numerical approach and to

Table 5. Seasonal variations in the Hureau coefficient of prey of *S. porcus* and *S. notata*.

| Seasons | Autumn | | Winter | | Spring | | Summer | |
|-------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Number of preys | Q <i>S. notata</i> | Q <i>S. porcus</i> | Q <i>S. notata</i> | Q <i>S. porcus</i> | Q <i>S. notata</i> | Q <i>S. porcus</i> | Q <i>S. notata</i> | Q <i>S. porcus</i> |
| Natantia (Shrimp) | 54.08 | 72.80 | 38.23 | 174.977 | 17.01 | 248.75 | 14.55 | 19.55 |
| Brachyura | 3409.6 | 2615.61 | 2630.42 | 565.294 | 3814.53 | 1040.04 | 1956.3 | 1830.31 |
| Other Reptantia | 133.40 | 0.40 | 519.97 | 69.699 | 370.14 | 15.57 | 89.17 | 0.00 |
| Indeterminate Decapoda | * | 101.72 | * | 49.344 | * | 15.31 | * | 48.97 |
| Other Crustaceans | 1.67 | 3.27 | 16.14 | 67.230 | * | 71.78 | * | 42.41 |
| Fishes | 76.30 | 125.30 | 25.49 | 181.490 | 8.22 | 44.37 | 133.79 | 733.79 |
| Pyrosoma | 0.00 | 0.00 | * | 0.661 | * | 133.01 | * | 8.56 |
| Mollusca | 2.05 | 5.05 | * | 72.907 | 0.34 | 16.60 | 0.12 | * |
| Polychaeta | * | * | * | * | | * | * | * |
| Various (indeterminate preys) | 121.66 | 76.94 | 30.59 | 56.693 | 52.73 | 67.48 | 27.72 | 3.57 |

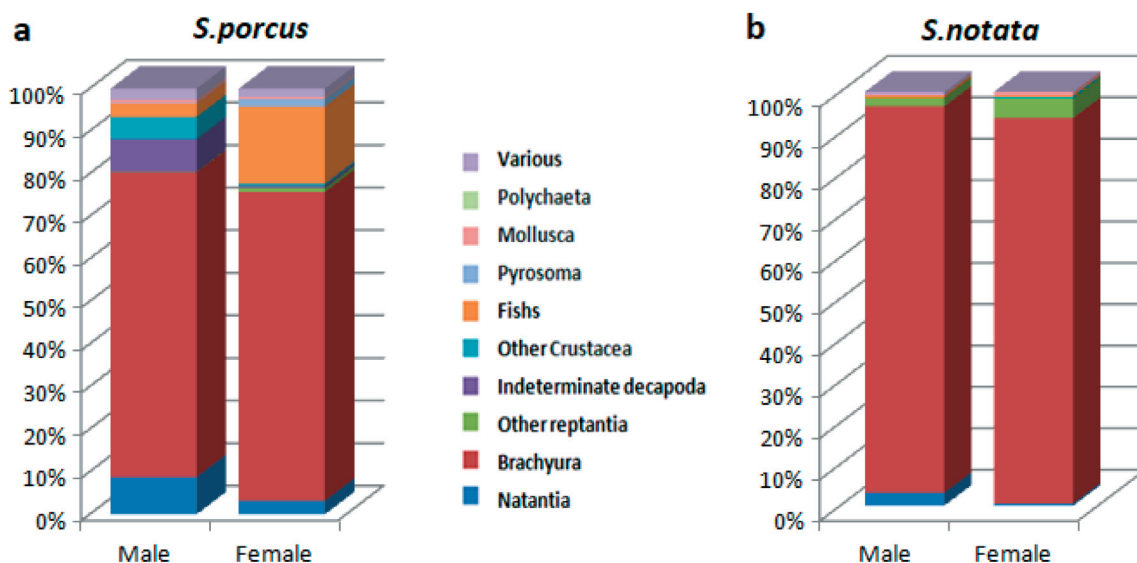


Figure 2. Variation of the Hureau Q (%) coefficient of *S. porcus* and *S. notata* prey as a function of sex.

synthesize the Horn-Morisita index into a single value, we calculated and noted in Table 6 the food similarity between the two species. The degree of inter-specific food competition between these scorpionfish was also measured by this index. These values show a strong similarity of the diet between females and males of the two species, $Imh > 0.9$ (values greater than 0.6 calculated by sexes).

Table 6. Horn-Morisita similarity index (Imh) between females and males of the two species, *S. porcus* and *S. notata*.

| Species by sexes | ♂ <i>S. porcus</i> | ♀ <i>S. porcus</i> | ♂ <i>S. notata</i> | ♀ <i>S. notata</i> |
|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| ♂ <i>S. porcus</i> | 1 | | | |
| ♀ <i>S. porcus</i> | 0.97* | 1 | | |
| ♂ <i>S. notata</i> | 0.95* | 0.95* | 1 | |
| ♀ <i>S. notata</i> | 0.94* | 0.95* | 0.99* | 1 |

(*) – Value greater than 0.6 considered significant overlap.

◆ As a function of size

To estimate the similarity index according to size, we have chosen to separate small and large individuals into two classes, depending on the L50 (size at first sexual maturity) defined for each species within the framework of this work (Mokrane *et al.* 2016). The 50% rate of mature female *S. notata* individuals corresponds to the size of 13.11 cm; 18.41 cm in *S. porcus*.

Table 7. Horn-Morisita similarity index according to size in *S. porcus* and *S. notata*.

| | <i>S. porcus</i> < 18 cm | <i>S. porcus</i> > 18 cm | <i>S. notata</i> < 13 cm | <i>S. notata</i> > 13 cm |
|--------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| <i>S. porcus</i> < 18 cm | 1 | | | |
| <i>S. porcus</i> > 18 cm | 0.50 | 1 | | |
| <i>S. notata</i> < 13 cm | 0.48 | 0.99* | 1 | |
| <i>S. notata</i> > 13 cm | 0.47 | 0.98* | 0.99* | 1 |

(*) – Value greater than 0.6 considered significant overlap.

The variations in the feeding overlap between the two scorpionfish are also remarkable according to their size (Table 7). We find that small individuals of *S. porcus* exhibit a special feeding behaviour not similar to large individuals ($Imh = 0.5$) as well as to all the size ranges of *S. notata*. In contrast, significant values of the Horn-Morisita similarity index are marked between large individuals of *S. porcus* with all individuals of *S. notata*.

DISCUSSION

The diet of *S. notata* and *S. porcus* has been poorly studied, despite being common in many areas of the Mediterranean basin. The sampling carried out on the Algerian coast made it possible to define the feeding

strategy and to identify the main groups of prey consumed by two scorpionfish, most of which belong to the Crustaceans class. Brachyuran crabs are the preferred prey for both sexes throughout the year, followed by other Crustaceans, Reptantia, Natantia, fish and molluscs. The predominance of this group is probably related to the habitat of scorpionfish that frequent rocky bottoms (Mokrane 2015). The number of prey taxa recorded in this present study is comparable to those found in other Mediterranean coastal Scorpaenids, especially if the comparison deals with high groups of taxonomic prey.

These results coincide with those of Bradai and Bouain (1990) and Raftafi-Nouira *et al.* (2016) who report that crustaceans and fish are the most frequent prey in food bowls of *S. porcus* from the Tunisian coasts. Arculeo *et al.* (1993), as well as Morte *et al.* (2001) report that the staple food of *S. porcus* and *S. notata* is made up of crustaceans and more particularly shrimps and crabs, while fish and amphipods are rarely found in their stomach. Morte *et al.* (2001) consider crabs to be the most important prey in all seasons, although they are less abundant in summer. Pallaoro and Jardas (1991) have shown that the brown scorpionfish in the Adriatic Sea also feeds on crabs and fish living in rocky environments. This has also been observed in the Black Sea by Başçınar and Sağlam (2009) and Irina and Oana (2010). According to Morte *et al.* (2001), the diet of *S. notata* and *S. porcus* changes with the seasons, thus depending on the abundance of prey in the environment, provided that these prey belong to the chosen size range and have the same ecological characteristics. The abundance of fish in the stomachs of *S. porcus* in autumn is probably related to a high consumption of young fish, abundant during this period which corresponds to the recruitment of the majority of littoral species (Francour 1997).

Food seems to be associated with the availability of prey, the distribution and abundance of which are linked to the dynamics of water masses (Kacher 2004). Rosecchi and Nouaze (1985) thinks that the differences in diet are due to a change in food preferences with age, a change in biotope or a correlation of the size of the prey with that of the predator's mouth. This partly corresponds to the results of Başçınar and Sağlam (2009) which showed that the smaller and larger individuals of *S. porcus* mainly ate crabs, with medium-sized individuals preferring shrimp. This could be related to sexual maturation, during which the development of the gonads compresses the stomach (Kapris 2004). Although the detection of habitat effects on the condition of individuals should deal with species mobility, this should not be the case for scorpionfish, which have strong sedentary behaviour and a close relationship to the benthic habitat. They are ambush predators, who have developed a hunting technique generally based on the capture of mobile prey, such as

Crustaceans and Teleosts (Harmelin-Vivien et al. 1989; Morte et al. 2001). Scorpionfish hide to hunt prey that comes on the bottom and, being very active predators, they prefer hard prey which they digest slowly.

The comparisons that we achieved demonstrated a very strong overlap of niches between two species of scorpionfish. Several authors have noticed that this food similarity is mainly found in coexisting species. Under these conditions, MacArthur (1972) predicts that a greater number of species can coexist in more productive environments, because they can achieve more overlapping trophic niches there than in less productive environments. Ordines et al. (2007) report in this same context that the diet of *Scorpaena* is crustacean-based, a taxon being reported to be more abundant in its preferred high-quality productive habitat (reefs, rocky), not only due to structural complexities (possibilities of housing inside), but also because of a greater abundance of its main prey in this type of rocky habitat.

Moreover, according to our results, as the size and maturity of *S. porcus* and *S. notata* increase, the share of crustaceans in the diet decreases, but it is compensated by the consumption of other types of prey. In this case, a problem of competition between these two species can be advanced during their reproductive cycle. On the other hand, several authors have noticed that the movement of predators during the reproduction season is marked by selection pressure, other than inter-specific competition. Competition between species requires two conditions: that they have overlapping trophic niches and that resources are limiting. Finally, two species of the same genus may have different diets, a phenomenon called segregation or trophic partition. These trophic partitions can result from totally independent feeding or come from competition avoidance mechanisms. All of these reflections deserve to be studied more closely to confirm this inconstancy with species whose trophic niches are sometimes overlapping and sometimes distinct according to geographical locations.

CONCLUSION

Knowledge of the diet of *Scorpaena notata* and *Scorpaena porcus* is important to locate the place of this resource in the marine ecosystem and in the food web; analysis of stomach contents can also provide information on eating habits. *S. porcus* and *S. notata* are active predators, carnivorous macrophages with a relatively large niche and a preference for decapods crustaceans. These species must therefore play a major role in the trophic chains of rocky coastal environments. Therefore, on the basis of the prey species identified as well as the list of predators obtained through the literature, it is as-

sumed that the two species of scorpion fish cohabiting the same Algerian coastal ecosystem have a major role in the regulation of marine food webs. In contrast, they show a specialized and opportunistic feeding strategy linked to the difference in preys distribution and availability. This strategy confirms an inter-specific feeding competition.

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