

THE NEW RECORD OF *MORCHELLIUM ARGUS* AND *APLIDIUM AFF. NORDMANNI* IN TUNISIA (MEDITERRANEAN): COMPARISON WITH THE NATIVE SPECIES *APLIDIUM CONICUM*

Nadia CHABBI¹, F. MASTROTTOTARO² et H. MISSAOUI³

1 Département halieutique, Institut National Agronomique de Tunis INAT, 43 Avenue Charles Nicole 1083 Tunis, Tunisie

2 Dipartimento di zoologia, Univesita degli studi di Bari, Italia.

3 Institut Supérieur de la pêche et de l'Aquaculture de Bizerte ISPAB, Tunisie.

1 nadia.chebbi@gmail.com

ملخص

إعلان حول وجود *Morchellium argus* و *Aplidium aff. nordmanni* في تونس (البحر الأبيض المتوسط) مقارنة مع النوعية الخاصة بالبحر الأبيض المتوسط *Aplidium conicum*: ثلاثة نوعيات من القربيات صنف *Aplidium* تم وصفها: غرب المحيط *Morchellium argus*, *Aplidium aff. nordmanni* و *Aplidium conicum* النوعان الأولان دخيلتين من الأطلسي و هما يختلفان عن النوع الخاص بالبحر الأبيض المتوسط في عدد صفوف الرئة و في شكل البطن. لقد تم وصف الانتشار المكاني والزمني لهذه الأنواع في هذا العمل. كلمات مفاتيح: *Morchellium argus*, *Aplidium nordmanni*, *Aplidium conicum*، قربيات، اعلام جديد، انشار مكاني و زمني.

RÉSUMÉ

Nouvelle signalisation de *Morchellium argus* et *Aplidium aff. nordmanni* en Tunisie (Méditerranée) : comparaison avec l'espèce endémique *Aplidium conicum* : Trois espèces d'ascidies de la famille Polyclinidae de la Méditerranée ont été décrites: *Morchellium argus*, *Aplidium aff. nordmanni* et *Aplidium conicum*. Les deux premières espèces, sont des espèces d'origine de l'Atlantique Nord-est où elles diffèrent principalement de l'espèce endémique de la Méditerranée *A. conicum* par le nombre rangs de stigmates et la forme de l'estomac. Les distributions spatiales et temporelles des trois espèces ont été décrites dans ce travail.

Mots clés : *Morchellium argus*, *Aplidium aff. nordmanni*, *Aplidium conicum*, description, distribution, Tunisie, Méditerranée.

ABSTRACT

Three species of the Polyclinidae family from the Mediterranean are described: *Morchellium argus*, *Aplidium aff. nordmanni* and *Aplidium conicum*. The two first, are from the Western Atlantic Ocean, which principally differs from the native species *A. conicum* in the number of the rows of stigmata and the shape of stomach. The spatial and temporal distributions of the three species are described in this paper.

Key Words: *Morchellium argus*, *Aplidium aff. nordmanni*, *Aplidium conicum*, description, repartition, Tunisia, Mediterranean Sea.

INTRODUCTION

The Atlanto-Mediterranean ascidians (Pérès, 1958) *Morchellium argus* and *Aplidium aff. nordmanni* were found for the first time in the year 2006 in the gulf of Tunis (Western Mediterranean basin) and the gulf of Hammamet (Eastern Mediterranean basin) with an abundant population. In Sidi Raïs and Haouaria (gulf of Tunis) occurs on the rhizomes of *Posidonia* at depth of 3 to 15 m; and in the gulf of Hammamet, on rhizomes of *Posidonia* at depth of 5 to 18 m. The origin of these species are not clear, they may have entered in the Mediterranean across the Gibraltar strait by natural spread or as fouling organism on ships hulls.

M. argus was first described from the Manche (France coast) by Milne Edwards, 1841 and widely reported from United Kingdom (Berill, 1950; Millar, 1970; Hiscock, 2006), France (Lahille, 1890, Harant and Vernières, 1933; Lafargue, 1970), Portugal (Saldanha, 1974), Morocco (Tanger ; C. and F. Monniot, 1983) and Mediterranean (Cap Creus; Lafargue *et al.* 1986). In other hand, *A. nordmanni* was first described from the Manche (French coast) by Milne Edwards, 1943 and subsequently widely reported from United Kingdom (Berill, 1950; Kott, 1952; Millar, 1970), Spain (Santander, Rodriguez, 1922), Portugal (Saldanha, 1974), Morocco (Tanger ; Ramos, 1991) Western Mediterranean (Lahille, 1890; Lafargue, 1970; Tursi, 1980) and Eastern Mediterranean (Koukouras *et al.*, 1995).

Wishing to compare these species with the native species *Aplidium conicum*, many samples have collected between January 2006 and December 2006. We describe these three species and we mentioned her distribution in Tunisia in this paper.

MATERIAL AND METHODS

Sampling carried out by scuba diving between -1 and -10 m of depth. The species found in Gulf of Tunis and between -6 and -18 m in the Gulf of Hammamet in the various sites in every season at variable frequencies (Fig. 1).. The salinity of water in Sidi Rais varied between minimum 37,2 psu (January

2006) and maximum 37,6 psu (August, 2006), in Haouaria between 37, 1 psu (January 2006) and 37, 6 psu (July 2006) and in Hammamet between 37, 3 psu (January 2006) and 37,8 psu (August 2006) (Fig.2). The temperature varied in Sidi Raïs between 10 °c (January 2006) and 26°c (August, 2006), in Haouaria between 10°c (January 2006) and 27 °c (July 2006) and in Hammamet between 11 °C (January 2006) and 28° C (August 2006) (Fig. 3). The collected samples were anaesthetized at their exit of water with crystals of menthol then fixed by formalin 5% (in seawater).

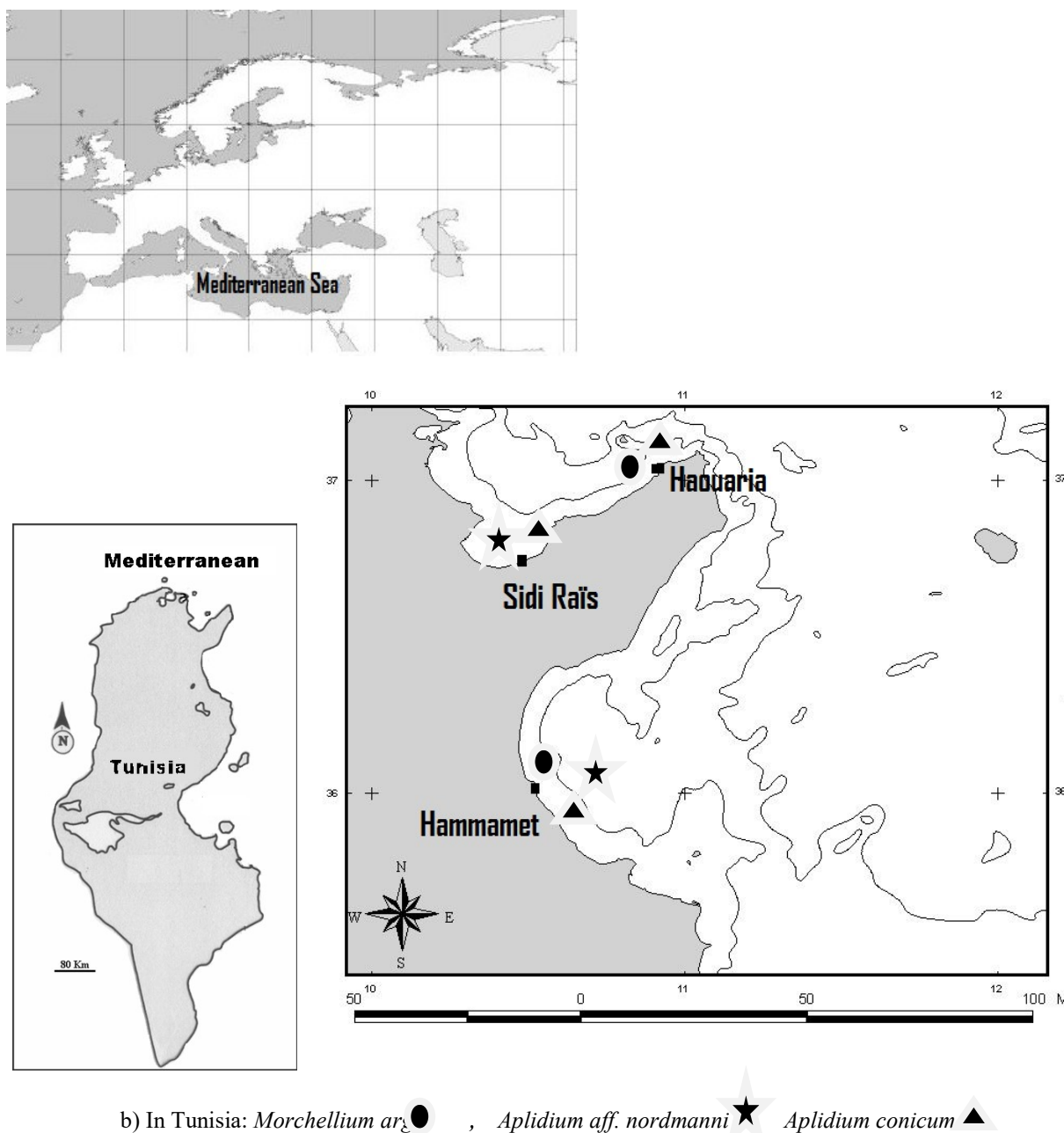


Fig. 1: Geographic distribution of the three species of Polyclinidae family

The morphological observations were made after dissection and colourings of the species with the hemalun of Masson under the binocular magnifying glass. The identification was made at the Halieutic Resources laboratory of the INAT and was confirmed at the laboratory of zoology at the University of Bari in Italy

RESULTS

Morchellium argus (Milne Edwards, 1841)

Description of the species

Morchellium (= *Synoicum*) *argus*, is a colonial species belonging to the family of the Polyclinidae. It was described by Berill in 1950 under the name of *Morchellium argus* and announce in the English and Irish coasts. Then in 2006, Hiscock made a detailed description of this species under several aspects.

External morphology

The colony presents under the aspect of group of mushrooms of small sizes connected sets whose base or foot is mean. The colour of the peduncle is beige and encrusted with fine sand, the higher end is round and present a beige colour a little pink more or less transparent which lets realize the colour orange of zooids. The length of the peduncle can reach 4 cm and the diameter does not exceed 1 cm (Fig. 4).

Internal morphology

The zooids are very long and cross the entire colony from where them length can reach until 27 mm. The oral siphon is with 8 lobes and the atrial siphon

presents a simple short strip (Fig.5). The branchial sac presents between 14 and 16 rows of stigmata with 30 stigmata / row (Fig.6). The stomach in the abdomen is haloed (Fig.5 and 7); the post stomach presents an infundibulum. The ovaries are close to the intestinal loop for some zooids and in the post abdomen for others. The male gonads are in the post abdomen that is three times longer than the abdomen and the head (1, 1, 3).

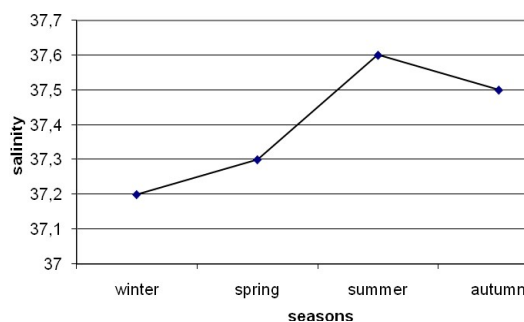
Ecology

Spatial distribution

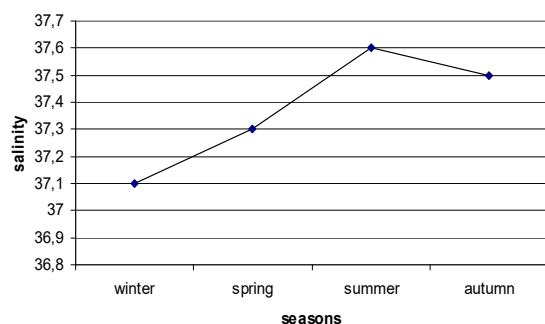
Morchellium argus is a colony which has so much variability in relation to the depth and the nature of substrates (Fig. 8). Indeed, one can notice the preference of this colony to the average depths (14 m) where it is more abundant. As regards the substrates where it collected, it is abundant on the *Posidonia* rhizomes more than on the rocks (Fig. 8). This species is more frequent in El Haouaria coast (50%) that on the Hammamet coast (35%).

Temporal distribution

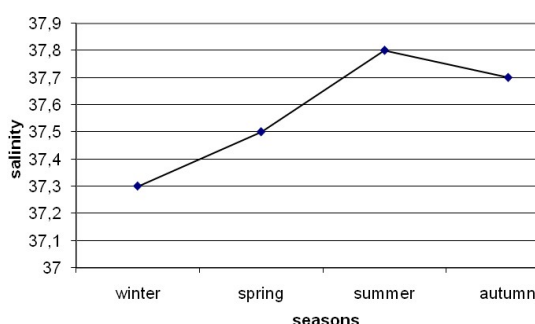
The sampling of this species began in January 2006 until December 2006. During this time this species was found in the two sites at variable frequencies (Fig.9) and it is during the winter (January) that this species was most abundant (40%) compared to the other seasons and it is during the summer (July) that one noted the lowest abundance of this species (15%).



a) In Sidi Rais



b) In the Haouaria



c) In Hammamet

Fig.2: Seasonal salinity recorded between January and December 2006

***Aplidium aff. nordmanni* (Milne Edwards, 1841)**

This specie, rare in Mediterranean Sea, was founding in France (Harant and Vernières, 1933; Médioni, 1970; Gaill, 1972), Italy (Tursi, 1980), Spain (Turon, 1987, 1988, 1990; Ramos-Esplá, 1991) and Greece (Koukouras *et al.*, 1995).

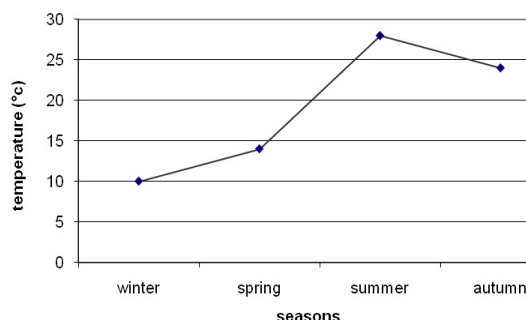
Description

Aplidium (= *Amaroucium*) *aff. nordmanni* is a colonial species belonging to the family of the Polyclinidae. The colonies founded are young small and light pink colour fixed in the rhizome of

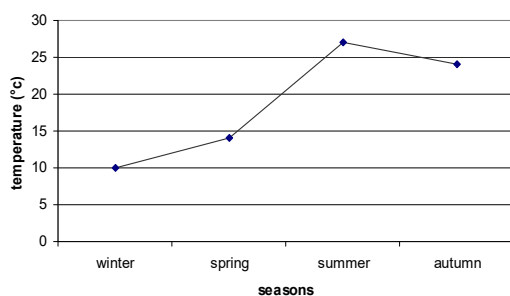
Posidonia; the zooids are arranged in regular systems, each with common cloaca.

Internal morphology

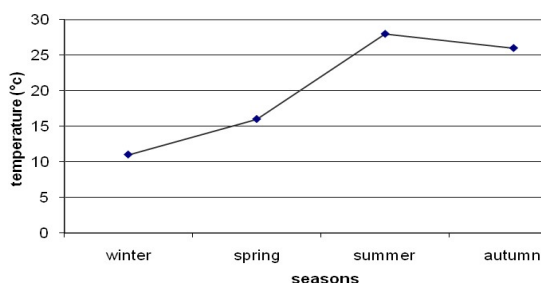
The zooids have a branchial aperture with 6 lobed atrial siphons with a cloacal languet. The branchial sac has at least 12 rows of stigmata (the number being from 11 to 16). The stomach is globular with 20 vertical folds (the number being from 18 to 26). The post-stomach is narrow and very short. The post abdomen is relatively short, the ovary occupying the anterior end and the testes are arranged in series posterior to the ovary (Fig. 11)



a) In Sidi Rais



b) In Haouaria



c) In Hammamet

Fig. 3: Seasonal water temperature recorded between January and December 2006

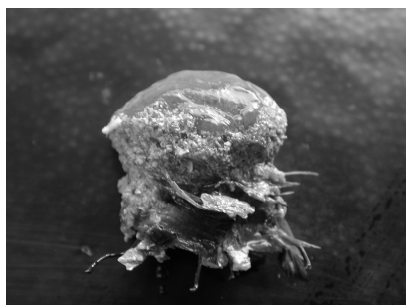


Fig. 4: External aspect of *Morchellium argus*



Fig. 5: The thorax and abdomen of *Morchellium argus*

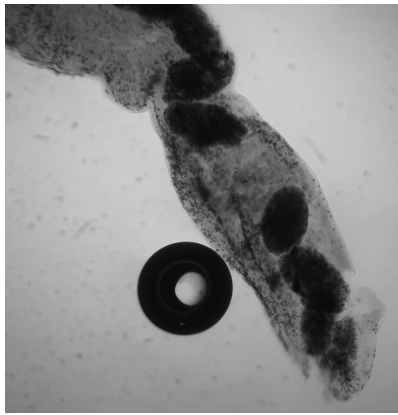


Fig.6: The post abdomen of *Morchellium argus*

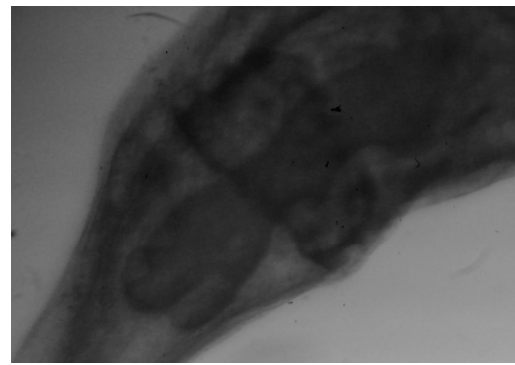
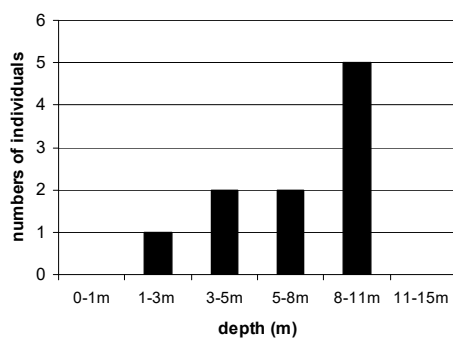
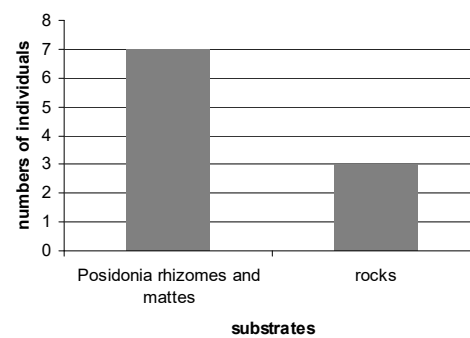


Fig.7: The stomach of *Morchellium argus*



a) According to the depth



b) According to the nature of substrates

Fig.8: Spatial distribution of *Morchellium argus*

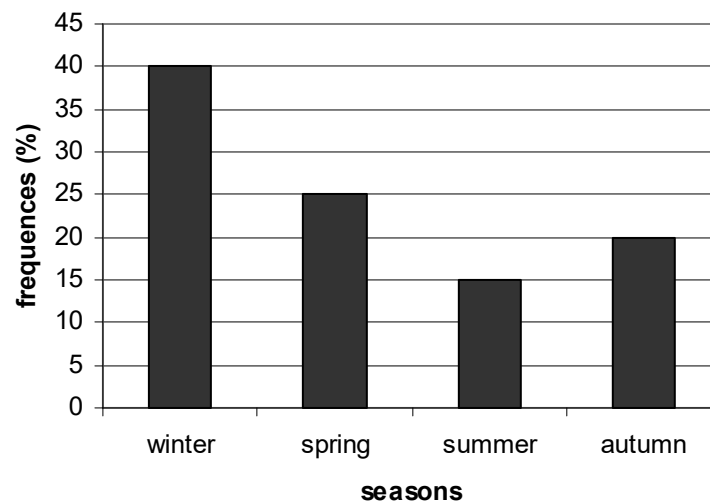


Fig.9: temporal distribution of *Morchellium argus* according to the seasons

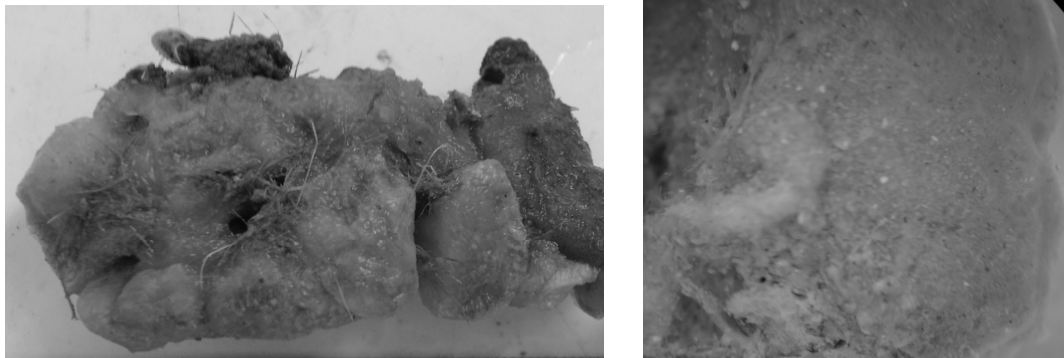
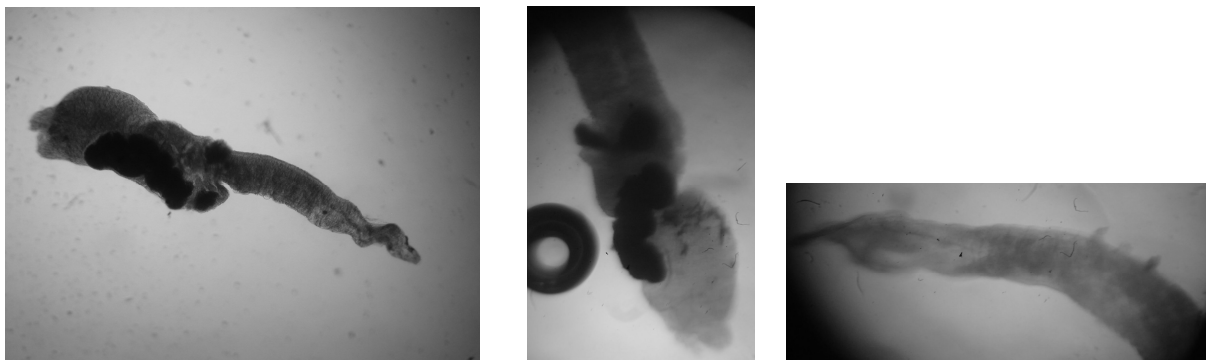


Fig. 10: Aspect of *Aplidium aff. nordmanni* colony



a) Complete zooid

b) Abdomen

c) Post abdomen

Fig. 11: Zooid of *Aplidium aff. nordmanni*

Ecology

Spatial distribution

Aplidium aff. nordmanni (Milne-Edwards, 1842) is a colony which has more variability at the depth and in relation to the nature of substrates (Fig. 12). Indeed, we can notice the preference of the average depths (10 m in Sid Raïs and 16 m in Hammamet) where it is more abundant. As regards the substrates where it collected, it is abundant on the *Posidonia* rhizomes of more than on the rocks (Fig. 12). This species is more frequent in Hammamet coast (60%) that on the Haouaria coast (40%).

Temporal distribution

The sampling of this species began in January 2006 until December 2006. During this time this species was found in the two sites at variable frequencies (Fig.13) and it is during the winter (January) that this species was most abundant (65%) compared to the other seasons and it is during the summer (July) that noted the lowest abundance of this species (5%).

Aplidium conicum (Olivi, 1792)

Description

Aplidium conicum (Olivi, 1792), founded in the gulf of Tunis and Hammamet are fixed in the rhizomes of *Posidonia* in many depths.

External morphology

The colonies founded present two colours: white in the Haouaria (gulf of Tunis) and orange in Hammamet (gulf of Hammamet). The surface is smooth and the diameter of the colonies varied between 2 cm to 13 cm and the average thickness is 5 cm (Fig. 14).

Internal morphology

The zooids of orange colour are dispersed and present an atrial siphon with 6 lobes near her the cloacal siphon have a small aperture with simple languet. The branchial sac has at least 18 rows of stigmata (the number being from 15 to 20). The stomach is globular with 5 vertical fold. The post abdomen is very long and the gonads occupying the entire part (Fig. 15).

Ecology

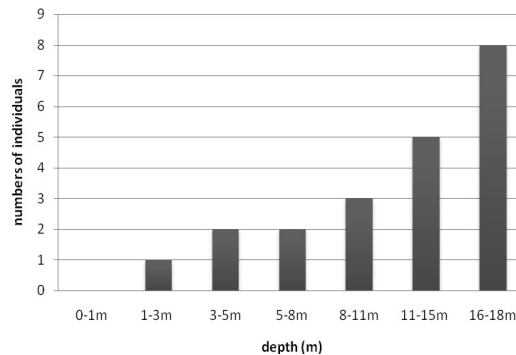
Spatial distribution

Aplidium conicum has a variable distribution in relation to the depth and the nature of substrates (Fig. 16). Indeed, we can notice the preference of the average depths (8 m in Sidi Rais, 10 m in Haouaria and 12 m in Hammamet) where it is more abundant. As regards the substrates where it collected, it is abundant on the *Posidonia* rhizomes of more than on the rocks (Fig.16).

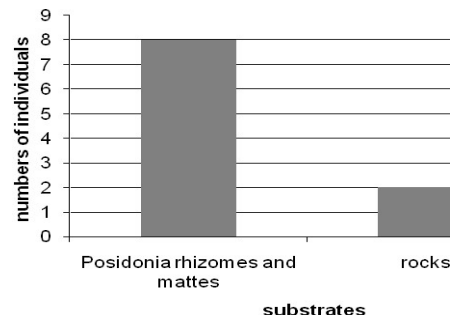
Temporal distribution

The sampling of this species began in January 2006 until December 2006. During this time this species was found in the two sites at variable frequencies (Fig.17) and it is during the winter (January) and the

spring (April) that this species was most abundant (35%) compared to the other seasons and it is during the summer (July) that noted the lowest abundance of this species (10%).



a) According to the depth



b) According to the nature of substrates

Fig.12: Spatial distribution of *Aplidium aff. nordmanni*

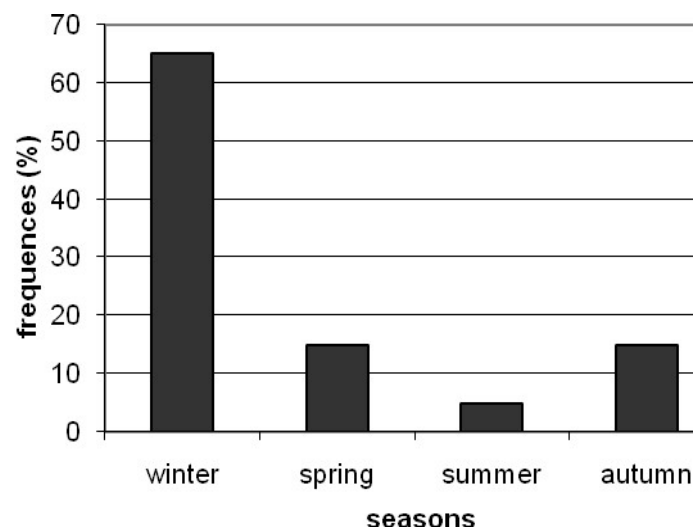


Fig.13: Temporal distribution of *Aplidium aff. nordmanni* according the seasons

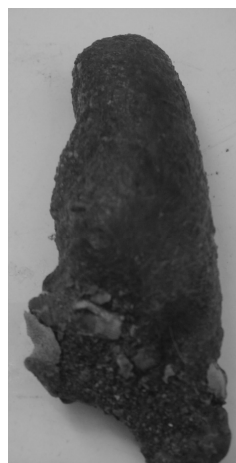


Fig.14: External morphology of *Aplidium conicum*

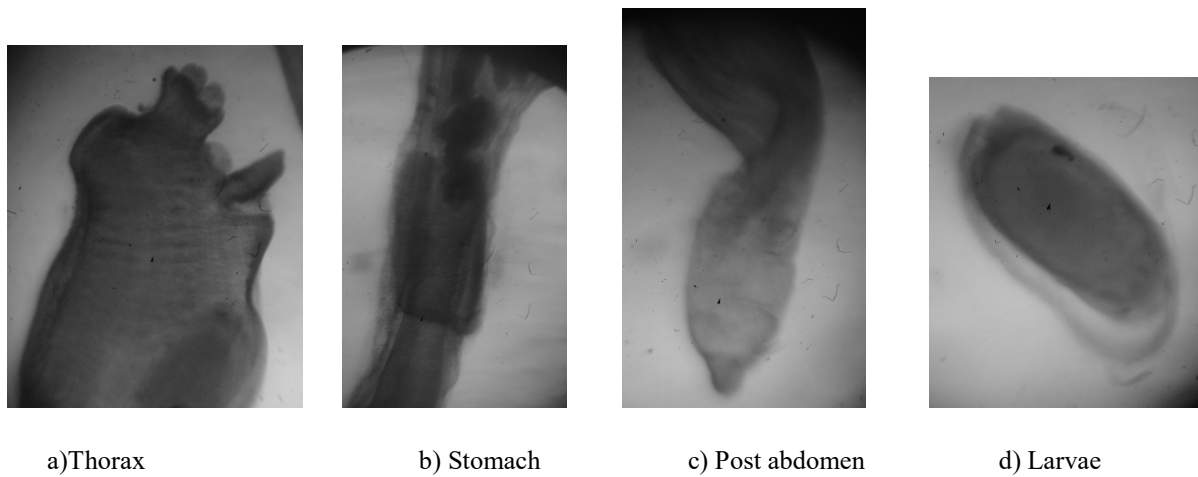


Fig.15: Internal morphology of *Aplidium conicum*

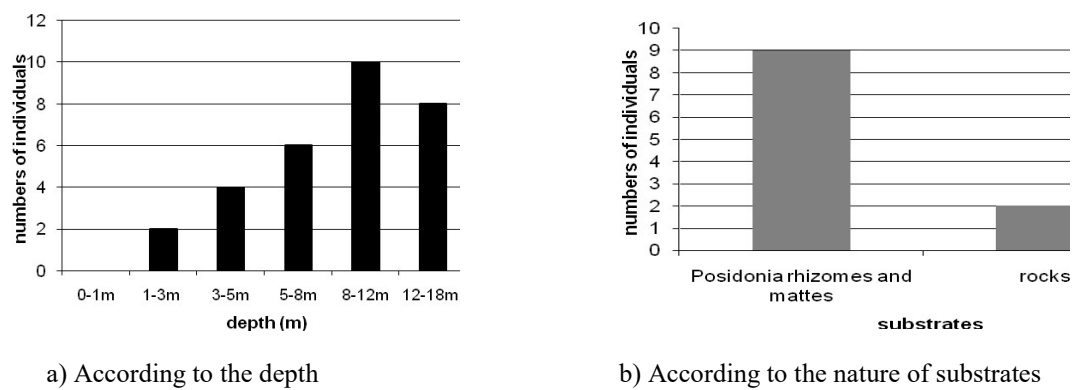


Fig.16: Spatial distribution of *Aplidium conicum*

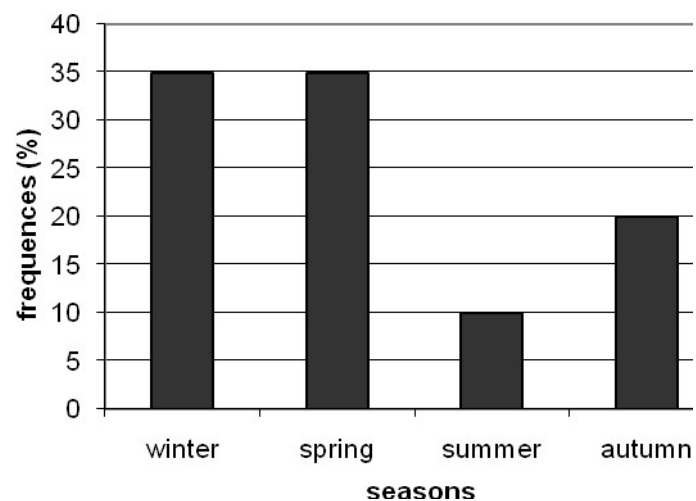


Fig.17: Temporal distribution of *Aplidium conicum* according the seasons

DISCUSSION AND CONCLUSION

The species *Aplidium conicum*, Mediterranean native, is very abundant in Tunisian coast. (Pérès, 1954, 1956; Méliane, 2002; Mestiri, 2005). These species present two types of colours: white and orange and live in variable depth. In the habitat of *A. conicum*, are present the two species *A. argus* and *A. aff. nordmanni*, Atlanto-Mediterranean species, but more abundant in the Atlantic than the north Mediterranean. These two species, habitually of cold water, are recorded for the first time in Tunisian coast (south Mediterranean) in the gulf of Tunis and the gulf of Hammamet.

Aplidium argus (Milne-Edwards, 1841), is more abundant in El Haouaria than in Hammamet proves that this intrusion is still recent. This species has a preference of water at least cold from where it's more frequent around -10 m than near to the coast. This preference seems to be also related to the nature of the substrate where it is more abundant on the hard substrates such as the *Posidonia* rhizomes than the rocks. The aspect of this colony compared to the descriptions made by other authors on the Atlantic (Berill, 1950; Levi and Gontcharoff, 1955; Millar, 1970; Lafargue, 1970; Gaill, 1973, 1974;) or from the Mediterranean coasts (Lafargue, 1971; Médioni, 1971; Gaill, 1973, 74; Monniot, 1979; Monniot *et al*, 1992; Tursi, 1980; Lafargue *et al*, 1986; Turón, 1987, 1988, 1990; Ramos and Ros, 1990; Ramos, 1991; Ramos *et al*, 1992; Naranjo *et al*, 1996;) is similar.

Aplidium nordmanni (Milne Edwards, 1843), is more abundant in Hammamet than in Sidi Raïs. This species is more frequent between 10 and 16 m of depth and prefers the *Posidonia* rhizomes like a substrate. The appearance of the colony is similar a description of Berill in 1950 but in Tunisian coast the colour of the colony is only light pink and the size of colony is small. In comparison with the *A. nordmanni* zooid described by Berill (1950) the number of rows of stigmata is upper than those described by Berill (1950) and the number of stomach folds is lowest.

Acknowledgements

Very special thanks are dedicates to Professor Angelo Tursi, who allowed me to carry out this training course at the zoology laboratory of the University of Bari.

Other thanks are dedicates to the CAR/SPA that financed my training course.

BIBLIOGRAPHY

Berill N.J., 1950 - The Tunicata with an account of the British species. 354 p.
Gaill F. 1972- Morphologie comparée de la glande pylorique chez quelques Aplousobranches (Tuniciers) 557 Extr. des Archives de Zoologie

Expérimentale e Générale, tome 113, fasc. 2, pp. 295-307
Gaill F. 1973- Etude histologique de la glande pylorique de *Synoicum argus* (Polyclinidae, Tuniciers). Extr. des Archives de Zoologie Expérimentale et Générale, tome 114, fasc. 1, pp. 97-110
Gaill F. 1974- Aspect ultrastructural de la glande pylorique et de l'intestin postérieur de *Sydnum argus* (Polycinidae, Tuniciers). Extr. de Biologie Marine, tome XV, pp. 337-341.
Harant H. and Vernières P. 1933- Tuniciers, Fasc. 1: Ascidiés. Faune de France, 27: 100 pp.
Hiscock K. 2006- *Morchellium argus*. A colonial sea squirt. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom.
Kott P. 1952 - Ascidiens of Australia, Stolidobranchia and Phlebobranchiata. Aust. J. mar. res. Freshw. Res., 3 (3): 206-333.
Koukouras A., Voultsiadou-Koukoura E., Kevrekidis T. and Vafidis D. 1995- Ascidian fauna of the Aegean sea with a check list of the eastern Mediterranean and black sea species. Ann. Institut Océanographique de Paris, 71 (1) : 19-34.
Lafargue F. 1970- Peuplements sessiles de l'Archipel de Glenan. I - inventaire ascidiés. 85 Vie et Milieu, Série B: Océanographie, Tome XXI, Fasc. 3-B, pp. 729-742.
Lafargue F. 1971- Note préliminaire concernant les Ascidiés récoltés dans la région de Rovinj (Yougoslavie). 99 Thalassia Jugoslavica, 7(2), pp. 515-524.
Lafargue F., Ramos A. A., Turon X., Banaigs B. and Wahl M. 1986- The littoral ascidiens of the Spanish Mediterranean. 1. From Port Bou to the Islas Medas, Vie Milieu, 36 (2): 133-139.
Lahille, F. 1890- Recherches sur les Tuniciers des côtes de France. Thèse, Université de Paris.
Levi C. and Gontcharoff M. 1955- Inventaire de la faune marine de Roscoff. Nemertes-Tuniciers. supplément 7, Aux travaux de la station biologique de Roscoff.
Médioni A. 1971 - Les peuplements sessiles des fonds rocheux de la région de Banyuls-sur-mer. Ascidiés-Bryozoaires (2^{ème} partie). Vie Milieu, 22: 541-456.
Méliane I. 2002- Contribution to the knowledge of the ascidian fauna in the South East of Tunisia. MS thesis, University of Alicante, Spain.
Mestiri M. 2005- « Systématique des Ascidiés (Ascidiacea) du parc marin de Zembra (Tunisie) et biodiversité des Ascidiés tunisiennes ». Mémoire de Mastère à l'Institut National Agronomique de Tunis, 109 p.

- Millar R. H., 1970- British Ascidiaceae. Keys and Notes for the Identification of the species. 88 p.
- Monniot C. et Monniot F. 1983- Navigation ou courants ? La colonisation des Açores et des Bermudes par les ascidies (Tuniciers benthiques). C.R. Soc. Biogéogr., 59 : 53-58.
- Monniot F. 1979- Microfiltres et ciliatures branchiales des ascidies littorales en microscopie Électronique. Bull. Mus. natn. Hist. nat., Paris, 4 sér., 1, section A, n. 4, pp. 843-859.
- Monniot F., Martoja R. and Monniot C. 1992- Silica distribution in ascidian ovaries, a tool for systematics. Biochemical Systematics and Ecology, Vol. 20, n. 6, pp. 541-552.
- Naranjo S. A., Carballo J. L. and Garcia-Gomez J. C. 1996 - Effects of environmental stress on ascidian populations in Algeciras Bay (southern Spain). Possible marine bioindicators? Marine Ecology Progress Series, 144: 119-131.
- Pérès J.M. 1954 - Contribution à l'étude des Ascidies de Tunisie. Bulletin de la station océanographique de Salammbô n°49. 1- 21.
- Pérès J.M. 1956 a - Ascidies : Résultats des campagnes scientifiques de la « Calypso » ; études sur le seuil Siculo-tunisien, Vol. II. Ann. Institut Océanographique de Paris, 32 : 256-304.
- Pérès J. M. 1958 - Origine et affinités du peuplement en Ascidies de la Méditerranée. 14 Commission Internationale pour l'exploration scientifique de la mer Méditerranée. Rapports et Procès-Verbaux des Réunions, Vol. XIV (Nouvelle série), pp. 493-502.
- Ramos Espla A. A. 1991 - Ascidias litorales del Mediterráneo ibérico. Faunistica, Ecologia y Biogeografia. Alicante: Universidad, Secretario de Publicaciones, 1991, 405 p.,VI: il., map.
- Ramos Espla A. A., Buencuerpo V., Vasquez E., and Lafargue F. 1992- Some biogeographical remarks about the ascidian littoral fauna of the Straits of Gibraltar (Iberian sector). Bull. de l'Inst. Océan. Monaco, N° spécial 9 : 125-132.
- Ramos. A. A., and Ros J. 1990- Tipos biológicos en ascidias litorales de substratos duros. Benthos 6: 283-299.
- Rodriguez E. 1922- Fauna Baleare: Tunicados existentes en la coleccion del laboratorio biologic-marino de Baleares. Bol. Pesca. Int. Esp. Oceanogr., 7 (2): 279-296.
- Saldanha L. 1984- Estudo do povoamento dos horizontes superiores da rocha litoral da costa da Arrábida (Portugal). Arq. Mus. Bocage, 2e. Ser. 5 (1): 1-382.
- Turon X. 1987- Las ascidias de Tossa de Mar (Girona). I. Generalidades. Faunistica y taxonomia. Misc. Zool., 11 : 221-231.
- Turon X. 1988- Distribucion ecologica de las costas de Cataluna e Islas Baleares (Mediterraneo Occidental). Misc. Zool., 12: 219- 236.
- Turon X. 1990- Distribution and abundance of Ascidiaceans from a locality on the Northeast coast of Spain. Marine Ecology, 11 (4): 291-308.
- Tursi A. 1980- Guide per il riconoscimento delle specie animali delle acque lagunari e costiere italiane. 4. Ascidiacei. Consiglio nazionale delle ricerche.