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PRELIMINARY STUDY ON THE FEEDING HABITS OF CLEAVER WRASSE, *XYRICHTHYS NOVACULA* (PISCES: LABRIDAE) IN THE STRAIT OF SICILY (MEDITERRANEAN SEA).

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Abstract: Feeding habits of *Xyrichthys novacula* (Osteichthyes, Labridae) were investigated, in order to provide some new data of its diet from different study area. Specimens were collected by trammel net and gill net, at Selinunte (S/W Sicily), during the summer 2001.The diet was constituted mainly by Crustacea and Mollusca. Particularly, Anomura and Tellinidae were dominant in terms of percentage frequency of occurrence, percentage number, percentage volume and percentage of index of relative importance. Moreover, the other prey items such as *Plagiocardium papillosum*, *Abra alba* and *Nucula nucleus* were very important as showed by the indexes calculated. The cleaver wrasse feeds mostly on benthic organisms belonging to the fine, well-sorted sand assemblage and shows a different dietary composition correlated to size classes.

Key Words: feeding habits, diet, *Xyrichthys novacula*, Strait of Sicily, Mediterranean sea.

Introduction

The cleaver wrasse, X*yrichthys novacula* (Linnaeus, 1758) is a benthic species, distributed in the Mediterranean Sea and along the western and eastern Atlantic coasts, generally living on shallow sandy or muddy bottoms, sometime near seagrass (*Posidonia oceanica*) meadows, at depth ranging from 1 to 90 m. (Tortonese, 1975).

The previous studies on the feeding biology of this species are few and were carried out in the Tyrrhenian Sea (Cardinale et al., 1997; Castriota et al., 2005) and in the Balearic Islands (Riera & Linde, 2001). During a study on the stock assessment of commercial species carried out in Sicily, from 1997 to 2001 (Cannizzaro et al., 2001), we recorded an increasing occurrence along the south-western coast of Sicily, precisely in the Selinunte area. We observed also an increasing importance of this species in local markets, where it reached a high commercial value. We report the diet of the cleaver wrasse from the Selinunte area (Straits of Sicily) where this species has not been investigated yet.

Materials and Methods

During the summer 2001, a total of 64 specimens of cleaver wrasses were caught by trammel net and gill net, at a depth between 15 and 25 m, on sandy bottoms of Selinunte (37°34'008N; 12°46'726E), south-western coast of Sicily (Italy) (Figure 1). Fish were eviscerated and the stomachs were preserved in a 5% neutral solution of formaldehyde and sea water. Prey items were identified and classified to the lowest possible taxonomic level, and counted.

The diet analysis was carried out by means of the percentage frequency of occurrence (%F= number of stomachs containing prey *i*/total number of full stomachs x 100), percentage numerical abundance (%N = number of prey *i*/total number of prey x 100), percentage volume (%V = volume of prey *i*/total volume of prey x 100) (Hyslop, 1980). We used these values to calculate the index of relative importance (IRI) for each prey item. So, IRI index was calculated by the following equation:

$$IRI = (\%\ N + \%\ V) \times \%F$$

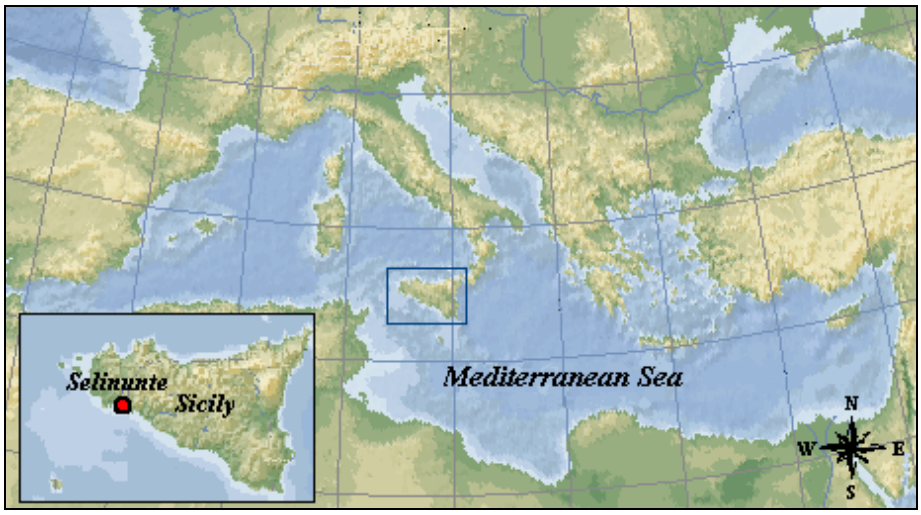

Figure 1. Map of the study area.

Then the IRI percentage index was also calculated (%IRI=IRI/Σ IRI x 100) (Pinkas et al.,1971). The vacuity coefficient was evaluated (VC = number of empty stomachs/total number of stomachs examined x 100).

We applied the non-parametric multivariate analysis of variance (NPMANOVA) (Anderson 2000, 2001; Mc Ardle & Anderson, 2001) to analyse diet variation between size classes. We performed this analysis on 64 specimens considering 2 size categories (< 160 mm of Total Length, TL; > 160 mm TL). Data were transformed to ln (x+1); the analysis is based on Gower distances, with 4999 permutations used.

We also used the permutational analysis of multivariate dispersions (PERMDISP) (Anderson, 2004) to detect differences in dispersion inside the groups. Data were transformed to ln (x+1); analysis is based on Gower excluding double zeros, with 4999 permutations used.

Results

The specimens of *X. novacula* examined were females ranging from 122 to 181 mm TL. All 64 stomachs examined were full (CV=0). The analysis of prey items led to the identification of 27 taxa. According to all numerical indicators, the best represented prey categories were Crustacea (%F=53.1; %N=17.9; %V=29.8) and Mollusca (Bivalvia: %F=70.3; %N=48.9; %V=59.6; Gastropoda: %F=39.1; %N=30.5; %V=2.9), whereas Polychaeta (%F=14.1; %N= 2.1; %V=4.3) and Teleostei (%F=6.3; %N= 0.7; %V=3.4) were less important.

Particularly, among Crustacea, Anomura was the best represented taxa in terms of frequency, number, volume and IRI value; among Bivalvia the family of Tellinidae showed the highest values of all indexes (Table 1). Moreover among bivalves *Nucula nucleus*, *Plagiocardium papillosum* and *Abra alba* showed high values of %F, %N, %V and %IRI.

Results of NPMANOVA showed significant differences between the size classes <160 mm TL and >160 mm TL ($F_{1, 62}$ = 3.7828, p<0.001); the PERMDISP test resulted no significant ($F_{1, 62}$ = 1,4858; not significant).

%IRI index analysis applied to these two size classes showed that the specimens less than 160 mm TL feed mainly on Bivalvia as Tellinidae, *Abra alba*, *Acantocardia tubercolata*, and Polychaeta, while Anomura, Bivalvia as *Ensis ensis* and *Nucula nucleus*, Gastropoda were most preyed from specimens larger than 160 mm TL (Table 2).

Discussion and conclusions

The diet of *X. novacula* in the study area mainly consisted of benthic invertebrates. It feed mostly on two prey categories as Crustacea and Mollusca, particularly Anomura and Bivalvia are the major

Table 1. Percentage frequency of occurrence (%F), percentage number (%N), percentage volume (%V) and percentage of index of relative importance (%IRI) of prey categories.

PREY CATEGORIES		%F	%N	%V	%IRI
ARTHROPODA					
Crustacea					
	Amphipoda	7.81	1.81	0.09	0.37
	Mysidacea	9.38	2.71	1.90	1.07
	Tanaidacea	6.25	0.78	0.09	0.13
	Anomura	20.31	7.49	17.92	12.79
	Macropodia sp.	4.69	0.90	2.50	0.40
	other Decapoda	9.38	1.68	2.30	0.92
	unidentified Crustacea	10.94	1.81	1.60	0.92
MOLLUSCA					
Bivalvia					
	Abra alba	18.75	9.17	0.66	4.57
	Acanthocardia tuberculata	10.94	2.07	3.53	1.52
	Chamelea gallina	6.25	1.03	0.25	0.20
	Diosinia lupinus	7.81	1.03	0.98	0.39
	Donax venustus	4.69	0.52	0.13	0.08
	Ensis ensis	6.25	0.90	5.28	0.96
	Mactra sp.	7.81	0.90	1.12	0.39
	Nucula nucleus	18.75	7.24	13.65	9.70
	Plagiocardium papillosum	15.63	5.94	9.29	5.90
	Tellinidae	29.69	17.18	17.34	25.40
	unidentified Bivalvia	9.38	1.03	0.65	0.39
Gastropoda					
	Unidentified Gastropoda	39.06	29.33	2.58	30.89
POLYCHAETA					
	Glycera spp.	7.81	1.03	1.04	0.40
	unidentified Polichaeta	6.25	1.03	2.80	0.59
VERTEBRATA					
	Teleostei	6.25	0.65	3.00	0.57
NEMATODA					
	Nematoda	15.63	3.23	0.32	1.38
	Posidonia oceanica	6.25		1.04	
OTHER ITEMS					
	Foraminifera	4.69	0.52	0.04	0.06
	Sand grains	6.25		2.99	
	Unidentified	32.81		6.89	

Table 2. Percentage of relative importance index (%IRI) for two size classes: <160 mm TL; >160 mm TL.

PREY CATEGORIES	< 160 mm TL %IRI	> 160 mm TL %IRI
ARTHROPODA		
Crustacea		
Amphipoda	2.08	-
Mysidacea	0.07	2.17
Tanaidacea	0.03	0.21
Anomura	7.68	15.65
Macropodia sp.	-	1.07
other Decapoda	5.47	-
unidentified Crustacea	5.43	-
MOLLUSCA		
Bivalvia		
Abra alba	6.10	3.01
Acanthocardia	5.58	0.15
Chamelea gallina	1.14	-
Diosinia lupinus	-	1.03
Donax venustus	0.43	-
Ensis ensis	-	2.62
Mactra sp.	1.64	0.02
Nucula nucleus	4.70	13.15
Plagiocardium	2.26	5.61
Tellinidae	31.22	19.66
unidentified Bivalvia	0.05	0.73
Gastropoda	19.96	32.10
POLYCHAETA	4.73	0.05
Teleostea	-	1.54
Nematoda	1.39	1.15
Foraminifera	0.03	0.08

important prey in the diet of the cleaver wrasse. The dietary analysis indicated that most of prey items that it feeds were benthic organisms belonging to the fine, well-sorted sand biocenosis (Pérès, 1967), such as *Acanthocardia tuberculata, Chamelea gallina, Diosina lupinus* and some other. The presence of small sand grains in almost all the stomachs confirms that *X. novacula* feeds on soft-bottom, where it has been caught. This could be indicate that this species catches in the same area where it live, according to Cardinale et al. (1997) and Castriota et al. (2005). The most presence of Tellinidae in its diet could be reflect a high environmental availability, as resulted from a previous study in the same area (Beltrano et al, 1999).

The low values found for Polychaeta and Teleostei reveal their minor importance in the diet of cleaver wrasse. The high presence of Anomura and Mollusca is also reported by Cardinale et al. (1997) for the sizes ranging from 120 to 170 mm TL, even though with different dominant species. In fact, among bivalves, *Plagiocardium papillosum*, *Abra alba* and *Nucula nucleus* dominated our sample, while *Acantocardia tubercolata* was a frequent prey but with scarce numerical and volumetric importance, suggesting its minor importance in the diet.

Moreover we observed, from statistical tests and %IRI indexes, prey differences between the two size classes considered, as recorded also by Castriota et al. (2005) and Cardinale et al.(1997).

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References

Anderson, M.J. (2000). NPMANOVA: a FORTRAN computer program for non-parametric multivariate analysis of variance (for any two-factor ANOVA design) using permutation tests. Department of Statistics, University of Auckland.

Anderson, M.J. (2001). A new method for non-parametric multivariate analysis of variance. Australian Ecol. **26**: 32-46.

Anderson, M.J. (2004). PERMDISP: a FORTRAN computer program for permutation analysis of multivariate dispersions (for any two-factor ANOVA design) using permutation tests. Department of Statistics, University of Auckland, New Zealand.

Beltrano, A.M., Cannizzaro, L., & Garofalo, G. (1999). Note preliminari sulle abitudini alimentari di Lithognathus Mormyrus (Linnaeus, 1758) della Sicilia sud-occidentale. N.T.R.. Istituto di ricerca sulle Risorse Marine e l'Ambiente – Consiglio Nazionale delle Ricerche, **60**: 1-12.

Cannizzaro, L., Garofalo, G., Arculeo, M., Kallianiotis, A., & Potoschi, A. (2001). Stocks assessment of some coastal species caught by artisanal fishery. Final Report. Contract E.U. 96/054 (mimeo). 320 pp.

Cardinale, M., Colloca, F., & Ardizzone, G.D. (1997). Feeding ecology of Mediterranean razorfish Xyrichthys novacula in the Tyrrenian Sea (Central Mediterranean Sea). J. Appl. Ichthyol. **13**: 105-111.

Castriota, L., Scarabello, M.P., Finoia, M. G., Sinopoli, M., & Andaloro, F. (2005). Food and feeding habits of pearly razorfish, Xyrichthys novacula (Linnaeus, 1758), in the southern Tyrrhenian Sea: variation by sex and size. Environ. Biol. Fishes, **72**: 123 - 133

Hyslop, E.J. (1980). - Stomach content analysis: a review of methods and their applications. J. Fish. Biol., **17**: 411-429.

McArdle, B.H., & Anderson, M.J. (2001). Fitting multivariate models to community data: a comment on distance-based redundancy analysis. Ecology **82** (1): 290-297.

Pinkas, L., Oliphant, M. S., & Iverson, I. L. K. (1971). Food habits of albacore, bluefin tuna and bonito in California waters. Fish. Bull. **152**: 1–105.

Pérès, J.M. (1967). The Mediterranean benthos. Oceanogr. Marine Biol. Ann. Rev. **5**: 449-533.

Riera, F., & Linde, M. (2001). El raor, Xyrichthys novacula (Linnaeus, 1758) pp. 9-34. In: El raor i la cirviola. Conèixer per preservar. Quaderns de Pesca. Governo de les Illes Balears, Conselleria d'Agricoltura i Pesca 6.

Tortonese, E., (1975). Osteichthyes (Pesci ossei). Fauna d'Italia. Calderini. Bologna 1, 223.