

P. FRANZOI, F. RICCATO, A. FRANCO, P. TORRICELLI

Dipartimento di Scienze Ambientali, Università Ca' Foscari di Venezia, Campo della Celestia,
Castello 2737/b - 30122 Venezia, Italia.

DIETARY DIFFERENCES IN THREE PIPEFISH SPECIES (OSTEICHTHYES, SYNGNATHIDAE) RELATED TO SNOUT MORPHOLOGY

DIFFERENZE NELLA DIETA DI TRE SPECIE DI PESCI AGO (OSTEICHTHYES, SYNGNATHIDAE) IN RELAZIONE ALLA MORFOLOGIA DEL MUSO

Abstract

The diets of three pipefish species co-occurring in a sea grass meadow of the Venice Lagoon (Syngnathus abaster, S. typhle and Nerophis ophidion) were investigated through the analysis of stomach contents and related to snout and mouth morphology. Cluster analyses highlighted significant differences in the dietary composition among the three species. A long and high snout enables S. typhle to catch both fast and large pelagic preys, while the short snout of S. abaster and N. ophidion allows them to capture small preys hidden in the vegetation.

Key-words: *diets, brackishwater fish, sea grass, Venice Lagoon.*

Introduction

Pipefishes are characterized by an elongate tubular snout and could be considered as specialized suction feeder (Muller & Osse, 1984). This work aims to study the differences in diet composition of a guild of pipefishes associated with a sea grass meadow (*Cymodocea nodosa*) in the Venice Lagoon (Riccatto *et al.*, 2003), and to relate them to the different morphology of head and snout.

Materials and methods

Sampling was carried out, almost monthly from April to October 2001, by means of a fine-mesh seine in a seagrass meadow of the northern Venice lagoon (45°26'050 N 12°23'560 E). On the whole, 180 gut contents were analysed under a dissection stereoscope; food items were classified to the lowest possible taxon and then pooled into dietary categories. For each sample the percent frequency of occurrence and the relative contribution of each dietary category to the diet, by number and volume, were calculated. The Index of Relative Importance IRI and IRI% (Barry *et al.*, 1996) were calculated for each sample. Head length, snout length and mouth height measures were performed on a sample of individuals of each species and the differences among species were tested by means of Mann-Whitney U-Test. Dietary and morphological data were analysed by means of PRIMER 5 package (Clarke & Warwick, 1994).

Pipefish feeding behaviour was observed in animals held in aquarium systems containing synthetic eelgrass.

Results

A Bray-Curtis similarity matrix, performed on fourth root transformed dietary data, was calculated and a cluster analysis was performed in order to highlight differences in diet composition (Fig. 1). The diet of *S. typhle* was typified by Amphipoda of the genus *Ericthonius*, but this species also preyed on relatively quick pelagic organisms such as Misydacea and Palaemonidae.

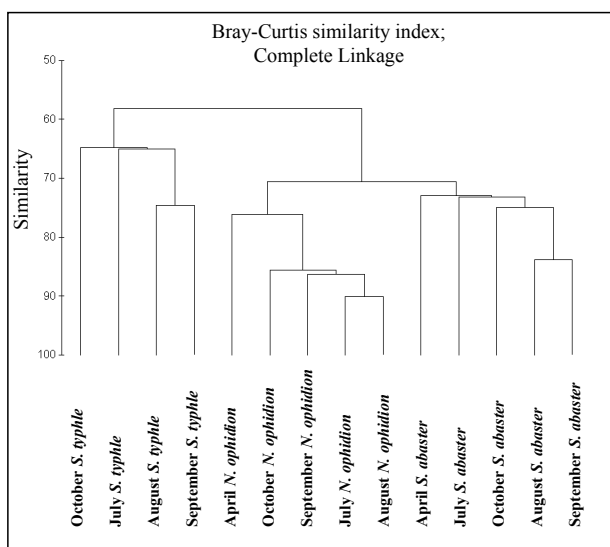


Fig. 1 - Cluster analysis of the specimens based on monthly dietary data.
Dendrogramma ottenuto dalla cluster analisi dei dati mensili di dieta.

The diet of both *S. abaster* and *N. ophidion* was mainly composed by small crustaceans associated to the vegetation, such as Amphipoda (gen. *Erichthonius*) and Harpacticoida (gen. *Tisbe*). Isopoda and other genera of Amphipoda typified the diet of *S. abaster* while *Porcellidium* sp. (Harpacticoida) characterized that of *N. ophidion* (Tab. 1).

Tab. 1 - Contribution (IRI%) of the major dietary categories to the overall diet of *S. abaster*, *S. typhle* and *N. ophidion*.
Contributo in termini di IRI% delle principali categorie alimentari rinvenute negli stomaci delle tre specie di pesci ago.

<i>S. abaster</i> (n=74)	IRI%	<i>S. typhle</i> (n=58)	IRI%	<i>N. ophidion</i> (n=45)	IRI%
Copepoda:		Amphipoda:		Copepoda:	
<i>Tisbe</i> sp.	47,5	<i>Erichthonius</i> sp.	92,1	<i>Porcellidium</i> sp.	37,4
		Amphipod unid.	1,0	<i>Tisbe</i> sp.	33,2
Amphipoda:		Mysidacea	3,5	Amphipoda:	
<i>Erichthonius</i> sp.	42,6			<i>Erichthonius</i> sp.	28,8
Caprellidae	7,5	Decapoda:		Caprellidae	0,4
		Natantia	3,2		
Mysidacea	0,4				
Isopoda	0,3				
Other	1,7	Other	0,2	Other	0,2

As regards morphological data, *S. typhle* is characterized by a higher mouth and a longer snout (Fig. 2), than *S. abaster* (U=9, p<0.001 for mouth height; U=37,

$p < 0.001$ for snout length) and *N. ophidion* ($U=8$, $p < 0.001$ for mouth height; $U=20$, $p < 0.001$ for snout length).

This latter species is characterised by a short snout and mouth (Fig. 2), than *S. abaster* ($U=348$, $p < 0.001$ for mouth height; $U=470$, $p < 0.001$ for snout length).

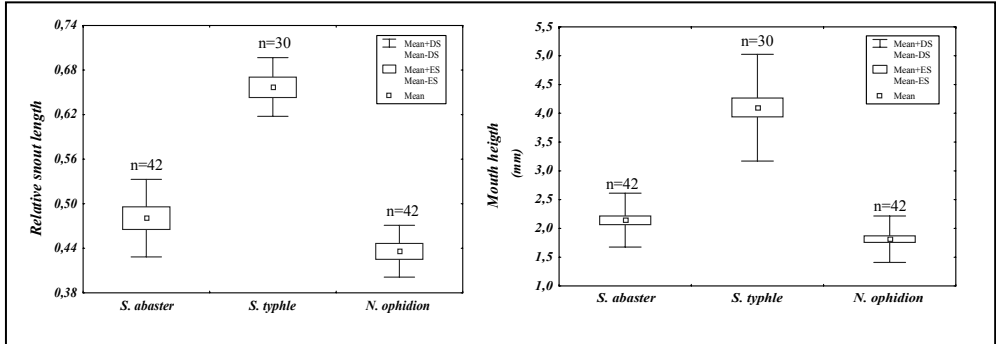


Fig. 2 - Measures of snout length/head length and mouth height in the three species.

Misure del rapporto lunghezza preorbitale/lunghezza capo e altezza della bocca nelle tre specie.

The observation of animals held in microcosm-aquarium systems showed that *N. ophidion* remain attached to the vegetation and search for preys on the canopy leaves, while *S. abaster* and *S. typhle* show a higher mobility, the first moving through the seagrass searching for small preys, the latter swimming slowly toward preys in to the water column clear of the canopy.

Conclusions

The dietary differences detected among the three pipefish species could be explained by the differences observed in both snout and mouth morphology. A longer and higher snout enables *S. typhle* to catch both fast and large pelagic preys, while the shorter and cone shaped snout of *S. abaster* and *N. ophidion* allows them to capture little preys hidden in the vegetation. Moreover the three species seem to forage in different microhabitats of the canopy.

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