

## LIFE CYCLE AND DIET OF TWO PIPEFISH (SYNGNATHIDAE) IN THE STAGNONE LAGOON (NW SICILY)

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Pipefish commonly inhabits shallow vegetated waters in coastal and estuarine areas, where they form a large component of fish assemblage associated with macroalgae and macrophyte beds. We investigated population structure, life cycle and food niche segregation of *Syngnathus abaster* Risso, 1826 and *S. typhle* Linnaeus 1758, in a Mediterranean coastal lagoon. Pipefish were collected in the Stagnone di Marsala, this biotope, located in the western part of Sicily, is characterized by phanerogame and seaweed beds. Wide salinity and temperature fluctuations are recorded during the seasonal cycles. Monthly samplings were carried out from January to December 1993 by means of a beach seine 15 m long (4 mm mesh size in the bag), in six stations characterized by sandy and/or muddy bottom showing a patchy submersed vegetation (mainly *Cymodocea nodosa* beds but also *Caulerpa prolifera* and *Cystoseira spp.*). Samples were preserved in 10% neutralized formalin, species were sorted out in order to record standard length and weight. Syngnathids were sexed by presence or absence of a male brood pouch. Fecundity of ripe females and brooding males was estimated: the mean number and diameter of oocytes and eggs. Brood pouch length in males and standard length at birth were also measured. Gut contents

analysis was performed on subsamples collected in July and October. Food items were classified and counted. Percent numerical abundances and frequencies of occurrence per food item were calculated; Renkonen measures of niche overlap between the two pipefish populations in July and October were calculated too. The average number of different food items per gut has been considered as a measure of individual food niche breadth.

Analysing the population structure of these pipefish for both species the occurrence of two cohorts per year was evident: the parent cohort (age 1+), and the recruit cohort (age 0+). The newly-born fish of both species appeared in May and were present until the end of October. The occurrence of more subcohorts of age 0+, suggests that females are batch spawners and males can incubate several broods during the breeding season. Tab.1 shows a comparison between some life-history traits of these pipefish. In females several batches of oocytes in different maturity stages were observed. The number of oocytes increased with female body size, also the number of eggs incubated by males increased with brood pouch size. Diet compositions of both pipefish species are reported in Tab.2. Feeding habits of *S. abaster* and *S. typhle* are seemingly different: *S. abaster* preyed mainly on zoobenthos, especially harpacticoids of genus *Tisbe* and to a lesser extent on Amphipods (Gammaridea, Caprellidea), Isopods (*Idotea sp.*, *Sphaeroma sp.*, Arcturidae), Tanaidacea and Ostracods. *S. typhle* fed especially on Mysis, a macroplanktonic prey that in shallow waters occupies the entire water column, from surface to bottom. *S. abaster* and *S. typhle* are among the most typical representatives of Stagnone fish community. The continued capture throughout all the year, the presence of juveniles and the occurrence of males brooding embryos all suggest the existence of established, breeding populations of both species. These pipefish belong to the resident species group and show abbreviate iteroparity ("sensu" Miller, 1984), namely: short life span with only one or few reproductive seasons; increased parental care; in addition females spawn several times and males are able to hatch subsequent batches of eggs during the same breeding season. *S. abaster* and *S. typhle* seem to avoid competition for food, showing different foraging microhabitats. Food niche differences pointed out between these pipefish species may be related to snout morphology. *S. typhle* snout is longer, *S. abaster*'s is shorter and conical; this enables the former species to catch relatively fast pelagic preys, the later to prey small organisms hiding themselves in the submersed vegetation (FRANZOI *et al.*, 1993).

TAB.1- Life cycle traits

Species	<i>S. abaster</i>	<i>S. typhle</i>
No. tot ind.	277	321
Occurrence of juveniles	end MAY- OCT	begin MAY- OCT
Breeding season	MAR-OCT	APR- OCT
S.L. max (mm)	106	229
Sex-ratio (Males/Females)	0.46	0.198
No. of eggs/ Male (S.L.range mm.)	(74-96)	(130-150)
(mean $\pm$ SD, n=5)	27 $\pm$ 4.08	51 $\pm$ 11.8
No. of oocytes/Female (S.L.range mm.)	(74-96)	(130-150)
(mean $\pm$ SD, n=5)	29.5 $\pm$ 6.45	73.6 $\pm$ 38.4
Eggs diameter (mm)		
range (mode)	1-2 (1.3-1.5)	0.8-2.5 (2-2.5)
Oocytes diameter (mm)		
range (mode)	0.3-1.3 (1-1.3)	0.8-2 (1.7-2)
Average length of brood pouches (mm)(S.L.range mm.)	(74-96)	(130-150)
(mean $\pm$ SD, n=5)	24.5 $\pm$ 2.38	44 $\pm$ 4
Average S.L. at birth (mm)	(N=10)	(N=10)
(mean $\pm$ SD, n=5)	18.2 $\pm$ 0.5	19.5 $\pm$ 0.4

TAB.2- Gut content analysis

Sample month	July		October	
	<i>S. typhle</i>	<i>S. abaster</i>	<i>S. typhle</i>	<i>S. abaster</i>
Species				
No. of fishes	10	10	10	10
SL range (mm)	85-157	60-76	67-140	63-86
Average no. of prey per gut (SD)	11.0(2.0)	8.8(20.0)	1.8(0.9)	19.1(14.9)
Average no. of food items per gut (SD)	1.2(0.4)	3.3(1.4)	1.0(0.0)	3.4(1.9)
DIET COMPOSITION(%Number of prey)	N%	N%	N%	N%
GASTEROPODA	4.5	0.6		
ACARINA				0.65
OSTRACODA		6		1.3
COPEPODA HARPACTICOIDA		71.3		66
MYSIDACEA	87.9	1.3	84.6	1.3
TANAIDACEA		3.3		5.9
ISOPODA:				
Idoteidae		7.3		1.3
Sphaerominae		1.3		6.5
Arcturidae				0.7
AMPHIPODA:				
Gammaridea		8.7	15.4	15.7
Caprellidea				0.7
OSTRICHTHYES (post-larvae)	7.6			
RENKONEN INDEX	July: 2.0		October: 16.7	

### REFERENCES

- FRANZOI P., R. MACCAGNANI, R. ROSSI, V. U. CECCHERELLI, 1993. Life cycles and feeding habits of *Syngnathus taenionotus* and *S. abaster* (Pisces, Syngnathidae) in a brackish bay of the Po River Delta (Adriatic Sea). *Mar. Ecol. Prog. Ser.*, Vol. 97: 71-81.  
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