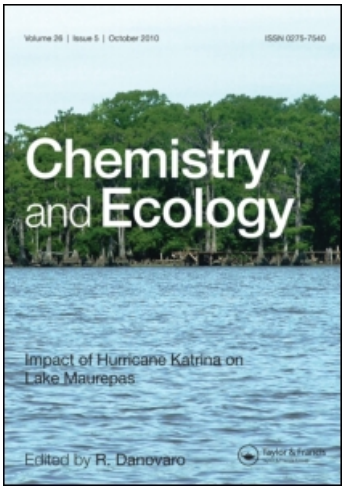

Chemistry and Ecology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713455114

Spawning periods calendar of commercial fish in the Adriatic Sea: a preliminary study

Carla Giansante[a]; Mario Vallerani[a]; Sabrina Angelini[a]
[a] Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Italy

To cite this Article Giansante, Carla , Vallerani, Mario and Angelini, Sabrina(2008) 'Spawning periods calendar of commercial fish in the Adriatic Sea: a preliminary study', Chemistry and Ecology, 24: 1, 165 — 174
To link to this Article: DOI: 10.1080/02757540801966371
URL: http://dx.doi.org/10.1080/02757540801966371

Chemistry and Ecology
Vol. 24, No. S1, June 2008, 165–174

Taylor & Francis
Taylor & Francis Group

Spawning periods calendar of commercial fish in the Adriatic Sea: a preliminary study

Carla Giansante*, Mario Vallerani and Sabrina Angelini

Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', Italy

(*Received 10 July 2007; final version received 15 January 2008*)

The Italian fishing industry, especially the part operating in the Adriatic, has long requested a change to the period of the fishing ban, normally effective in August, when Italy sees the greatest number of tourists. This study aims to contribute to knowledge of the reproductive periods of the main species fished in Italian waters, with the aim of protecting both the biodiversity of seafood and the income of fishermen using the technical ban. The tool chosen was consultation of the available bibliographic and documentary sources, in order to reliably and scientifically define the breeding periods of individual species. The results enabled the development of a reproductive calendar for every species taken into consideration. This calendar provides the technical basis to initiate a discussion on the scientific schedule for the biological bans.

Keywords: spawning calendar; fishing ban; Italy; reproduction; seafood

1. Introduction

Every year the Ministry of Agriculture and Forests issues a decree to enhance responsible fishing in the Italian seas in order to protect sea resources. The decree is part of a three year plan which consists of progressive measures taken to improve the sustainability of sea fishing. The aquatic resource protection plan gives great importance to the scientific evaluation of the measures adopted and to the consequent control of their efficacy.

It is governed by the EU regulation no.2792/99 and includes the procedures to follow for the temporary ban of trawlers and pair trawlers. Until 2004 the Ministry established, on an occasional basis, the ban to take place in August, but from Summer 2005 a strong request to revise the period of the fishing ban was made. In August a large number of tourists are hosted along the coast, should the ban be respected, the high demand for fresh seafood could be satisfied only by using imported products with a consequent blow to local economy as the local fishing industry would be completely excluded. So the request to the change was accepted by the Undersecretary of State for Fishing and Aquaculture and the Ministry of Agriculture and Forests revised the ban in the

*Corresponding author. Email: c.giansante@izs.it

ISSN 0275-7540 print/ISSN 1029-0370 online

DOI: 10.1080/02757540801966371
http://www.informaworld.com

Adriatic in the decree of 14 July 2005. The decree divided the Adriatic coast into three parts and issued this following calendar for the fishing activities.

- 1–30 August 2005: ships registered with the maritime authorities between Trieste and Ancona;
- 13–27 August 2005 and 17 September–1 October 2005: ships registered with the maritime authorities between San Benedetto del Tronto and Manfredonia;
- 3–18 September and 30 September–14 October 2005: ships registered with the maritime authorities between Molfetta and Crotone.

The aim of the study was to gather documentation on sea fish reproduction and give indications on fishing ban periods in the Adriatic Sea.

2. Materials and methods

A very careful survey of the main scientific databases of the sector was made in order to establish the breeding periods of marine fauna fished in the Adriatic Sea. The sources of information examined comprised scientific texts [3–8], articles published in local and national Journals, reports of technical and scientific studies [9–12], grey literature and study reports from the main fishing centres [13–15]. In order to ensure the complete identification of the most commercial species [16], the study was expanded to the systematic visit of fishing industry websites [10,11,13,15]. The method used was based on objective scientifically grounded criteria.

3. Results

The study involves a large number of species because of the rich biodiversity of the Italian sea. Owing to this great variety, knowledge of the breeding periods of each species is fragmentary and dispersed among the different authors and types of publication. There is currently no organised literature on this topic, furthermore there are often differences and disagreements in the sources of information that make it very difficult to compare the known data in order to obtain the correct reproductive pattern. Given that the methodology used in the various literature reports is not always known, the individual bibliographic references are reported for each of the 84 species taken into consideration. The information for each species was thus structured in the form of a calendar.

Results are reported in Table 1: the numbers in the column ‘season’ indicate the months of the year from December, indicated as month 12, in order to construct a scientifically rigorous reproductive calendar. The reproductive periods are indicated in light shading, with peaks – i.e. the most intense breeding periods – in dark shading. It should be stressed that many species breed over more than one season, and thus the same species has been considered a number of times in various seasons in drawing up the calendar. The month involved in the reproduction of an individual species is shown in grey in the corresponding cell. The sum of the number of shaded cells corresponds to the number of species breeding in that season.

Breeding periods considered by season (as revealed by the literature sources examined) were:

- 93 in winter (32.86%);
- 180 in spring (63.60%);
- 152 in summer (53.71%);
- 77 in autumn (27.20%).

Most reproductive activity is therefore in the spring.

Table 1. Breeding seasons of fauna in the Italian seas (reproductive periods □ ; the most intense breeding periods ■).

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Anchovy (*Engraulis encrasicolus • Linnaeus, 1758*) (5)*					□	□	□	□	□	□	□	□	
Anchovy (*Engraulis encrasicolus • Linnaeus, 1758*) (16)						□	□	■	■	□	□		
Anchovy (*Engraulis encrasicolus • Linnaeus, 1758*) (11)						□	□	□	□	□	□	□	□
Anchovy (*Engraulis encrasicolus • Linnaeus, 1758*) (3)						□	□	□	□	□	□	□	□
Garfish (*Belone belone • Linnaeus, 1761*) (16)				□	□	□	□						
Garfish (*Belone belone • Linnaeus, 1761*) (3)				□	□	□	□						
Spanish sardine (*Sardinella aurita • Valenciennes, 1847*) (16)								□	□	□			
Spanish sardine (*Sardinella aurita • Valenciennes, 1847*) (3)								□	□	□	□		
Crayfish (*Palinurus elephas • Fabricius, 1787*) (6)	□	□	□	□						□	□	□	□
Crayfish (*Palinurus elephas • Fabricius, 1787*) (8)				□	□	□	□			□	□		
Crayfish (*Palinurus elephas • Fabricius, 1787*) (15)				□	□	□				□	□		
Argentine (*Argentina sphyraena • Linnaeus, 1758*) (16)	□	□	□	□	□								
Argentine (*Argentina sphyraena • Linnaeus, 1758*) (3)			□	□	□								
Argentine (*Argentina sphyraena • Linnaeus, 1758*) (9)	□	□	□	□	□	□							
European lobster (*Homarus gammarus • Linnaeus, 1758*) (6)	□	□	□						□	□	□	□	□
European lobster (*Homarus gammarus • Linnaeus, 1758*) (15)			□	□	□	□	□	□					
European lobster (*Homarus gammarus • Linnaeus, 1758*) (9)									□				
Bogue (*Boops boops • Linnaeus, 1758*) (10)						□	□						
Bogue (*Boops boops • Linnaeus, 1758*) (16)				□	□	□	□	□	□	□			
Bogue (*Boops boops • Linnaeus, 1758*) (3)						□	□						
Bogue (*Boops boops • Linnaeus, 1758*) (7)			□	□	□	□	□						
European squid (*Loligo vulgaris • Linnaeus, 1758*) (8)				□	□	□	□	□	□	□	□	□	□
European squid (*Loligo vulgaris • Linnaeus, 1758*) (11)				□	□	□	□	□	□	□	□	□	□
European squid (*Loligo vulgaris • Linnaeus, 1758*) (15)		□	□	■	■	■	■	■	■	□	□	□	
Striped mullet (*Mugil cephalus • Linnaeus, 1758*) (8)										□	□	□	
Striped mullet (*Mugil cephalus • Linnaeus, 1758*) (11)	□											□	□
Striped mullet (*Mugil cephalus • Linnaeus, 1758*) (16)	□											□	□
Striped mullet (*Mugil cephalus • Linnaeus, 1758*) (3)				□	□	□	□	□	□	□			
Striped mullet (*Mugil cephalus • Linnaeus, 1758*) (7)									□	□	□	□	
Red bandfish (*Cepola rubescens • Linnaeus, 1766*) (9)				□	□	□	□	□	□	□	□	□	□
Red bandfish (*Cepola rubescens • Linnaeus, 1766*) (16)				□	□	□							
Mediterranean shad (*Alosa fallax nilotica • Geoffroy, 1827*) (16)				□	□	□							
Mediterranean shad (*Alosa fallax nilotica • Geoffroy, 1827*) (3)					□	□	□						

(*continued*)

Table 1. Continued.

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Mediterranean sand eel (*Gymnammodytes cicerelus* • *Rafinesque, 1810*) (16)													
Mediterranean sand eel (*Gymnammodytes cicerelus* • *Rafinesque, 1810*) (3)													
Brown meagre (*Sciaena umbra* • *Linnaeus, 1758*) (16)													
Brown meagre (*Sciaena umbra* • *Linnaeus, 1758*) (10)													
Brown meagre (*Sciaena umbra* • *Linnaeus, 1758*) (3)													
Common dentex (*Dentex dentex* • *Linnaeus, 1758*) (3)													
Common dentex (*Dentex dentex* • *Linnaeus, 1758*) (16)													
Tub gurnard (*Trigla lucerna* • *Linnaeus, 1758*) (16)													
Tub gurnard (*Trigla lucerna* • *Linnaeus, 1758*) (3)													
Streaked gurnard (*Trigloporus lastoviza* • *Brunn, 1768*) (10)													
Streaked gurnard (*Trigloporus lastoviza* • *Brunn, 1768*) (3)													
Streaked gurnard (*Trigloporus lastoviza* • *Brunn, 1768*) (16)													
Caramote prawn (*Penaeus kerathurus* • *Forsskäl, 1775*) (6)													
Black goby (*Gobius niger jozo* • *Linnaeus, 1758*) (3)													
European spider crab (*Maja squinado* • *Herbest, 1788*) (6)													
European spider crab (*Maja squinado* • *Herbest, 1788*) (10)													
Harbour crab (*Liocarcinus depurator* • *Linnaeus, 1758*) (11)													
Harbour crab (*Liocarcinus depurator* • *Linnaeus, 1758*) (6)													
Conger eel (*Conger conger* • *Linnaeus, 1758*) (6)													
Conger eel (*Conger conger* • *Linnaeus, 1758*) (10)													
Conger eel (*Conger conger* • *Linnaeus, 1758*) (3)													
Common dolphinfish (*Coryphaena hippurus* • *Linnaeus, 1758*) (7)													
Common dolphinfish (*Coryphaena hippurus* • *Linnaeus, 1758*) (16)													
Chub mackerel (*Scomber japonicus colias* • *Gmelin, 1788*) (16)													
Chub mackerel (*Scomber japonicus colias* • *Gmelin, 1788*) (3)													
Sand smelt (*Atherina boyeri* • *Risso, 1810*) (3)													
Sand smelt (*Atherina boyeri* • *Risso, 1810*) (16)													
Leerfish (*Lichia amia* • *Cuvier, 1831*) (16)													
Leerfish (*Lichia amia* • *Cuvier, 1831*) (3)													
European barracuda (*Sphyraena sphyraena* • *Linnaeus, 1758*) (3)													
European barracuda (*Sphyraena sphyraena* • *Linnaeus, 1758*) (16)													
Mutable nassa (*Nassarius mutabilis* • *Linnaeus, 1758*) (15)													
Blue whiting (*Micromesistius poutassou* • *Risso, 1826*) (3)													
Blue whiting (*Micromesistius poutassou* • *Risso, 1826*) (16)													
Blotched picarel (*Maena maena* • *Facciolà, 1918*) (16)													

(*continued*)

Table 1. Continued.

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Blotched picarel (*Maena maena • Facciolà, 1918*) (3)													
Blotched picarel (*Maena maena • Facciolà, 1918*) (10)													
Poor cod (*Trisopterus minutus capelanus • Risso, 1826*) (16)													
Poor cod (*Trisopterus minutus capelanus • Risso, 1826*) (16)													
Spanish ling (*Molva elongata • Canestrini, 1874*) (16)													
Spanish ling (*Molva elongata • Canestrini, 1874*) (3)													
Striped seabream (*Lithognathus mormyrus • Linnaeus, 1758*) (16)													
Striped seabream (*Lithognathus mormyrus • Linnaeus, 1758*) (3)													
Striped seabream (*Lithognathus mormyrus • Linnaeus, 1758*) (10)													
Lesser octopus (*Eledone cirrhosa • Linnaeus, 1758*) (15)													
Lesser octopus (*Eledone cirrhosa • Linnaeus, 1758*) (15)													
Lesser octopus (*Eledone cirrhosa • Linnaeus, 1758*) (13)													
Murex (*Murex brandaris • Linnaeus, 1758*) (15)													
Murex (*Murex brandaris • Linnaeus, 1758*) (10)													
Murex (*Murex brandaris • Linnaeus, 1758*) (13)													
Forkbeard (*Phycis phycis • Linnaeus, 1758*) (9)													
Forkbeard (*Phycis phycis • Linnaeus, 1758*) (16)													
European hake (*Merluccius merluccius • Linnaeus, 1758*) (8)													
European hake (*Merluccius merluccius • Linnaeus, 1758*) (3)													
Fly-specked moon snail (*Naticarius stercusmuscarum • Gmelin, 1791*) (15)													
Saddle bream (*Oblada melanura • Linnaeus, 1758*) (16)													
Saddle bream (Oblada melanura • Linnaeus, 1758) (10)													
Saddle bream (*Oblada melanura • Linnaeus, 1758*) (3)													
Saddle bream (*Oblada melanura • Linnaeus, 1758*) (9)													
Shi drum (*Umbrina cirrosa • Linnaeus, 1758*) (3)													
Shi drum (*Umbrina cirrosa • Linnaeus, 1758*) (9)													
Shi drum (*Umbrina cirrosa • Linnaeus, 1758*) (16)													
Shi drum (*Umbrina cirrosa • Linnaeus, 1758*) (11)													
Gilthead seabream (*Sparus aurata • Linnaeus, 1758*) (8)													
Gilthead seabream (*Sparus aurata • Linnaeus, 1758*) (16)													
Gilthead seabream (*Sparus aurata • Linnaeus, 1758*) (11)													
Gilthead seabream (*Sparus aurata • Linnaeus, 1758*) (3)													
Gilthead seabream (*Sparus aurata • Linnaeus, 1758*) (9)													
Common pandora (*Pagellus erythrinus • Linnaeus, 1758*) (3)													

(*continued*)

Table 1. Continued.

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Common pandora (*Pagellus erythrinus • Linnaeus, 1758*) (9)													
Common pandora (*Pagellus erythrinus • Linnaeus, 1758*) (8)													
Common pandora (*Pagellus erythrinus • Linnaeus, 1758*) (16)													
Common pandora (*Pagellus erythrinus • Linnaeus, 1758*) (11)													
Red porgy (*Pagrus pagrus • Linnaeus, 1758*) (16)													
Red porgy (*Pagrus pagrus • Linnaeus, 1758*) (10)													
Red porgy (*Pagrus pagrus • Linnaeus, 1758*) (3)													
Red porgy (*Pagrus pagrus • Linnaeus, 1758*) (9)													
Atlantic bonito (*Sarda sarda • Bloch, 1793*) (16)													
Atlantic bonito (*Sarda sarda • Bloch, 1793*) (1)													
Atlantic bonito (*Sarda sarda • Bloch, 1793*) (3)													
Smooth Hound (*Mustelus mustelus • Linnaeus, 1758*) (8)													
Smooth Hound (*Mustelus mustelus • Linnaeus, 1758*) (11)													
Smooth Hound (*Mustelus mustelus • Linnaeus, 1758*) (3)													
Mantis shrimp (*Squilla mantis • Linnaeus, 1758*) (8)													
Mantis shrimp (*Squilla mantis • Linnaeus, 1758*) (11)													
Mantis shrimp (*Squilla mantis • Linnaeus, 1758*) (15)													
European sprat (*Sprattus sprattus • Linnaeus, 1758*) (16)													
European sprat (*Sprattus sprattus • Linnaeus, 1758*) (3)													
European sprat (*Sprattus sprattus • Linnaeus, 1758*) (9)													
European flounder (*Platichthys flesus luscus • Linnaeus, 1758*) (3)													
European flounder (*Platichthys flesus luscus • Linnaeus, 1758*) (9)													
European flounder (*Platichthys flesus luscus • Linnaeus, 1758*) (7)													
European flounder (*Platichthys flesus luscus • Linnaeus, 1758*) (16)													
European flounder (*Platichthys flesus luscus • Linnaeus, 1758*) (11)													
African armoured searobin (*Peristedion cataphractum • Linnaeus, 1758*) (16)													
African armoured searobin (*Peristedion cataphractum • Linnaeus, 1758*) (3)													
Atlantic stargazer (*Uranoscopus scaber • Linnaeus, 1758*) (3)													
Atlantic stargazer (*Uranoscopus scaber • Linnaeus, 1758*) (16)													
Atlantic stargazer (*Uranoscopus scaber • Linnaeus, 1758*) (10)													
John Dory (*Zeus faber • Linnaeus, 1758*) (16)													
John Dory (*Zeus faber • Linnaeus, 1758*) (10)													
John Dory (*Zeus faber • Linnaeus, 1758*) (9)													

(*continued*)

Table 1. Continued.

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Silver scabbardfish (*Lepidopus caudatus • Euphrasen, 1788*) (3)													
Silver scabbardfish (*Lepidopus caudatus • Euphrasen, 1788*) (9)													
Silver scabbardfish (*Lepidopus caudatus • Euphrasen, 1788*) (16)													
Swordfish (*Xiphias gladius • Linnaeus, 1758*) (8)													
Swordfish (*Xiphias gladius • Linnaeus, 1758*) (11)													
Swordfish (*Xiphias gladius • Linnaeus, 1758*) (3)													
Swordfish (*Xiphias gladius • Linnaeus, 1758*) (9)													
Thresher shark (*Alopias vulpinus • Bonnaterre, 1788*) (3)													
Thresher shark (*Alopias vulpinus • Bonnaterre, 1788*) (5)													
Common octopus (*Octopus vulgaris • Cuvier, 1797*) (8)													
Common octopus (*Octopus vulgaris • Cuvier, 1797*) (15)													
Common octopus (*Octopus vulgaris • Cuvier, 1797*) (11)													
Common octopus (*Octopus vulgaris • Cuvier, 1797*) (1)													
Common octopus (*Octopus vulgaris • Cuvier, 1797*) (7)													
Anglerfish (*Lophius piscatorius • Linnaeus, 1758*) (3)													
Anglerfish (*Lophius piscatorius • Linnaeus, 1758*) (7)													
Anglerfish (*Lophius piscatorius • Linnaeus, 1758*) (8)													
Anglerfish (*Lophius piscatorius • Linnaeus, 1758*) (16)													
Thornback ray (*Raja clavata • Linnaeus, 1758*) (8)													
Thornback ray (*Raja clavata • Linnaeus, 1758*) (11)													
Thornback ray (*Raja clavata • Linnaeus, 1758*) (3)													
Starry ray (*Raja asterias • Linnaeus, 1758*) (5)													
Greater amberjack (*Seriola dumerili • Risso, 1810*) (16)													
Greater amberjack (*Seriola dumerili • Risso, 1810*) (3)													
Brill (*Scophtalmus rhombus • Linnaeus, 1758*) (3)													
Brill (*Scophtalmus rhombus • Linnaeus, 1758*) (9)													
Brill (*Scophtalmus rhombus • Linnaeus, 1758*) (16)													
Brill (*Scophtalmus rhombus • Linnaeus, 1758*) (11)													
Transparent goby (*Aphia minuta • Risso, 1810*) (16)													
Transparent goby (*Aphia minuta • Risso, 1810*) (3)													
Transparent goby (*Aphia minuta • Risso, 1810*) (9)													
Saupe (*Boops salpa • Linnaeus, 1758*) (3)													
Saupe (*Boops salpa • Linnaeus, 1758*) (10)													
Common two-banded seabream (*Diplodus vulgaris • Geoffroy, 1817*) (16)													
Common two-banded seabream (*Diplodus vulgaris • Geoffroy, 1817*) (3)													
Common two-banded seabream (*Diplodus vulgaris • Geoffroy, 1817*) (9)													

(*continued*)

Table 1. Continued.

SPECIES	Season	Winter			Spring			Summer			Autumn		
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Bullet tuna (*Auxis rochei* • *Risso, 1810*) (16)													
Bullet tuna (*Auxis rochei* • *Risso, 1810*) (3)													
Little tunny (*Euthynnus alletteratus* • *Rafinesque, 1810*) (3)													
Little tunny (*Euthynnus alletteratus* • *Rafinesque, 1810*) (9)													
Little tunny (*Euthynnus alletteratus* • *Rafinesque, 1810*) (16)													
Tuna (*Thunnus thynnus* • *Linnaeus, 1758*) (8)													
Tuna (*Thunnus thynnus* • *Linnaeus, 1758*) (16)													
Tuna (*Thunnus thynnus* • *Linnaeus, 1758*) (11)													
Tuna (*Thunnus thynnus* • *Linnaeus, 1758*) (3)													
Broadtail shortfin squid (*Illex coindetii* • *Verani, 1839*) (15)													
European flying squid (*Todarodes sagittatus* • *Lamarck, 1798*) (11)													
Greater weever (*Trachinus draco* • *Linnaeus, 1758*) (16)													
Greater weever (*Trachinus draco* • *Linnaeus, 1758*) (3)													
Greater weever (*Trachinus draco* • *Linnaeus, 1758*) (9)													
Red mullet (*Mullus barbatus* • *Linnaeus, 1758*) (8)													
Red mullet (*Mullus barbatus* • *Linnaeus, 1758*) (16)													
Red mullet (*Mullus barbatus* • *Linnaeus, 1758*) (11)													
Red mullet (*Mullus barbatus* • *Linnaeus, 1758*) (3)													
Red mullet (*Mullus barbatus* • *Linnaeus, 1758*) (9)													
Striped red mullet (*Mullus surmuletus* • *Linnaeus, 1758*) (8)													
Striped red mullet (*Mullus surmuletus* • *Linnaeus, 1758*) (16)													
Striped red mullet (*Mullus surmuletus* • *Linnaeus, 1758*) (11)													
Striped red mullet (*Mullus surmuletus* • *Linnaeus, 1758*) (3)													
Striped red mullet (*Mullus surmuletus* • *Linnaeus, 1758*) (9)													
Blue shark (*Prionace glauca* • *Linnaeus, 1758*) (3)													
Blue shark (*Prionace glauca* • *Linnaeus, 1758*) (9)													
Scaldfish (*Arnoglossus laterna* • *Walbaum, 1792*) (16)													
Scaldfish (*Arnoglossus laterna* • *Walbaum, 1792*) (3)													
Scaldfish (*Arnoglossus laterna* • *Walbaum, 1792*) (9)													
Picarel (*Maena smaris* • *Linnaeus, 1758*) (16)													
Picarel (*Maena smaris* • *Linnaeus, 1758*) (3)													

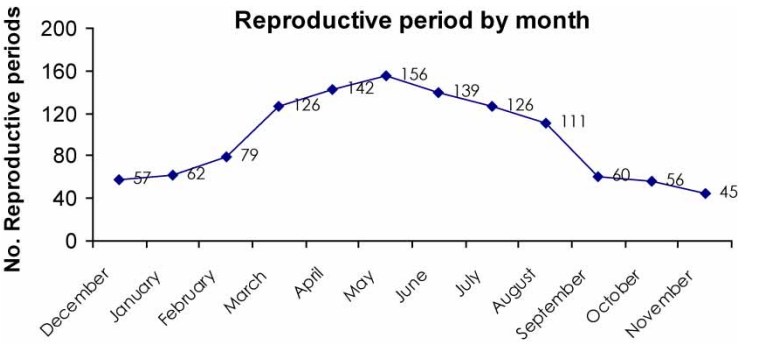

Figure 1. Reproductive period by month.

May demonstrated the highest breeding activity, as seen in Figure 1.

4. Discussion and conclusion

The data obtained deviates considerably from that currently considered as certain and taken to justify the choice to ban fishing in August. We therefore consider it necessary to change the criteria. Thanks to this knowledge of the breeding activity of the various species, the choice of the suspension period could aim to protect the spawning fish or the hatchlings: in the first case, the suspension would be implemented before and during the breeding period, and in the second case afterwards. Furthermore, the suspension could be generic, i.e. based on the period which protects the most species.

Alternatively, awareness of the breeding periods and fishing areas where a given species is more likely to be caught at any time or at a certain time of year would enable the suspension to be managed by dividing the sea into well-defined areas, reported on nautical charts. Fishing in these areas could be banned at different periods in rotation, in relation to the species present, in order to safeguard their reproduction. This would enable the fishing industry to fish throughout the year while protecting the breeding activities of spawners.

The choice of objectives is fundamental, as it is impossible to protect all species present in the Adriatic Sea with only one suspension period. Once the criteria are chosen, it will be necessary to monitor the consistency of fish stocks in order to check the efficacy of the strategies used.

This paper provides the basic information needed to support decisions relating to the fast, scientific choice of suspension periods in the Adriatic Sea by simple consultation of calendar data. The contribution of a recognised scientific body with direct experience in this area would be desirable and indeed essential in choosing strategies to safeguard marine fauna and subsequent verification of the results achieved in maintaining fish stocks, as envisaged by current legislation.

References

[1] F. Costa, *Atlante dei Pesci dei Mari Italiani*, Mursia, Milano, 1991.
[2] Ministero delle Politiche Agricole e Forestali. Decreto del 14 luglio 2005, *Interventi di protezione delle risorse acquatiche nell'ambito di politiche a sostegno della pesca responsabile, di cui al Piano triennale 2004–2006*, Gazz.Uff. No. 214 del 14 settembre, 2005.
[3] G. Bini, *Atlante dei Pesci delle Coste Italiane*, Mondo Sommerso editrice, Milano, 1968.
[4] European Commision. Council Regulation (EC) No 2792/1999 of 17 December 1999 laying down the detailed rules and arrangements regarding Community structural assistance in the fisheries sector, Official Journal L 337 , 30/12/1999 P. 0010 – 0028, 1999.

[5] L. Falciai and R. Minervini, *Guida dei Crostacei Decapodi d'Europa*, Muzzio Editore, 1991.
[6] A. Ghiotti and A. Mojetta, *Flora e Fauna del Mediterraneo*, Mondadori, Milano, 2005.
[7] R. Palombi and M. Santarelli, *Gli animali commestibili dei mari d'Italia*, Hoepli, Milano, 1986.
[8] E. Tortonese, *Osteichthyes (*Pesci ossei), in *Fauna d'Italia*, vol. XI–XII, Edizioni Calderoni, Bologna, 1975.
[9] G.D. Ardizzone, F. Corsi, and S. Agnesi, *Atlante delle Risorse Ittiche Demersali Italiane, Triennio 1994–1996*, Ministero Politiche Agricole, 1999.
[10] FAO, Food and Agriculture Organisation of the United Nations. http://www.fao.org
[11] ISMEA, Istituto di servizi per il mercato agricolo e alimentare. Pesca e acquicoltura. http://www.pesca.ismea.it
[12] R. Riedl, *Fauna e Flora del Mediterraneo. Dalle alghe ai mammiferi: una guida sistematica alle specie che vivono nel mar Mediterraneo*, Muzzio Editore, 1992.
[13] AdriaMed, Cooperazione Scientifica a Supporto della Pesca Responsabile nel Mare Adriatico. http://www.faoadriamed.org
[14] Federcoopesca, Federazione Nazionale Cooperative della Pesca. Specie ittiche marine commerciali del Mare Mediterraneo. http://www.federcoopesca.it/iniziativa/Progetti/specie_ittiche.htm
[15] R. Froese and D. Pauly. FishBase. http://www.fishbase.org/search.php 2006.
[16] Regione Abruzzo, Università degli Studi de l'Aquila & Istituto Zooprofilattico Sperimentale dell'Abruzzo e del Molise 'G. Caporale', *Analisi della pesca nella regione Abruzzo*. Progetto SICORA. Supporto Informativo per la gestione della zona Costiera della Region Abruzzo, 2005.