

# Hydrological data base for the Adriatic Sea

Antonio Artegiani\*

## Abstract

At IRPEM (Marine Fishery Research Institute) in Ancona (Italy) there is an historical data set (from the early 1900s to 1981) concerning the whole Adriatic Sea which is available to the scientific community. The database consists of records (*e.g.* temperature, oxygen and salinity) from about 9000 coastal and offshore hydrological stations, it is called ATOS (Adriatic Temperature Oxygen and Salinity) and is one of the products of the EU project MERMAIDS (Mediterranean Resolving Modelling And InterDisciplinary Studies). Since 1980 the data collection and measurement methodology has changed, a new database, starting from 1981 up to the present day, is in progress. The paper describes the characteristics of the hydrological data base.

## 1. Introduction

The size of small pelagic stocks of the Adriatic is known to show marked fluctuations. Total pelagic biomass ratio of maximum to minimum has been observed as of 4, the same abundance ratio for the anchovy stock is as much as 20. Similar fluctuations, although less dramatic, have also been reported for sardines and sprats. Spatial distribution is also believed to change with stock size as well as catchability. Environmental variables may strongly affect stock abundance, distribution and as a consequence availability to fishery. All the information on small pelagic stock biomass and distribution has been obtained through spatially constrained research covering only part of the Adriatic Sea. Validation of past information and the achievement of a complete insight into small pelagic stock abundance and distribution, including the connection with associated environmental variables, throughout the Adriatic Sea is of utmost importance especially in semi-enclosed area where shared stocks occur such as the Adriatic.

## 2. Characteristics of hydrological data base

In 1983 IRPEM started to organise the published historical hydrological data concerning the Adriatic Sea in a data base.

---

\* National Research Council (CNR), Marine Fishery Research Institute (IRPEM) - Largo Fiera della Pesca, 60125 Ancona, Italy; e-mail: artegiani@irpem.an.cnr.it

In 1994 the data base consisted of more than 9.000 hydrological stations, executed in the Adriatic Sea from 1911 to 1981, in the framework of different national and international projects.

In 1996 all the stations with less than 15 m bottom depth and all the stations located along the eastern coast inside the islands were extracted from the original dataset and their quality was checked. This new dataset was called ATOS (Adriatic Temperature Oxygen and Salinity) dataset consisting of a total of 5543 stations (Table 1, from Artegiani *et al.*, 1997<sub>a</sub>), 5518 of which include temperature, 5503 include salinity and only 2673 include dissolved oxygen.

Table 1. Details on the historical dataset: C represents the number of casts reported in each reference; C<sub>T</sub> the number of casts with temperature data; D<sub>T</sub> the number of temperature data; C<sub>S</sub>, D<sub>S</sub> the same for salinity and C<sub>O</sub>, D<sub>O</sub> the same for dissolved oxygen (from Artegiani *et al.*, 1997<sub>a</sub>).

Reference	C	C <sub>T</sub>	D <sub>T</sub>	C <sub>S</sub>	D <sub>S</sub>	C <sub>O</sub>	D <sub>O</sub>
Artegiani and Azzolini (1980)	107	107	640	107	644	40	284
Artegiani <i>et al.</i> (1981)	115	115	450	115	455	115	450
Brasseur <i>et al.</i> (1993)	850	832	4492	832	4212	338	1669
Brückner (1912, 1913, 1915)	350	350	2345	348	2340	92	174
Buljan and Zore-Armanda (1966, 1979)	1062	1061	8042	1051	7955	322	2668
Cescon and Scarazzato (1979)	523	523	1974	523	1971	392	1341
ENEA (1990)	583	583	2513	581	2499	-	-
Franco (1970, 1972, 1982)	335	335	1398	335	1415	320	1355
Hydrographic Inst. of Yugoslav Navy (1982)	154	154	1566	154	1566	133	1283
Inst. Za Oceanography i Ribarstvo, Split (1985)	29	29	175	29	171	16	29
Levitus (1982)	129	129	808	129	816	49	348
P. Malanotte-Rizzoli (1972, pers. Comm.)	73	73	431	73	427	73	425
Mosetti and Lavenia (1969)	300	300	1788	300	1787	-	-
R. Comitato Talassografico (1912,1913, 1914)	471	470	4050	470	4050	373	1587
Trotti (1969)	171	171	1239	171	1238	171	1173
Zore-Armanda <i>et al.</i> (1991)	291	286	2866	285	2809	239	2419
Total	5543	5518	34777	5503	34355	2673	15205

In the Figure 1 (from Artegiani *et al.*, 1997<sub>b</sub>) is shown the distribution of the stations for the four seasons.

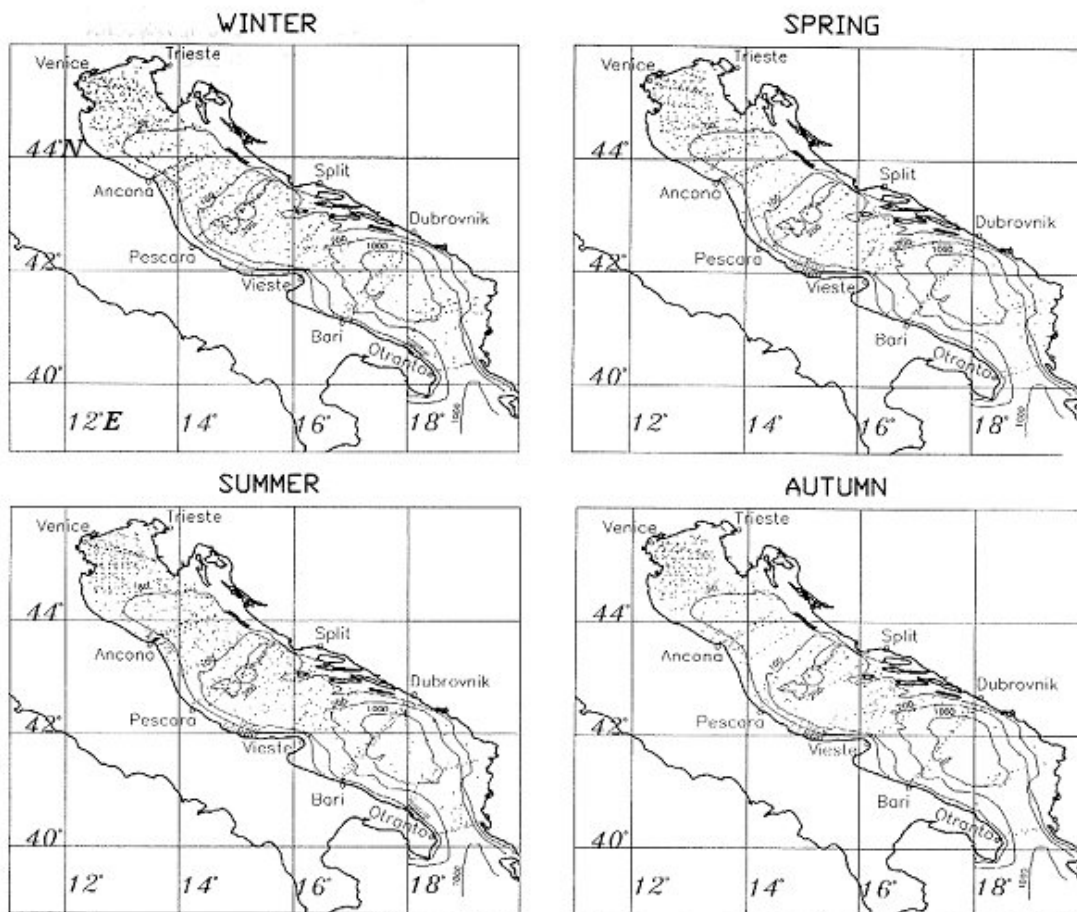


Figure 1. Seasonal spatial distribution of the casts.

Utilizing the ATOS dataset the climatologic and hydrological characteristics of the Adriatic Sea were described (Artegiani *et al.*, 1997<sub>a</sub>; Artegiani *et al.*, 1997<sub>b</sub>). The ATOS dataset is available to all the scientific community.

A task that must be done is to control (apply the quality control procedures to) all the coastal stations not included in ATOS. From a biological and fisheries point of view they are the most important.

Since 1997 a new dataset has been available, called ABCD (Adriatic Bio-geo-Chemical Dataset) (Zavatarelli *et al.*, 1998), consisting of published and available unpublished data relative to biogeochemical parameters of the Adriatic Sea.

A new dataset, considering only the North Adriatic Sea, called NADS, is in progress. The data are collected by IBM-CNR (Institute of Marine Biology-CNR Venice) and the analyses are carried out in collaboration with IRPEM of Ancona (Bastianini *et al.*, 2000).

All the Northern Adriatic stations of ATOS are incorporated in NADS as well as all the recent hydrological stations (published and unpublished) executed in the framework of the up-to-date national and international projects.

In Figure 2 the geographical distribution of the NADS hydrological stations is shown.

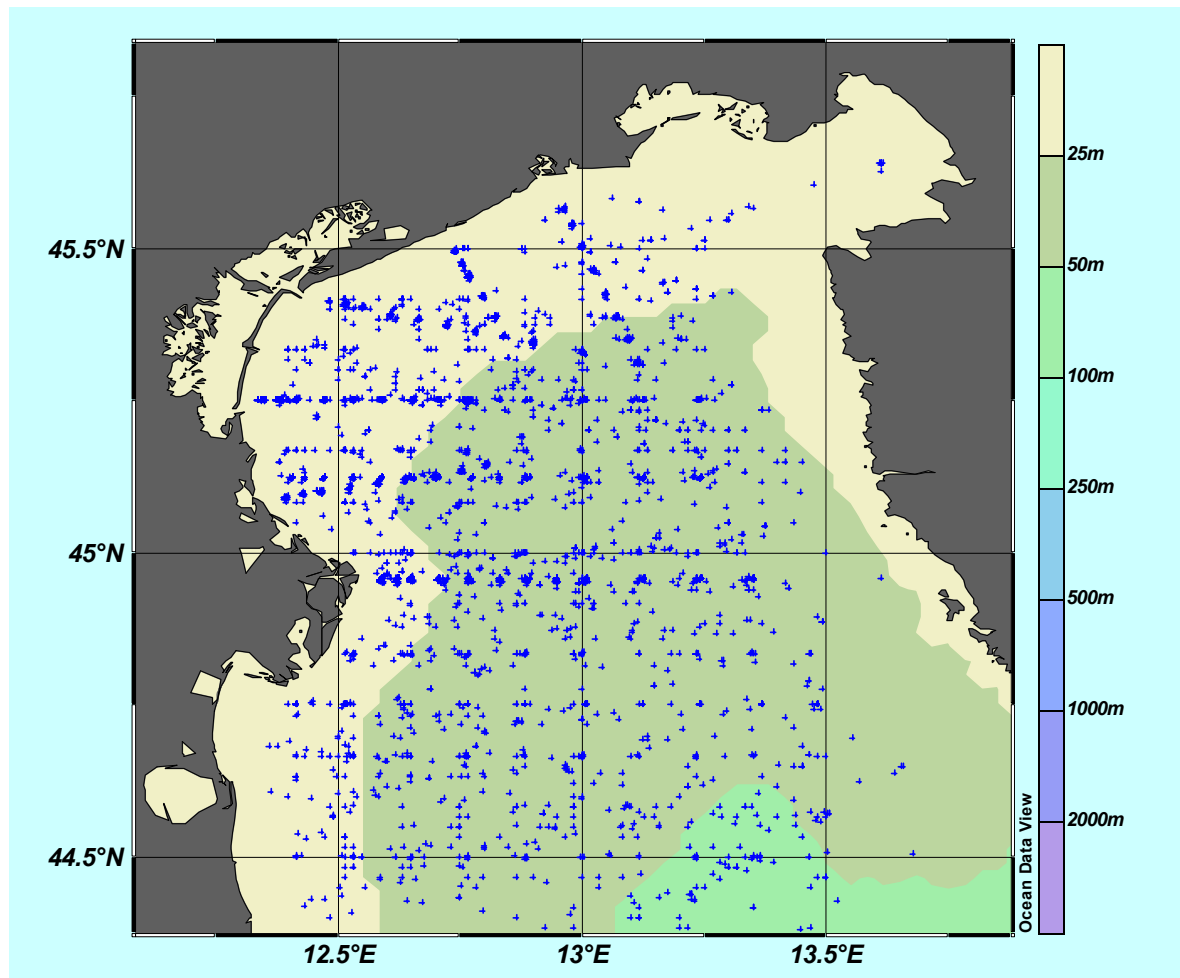


Figure 2. Hydrological stations, spatial distribution of the NADS (North Adriatic Data Set).

### 3. References

- Artegianni, A., and Azzolini, R. (1980) Rapporto sulle campagne idrologiche effettuate nelle acque costiere marchigiane negli anni 1977-78. *Quad. Lab. Tecnol. Pesca*, II: 307-392.
- Artegianni, A., Bregant, D., Paschini, E., Pinardi, N., Raicich, F., and Russo, A., (1997<sub>a</sub>) The Adriatic Sea general circulation. Part I. Air-sea interaction and water mass structure. *J. Phys. Oceanogr.*, 27: 1492-1514.
- Artegianni, A., Bregant, D., Paschini, E., Pinardi, N., Raicich, F., and Russo, A., (1997<sub>b</sub>) The Adriatic Sea general circulation. Part II. Baroclinic circulation structure. *J. Phys. Oceanogr.*, 27: 1515-1532.
- Artegianni, A., Azzolini, R., and Paschini, E., (1981) Unpublished data collected from 1979 through 1981 in the Adriatic Sea. \*

\* Available from CNR-Istituto di Ricerche sulla Pesca Marittima, Largo Fiera della Pesca, 60125 Ancona, Italy.

- Bastianini M., Rabitti, S., and Russo, A. (2000) First analysis of a new hydrological data set for the Northern Adriatic Sea. EGS, XXV General Assembly, Nice, 25-29 April 2000.
- Brasseur, E., Brankart, J-M., and Beckers, J.-M. (1993) Seasonal variability of general circulation fields in the Mediterranean Sea: Inventory of climatological fields (preliminary version). 221 pp.
- Bruckner, E. (1912) Beobachtungenauf den Terminfahrten S.M.S. Najade im Jahre 1911. Permanent International Kommission fur die Erforschung der Adria, Wien, 119 pp.\*\*
- Bruckner, E. (1913) Beobachtungenauf den Terminfahrten S.M.S. Najade im Jahre 1911. Permanent International Kommission fur die Erforschung der Adria, Wien, 114 pp.\*\*
- Bruckner, E. (1915) Beobachtungenauf den Terminfahrten S.M.S. Najade im Jahre 1911. Permanent International Kommission fur die Erforschung der Adria, Wien, 102 pp.\*\*
- Buljan, M., and Zore-Armanda, M., (1966) Hydrographic data on the Adriatic Sea collected in the period from 1952 through 1964. *Acta Adriat.*, XII: 1-438.
- Buljan, M., and Zore-Armanda, M., (1966) Hydrographic data on the Adriatic Sea collected in the period from 1965 through 1970. *Acta Adriat.*, XX: 1-368.
- Cescon, B., and Scarazzato, P. (1979) Unpublished original data of Adria cruises 1971-1973, 33 pp.
- ENEA. (1990) Atlante Climatologico del Mare Adriatico. 28 pp.
- Franco, P. (1970) Oceanography of Northern Adriatic Sea. 1 Hydrologic features: Cruises July-August and October-November 1965. *Arch. Oceanol. Limnol.*, XVI (suppl. 1): 1-93.
- Franco, P. (1972) Oceanography of Northern Adriatic Sea. 2 Hydrologic features: Cruises January-February and April-May 1966. *Arch. Oceanol. Limnol.*, XVII (suppl.): 1-97.
- Franco, P. (1982) Oceanography of Northern Adriatic Sea. Data from the cruises of the years 1978 and 1979. *Arch. Oceanol. Limnol.*, XX (suppl. 2): 33-207.
- Hydrographic Institute of the Yugoslav Navy. (1982) Report and results of oceanographic investigation in the Adriatic Sea (1974-1976). 239 pp.
- Institute za Oceanografiju i Ribarstvo - Split. (1985) Oceanographic data of the cruises made by ships Vila Velebita in 1913 and Hvar in 1948.
- Levitus, S. (1982) Climatological Atlas of the World Ocean. NOAA Prof. Paper 13, U.S. Govt. Printing Office, 173 pp. and 17 microfiches.
- Mosetti, F., and La venia, A. (1969) Appendice alla nota: Ricerche Oceanografiche nel Mare Adriatico nel periodo 1966-68. Osservatorio Geofisico Sperimentale, Contrib. 189 bis.
- R. Comitato Talassografico. (1912) Osservazioni fatte durante le 3 crociere della R.N. Ciclope (I - III), Commissione Internazionale Permanente per lo studio dell'Adriatico, 54 pp.

---

\*\* Available from CNR-Istituto Talassografico di Trieste, viale Romolo Gessi 2, 34123 Trieste, Italy.

- R. Comitato Talassografico. (1913) Osservazioni fatte durante le crociere della R.N. Ciclope (I V- V), Commissione Internazionale Permanente per lo studio dell'Adriatico, 41 pp.
- R. Comitato Talassografico. (1914) Osservazioni fatte durante le 5 crociere della R.N. Ciclope (VI- X), Commissione Internazionale Permanente per lo studio dell'Adriatico, 93 pp.
- Trotti, L. (1969) Crociere Mare Adriatico 1965-1966. Consiglio Nazionale delle Ricerche, Raccolta dati oceanografici, serie A, No 29: 82 pp.
- Zavatarelli, M., Raicich, F., Bregant, D., Russo, A., and Artegiani, A. (1998) Climatological biogeochemical characteristics of the Adriatic Sea. *Journal of Marine Systems*: 18, 227-263.
- Zore-Armanda, M., Bone, M., Dadic, V., Morovic, M., Ratkovic, D., Stojanoski, L., and I. Vukadin. (1991) Hydrographic properties of the Adriatic Sea in the period from 1971 through 1983, *Acta Adriat.*, 32: 1-544.