



Zooplankton diel vertical migration database

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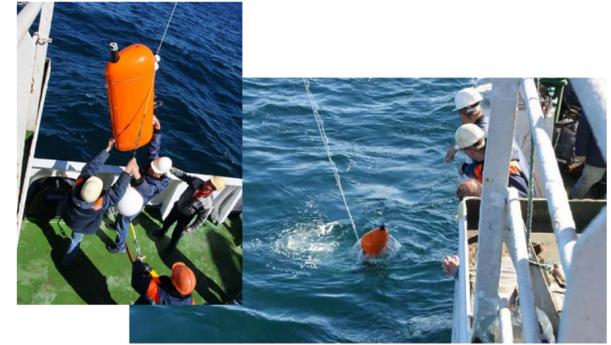
The moored profiler Aqualog as a multi-sensor platform for the water column sampling



The Aqualog profiler is an elevator that carries a payload of various sensors like the acoustic Doppler current meter or a CTD with the fluorometer.

The profiling mooring is advantageous as compared with a conventional mooring where the instruments are placed at fixed depths because it requires a single set of sensors.

The moored profiler Aqualog provides a researcher with homogeneous and regular time series of the vertical profiles of ocean quantities at fixed geographical location.

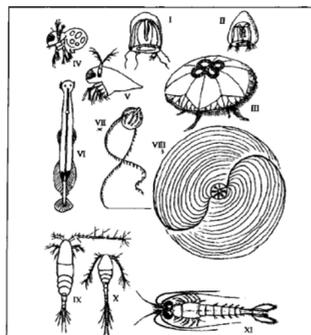


Hydroacoustic methods



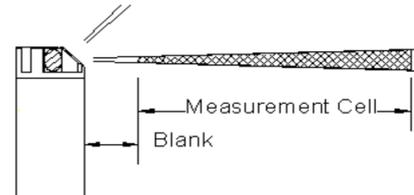
Different acoustic frequencies have different particle size sensitivities. Sensitivity is defined as the volume scattering strength for a given concentration. The peak sensitivity occurs at a values of $k \cdot a = 1$, when the circumference of the particle is equal to the acoustic wavelength, where "k" is the acoustic wave number ($2 \cdot \pi / \lambda$ or $2 \cdot \pi \cdot f / c$) and "a" is the particle radius. In general, the Aquadopp can detect, with reasonably good sensitivity, particles sizes where $k \cdot a > 0.05$ as long as there is no significant concentration of particles with $k \cdot a \approx 1$.

Zooplankton scatterers:
- swim-bladdered fish,
- Pteropods,
- Copepods.



Frequency (MHz)	Particle diameter for $k \cdot a = 1$
10	50 μm
3.0	160 μm
1.5	320 μm
0.50	960 μm

Nortek Aquadopp 2MHz

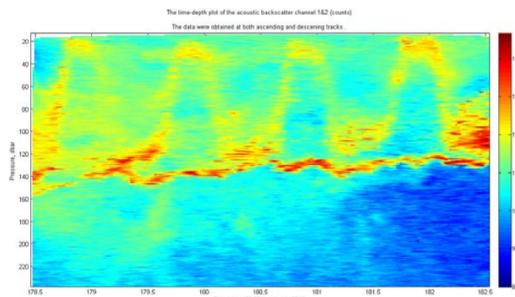


Aqualog profiler was equipped by high frequency 2MHz ADCP. It provided a higher spatial resolution for the measurements of the migrators velocity and volume backscattering strength than in the previous hydroacoustic studies.

Hydroacoustic methods, enabling sufficiently cheap, neither time consuming nor labor-intensive data collection and permitting the synoptic coverage of a large area, could provide information valuable for biologists and chemists. It could include: a zooplankton migration magnitude (upper and lower boundaries of the depth range covered during the migration), migrator velocities, zooplankton biomass and spatial distribution.

Data examples retrieved from ZMD

Backscatter, Black Sea

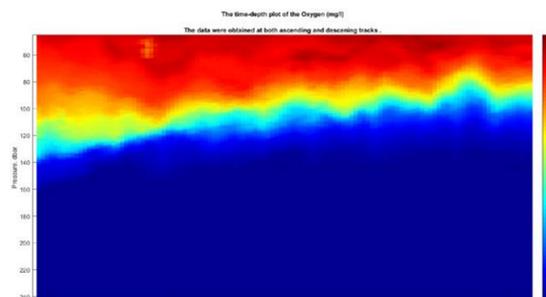


Sunset: 18:16 [GMT +0,0 h]
Start migration: 13:30 - 14:30
Finish migration: 17:00 - 18:00
Duration: ok, 3,5 h

Sunrise: 2:45 [GMT +0,0 h]
Start migration: 00:00 - 01:00
Finish migration: 02:30 - 03:30
Duration: ok, 2,5 h



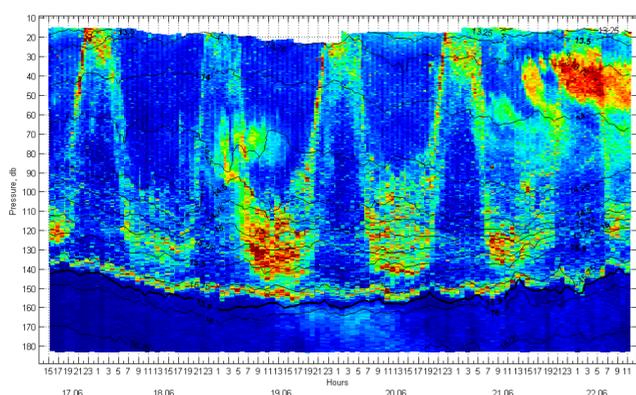
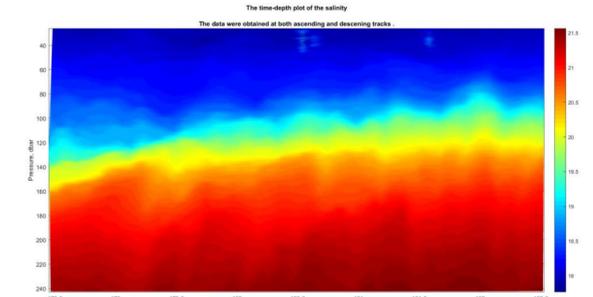
Oxygen, Black Sea



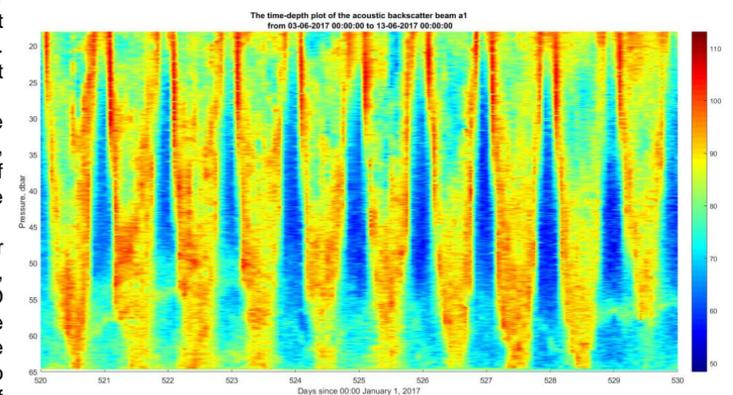
The synchronous measurements of temperature, salinity, pressure, dissolved oxygen, Chlorophyll, turbidity were made using a Seabird SBE 52MP or Idronaut 319 CTD sensors interacting with a Seabird SBE 43F or AANDEREA Optode oxygen sensor, Seapoint Chlorophyll Fluorometer and Turbidity sensor. Simultaneously, the vertical profiles of horizontal current velocity components were measured.

To identify the influence of various parameters on the zooplankton vertical migration, especially temperature, salinity and oxygen concentration, the calibration data of these sensors are stored in the database. The data were passed quality control according various criteria. ZMD also stores data from ship observations near profiler deployment points. Temperature, salinity, oxygen, chlorophyll, turbidity profiles were measured by CTD Rosette System from the ship. Water samples were taken using bathometers from different depths in the water column for chemical analyses. The database also stores data of concentration and species composition of zooplankton was obtained using biological nets.

Salinity, Black Sea

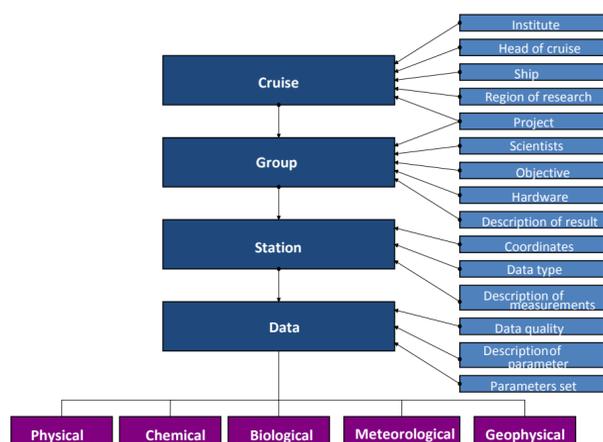


Backscatter, Black Sea



Backscatter, Baltic Sea

Data storing and publishing



ZMD allows requesting data using observation period, geographical point of observation and sensors set. Output format can be in CVS, ODV, XML, NetCDF. Sensors data are synchronized in time, depth. ZMD was developed on three-tier architecture. It has the following three tiers: presentation tier, application tier, data tier.

ZMD was developed using Oracle Database Server and Tomcat application server; Matlab is used for data processing CDI indexes and records for Download manager coupling table are automatically processed for data publish in EMODnet and SeaDataCloud system.