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Ocean Sneaker's Tool: An open code software tool for fast processing, exploring and visualising marine and aquatic data

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Aquatic data often require various processing steps from collection to analysis. This might include the adding of metadata to measured values for mapping software, the conversion of stacked net data to area related or other complex transformations. Although these steps can be accomplished quickly for single parameters it is a time consuming process with increasing numbers.

As a spin-off from GLOBEC-Germany the software package 'Ocean Sneaker's Tool' (OST) was developed (Fig. 1). Its focus is to aid biological researchers with their daily work and to facilitate the initial exploration of datasets. OST includes a basic spreadsheet analysis, provides a universal import filter for ASCII plaintext formats and supports several specific file types generated by different oceanographic gears. Three major modules cover a wide range of processing, converting, exploring and visualising of selected data subsets.

The data mining module can create reports for statistics, calculate percentile proportions, perform various transformations and conversions and provide iterative data scaling. Statistical analyses include basic descriptive statistics (e.g. *mean*, *median*, *sum*, *range*, *variance*, *SD*, *SE* and *VC*). For similarity and dissimilarity based investigations (Clarke and Warwick, 1994) matrices according to *Bray-Curtis*, *Canberra*, *Manhattan*- or *Euclidean distance* can be computed. The Sammon mapping option provides an easy multidimensional scaling technique (Sammon, 1969) that reveals inherent structures in order to explore data sets, like finding possible clusters, correlations or underlying distributions and can be run with raw data. Prior to analyses, data can be automatically *log*, *ln*, *sqrt* or *arcsin* transformed. Functions are available for the conversion of $n \times m^{-3}$ from stacked nets to $n \times m^{-2}$, which can be used to calculate the weighted mean depth (Bollens and Frost, 1989) for several species simultaneously.

The geo-coded export module includes metadata like cruise, station, date, time longitude, latitude and bottom depth to measured values. The output format can be imported directly to Ocean Data View (http://www.awi-bremerhaven.de/GEO/ODV) or other mapping programs for further investigation. Latitude and longitude can be given in various formats and are automatically converted to decimal degree notation as required for computer assisted work.

The visualising module allows data sets to be displayed in various graphical formats, e.g. as line, bar, area, polar, scatter, stacked and surface plots (examples in Fig. 1). All properties can be customised to modify the appearance in 2D or 3D mode. Additional algorithms can create interpolated isolines, allow labelling of charts and adjust to the desired perspective. Charts can be saved in different formats (e.g. emf, eps, gif, jpg, pdf, wmf and several others) and displayed data can be exported as MS Excel, HTML or native ASCII format.

At present OST is in the beta phase of version 2.0 after pervasive modifications during the last year. The project now consists of more than 23,000 lines of source code distributed over 25 units and is written in easy understandable object Pascal (Borland Delphi; http://www.borland.com/de/products/delphi). The source code can be downloaded from the website (http://www.awi-bremerhaven.de/Software/OST) and allows users to inspect algorithms, modify functions as desired and developers to implement new features.

Since the reorganisation of the website in October 2005 (www.awi-bremerhaven.de/Software/OST) the tool has drawn international attention beyond Germany (Fig. 2). It is now referenced by other institutes and projects like CENSOR, IOC Ocean-Teacher and Pangaea. OST runs under Windows 95/98/2k/XP and no problems have been reported so far when used with emulators under Linux and Mac environments. The use of efficient code and the waiving of specific code linked to an operating system results in a stand-alone software of just 2.5 MB. As neither additional libraries nor an installation is required OST can even be run directly out of a zip-archive from an USB stick on machines with different regional preferences.

References

Bollens S.M. and B.W. Frost. 1989. Predator induced diel vertical migration in a planktonic copepod. Journal of Plankton Research 11(5): 1047-1065.

Sammon J.W. 1969. A Nonlinear Mapping Algorithm for Data Structure Analysis, IEEE Transactions on Computers C18: 401-409.

Clarke K.R. and R.M. Warwick. 1994. Change in marine communities: an approach to statistical analysis and interpretation; Plymouth: Plymouth Marine Laboratory, 144pp.

Figure 1. Screen shot of the current Ocean Sneaker's Tool version. The application navigator (lower left) makes it simple to access the different chart (right) and data-windows (upper left). Windows are resizable and can be arbitrarily positioned.
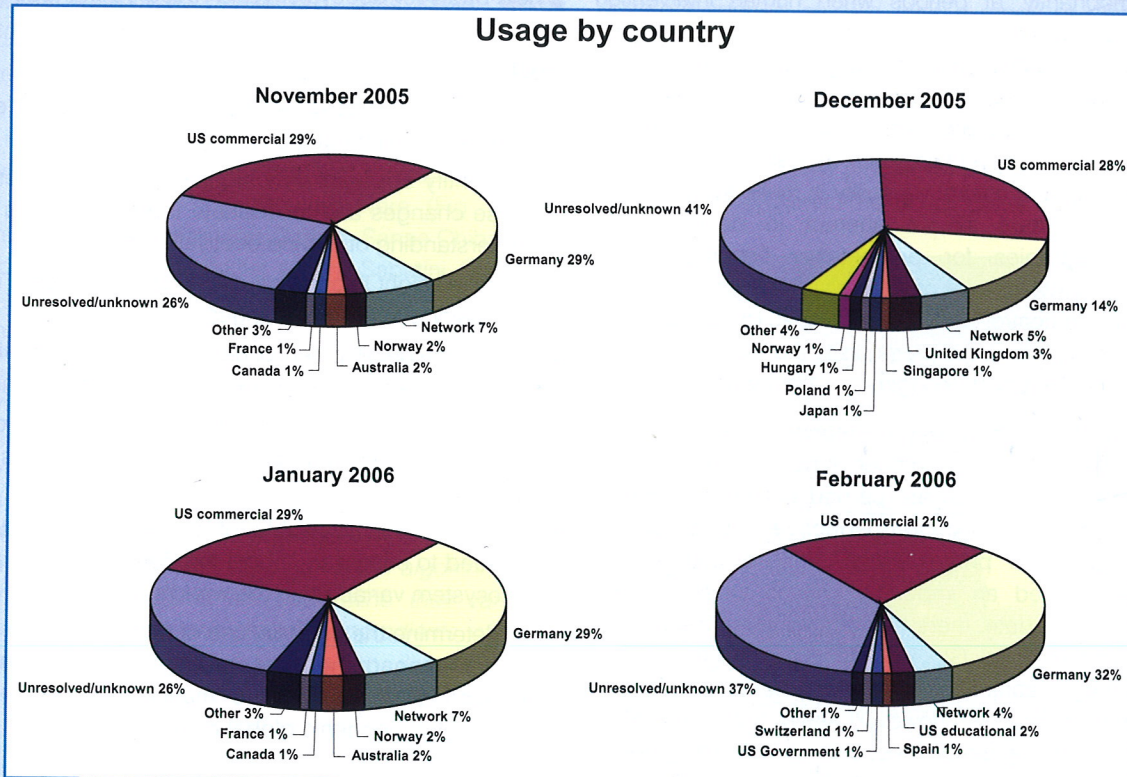

Figure 2. Website usage by country between December 2005 and February 2006 generated from the web logs.