BIOMASS Database

The history of the BIOMASS programme

The Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS) programme was a co-ordinated international science programme undertaken to study Antarctic marine living resources between 1981 and 1985. The programme was organised by the Scientific Committee on Antarctic Research (SCAR) and brought together ten countries involved in Antarctic Research. This programme focussed primarily on Antarctic Krill but also made records of bird observations, fish (including Ichthyoplankton) and various oceanographic data including chlorophyll-a measurements.

The BIOMASS Data Centre

The BIOMASS Data Centre was originally established at the British Antarctic Survey, Cambridge, in 1985. This data centre received copies from the original BIOMASS data analysis system based at the University of Frankfurt, Germany, in addition to fist hand data from scientists involved with the BIOMASS programme. The BIOMASS Data Centre was responsible for the organisation, standardisation and cleaning up of all data related to the BIOMASS programme prior to data analysis workshops. Validation and correction of these data was carried out during workshops by the investigators who took part in the BIOMASS programme.

More details on the history of the BIOMASS Data Centre and what was learnt as part of the process can be found in Thorley and Trathan (1993)

Caveats of the BIOMASS data set

The data contained in the BIOMASS database must be used with caution. In order to use the BIOMASS database it is important to know its problems and also the scientific objectives when data were originally collected. The problems that are documented here were recognised during the lifetime of the original Biomass Data Centre as well as during the data rescue phase for ESODAP. Despite extensive error checking do not assume that this document details all errors. It is the responsibility of the user to recognise the problems and limitations associated with the dataset. If any problems are encountered please email Nathan Cunningham njcu@bas.ac.uk .

Liability

Use by the recipient of the BIOMASS data set provided by the British Antarctic Survey is at the recipients own risk. Although every effort is made to ensure the accuracy of the data, BAS does not warrant the accuracy of any data supplied and has no responsibility for determining the fitness of the data for their intended use by the recipient. The provision of such data carries no liability for its accuracy or reliability and neither BAS nor its employees can be held accountable for any loss, damage, injury or any other occurrence arising from the use of these data.

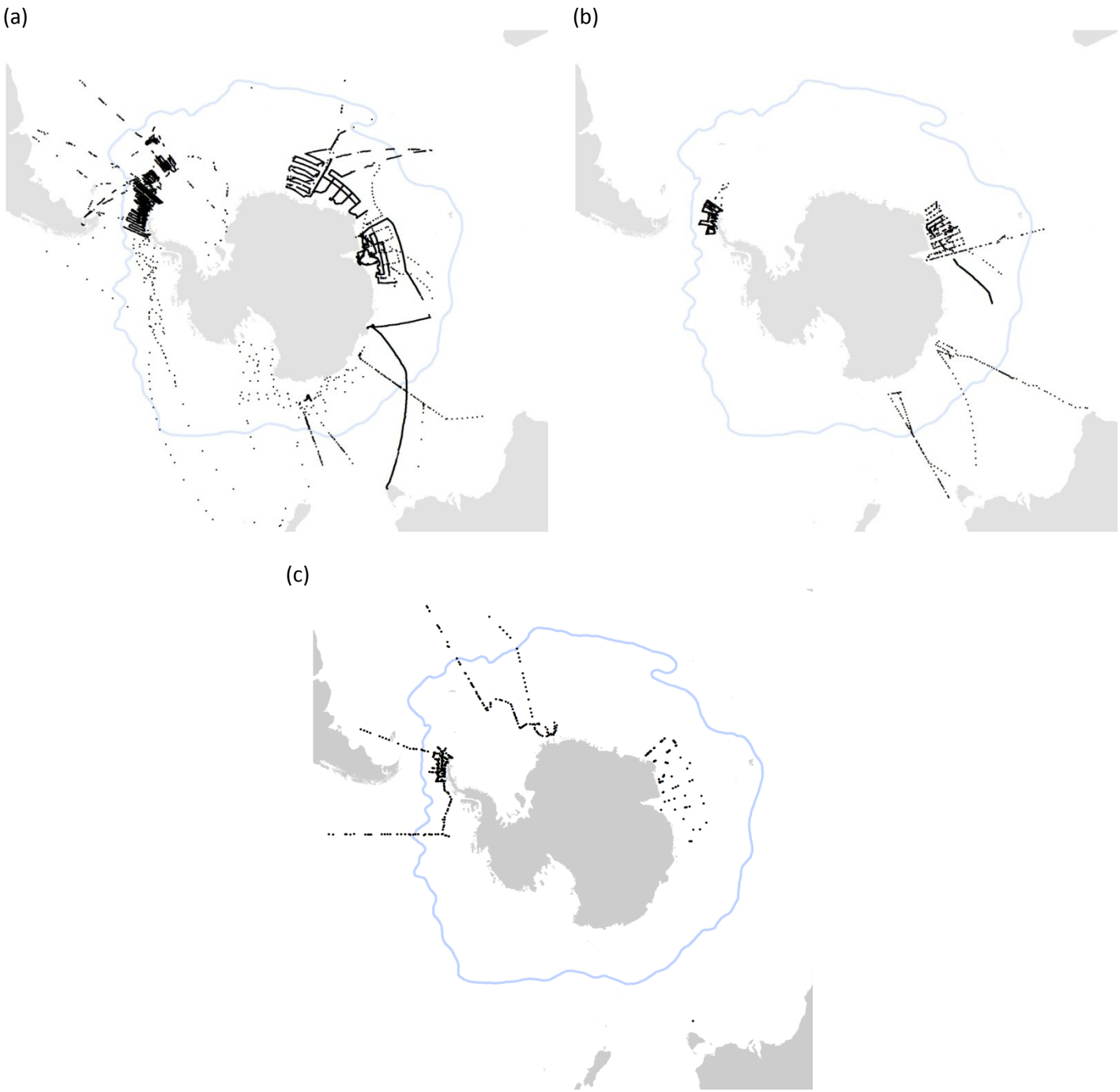


Figure 1: The geographic location of observations made during the (a) FIBEX (1980-81) (b) SIBEX 1 (1983-84) and (c) SIBEX 2 (1984-85) elements of the BIOMASS programme. Each point represents the location of an observation, the light blue line represents the average position of the polar front.

Organisation of the BIOMASS data set

The BIOMASS data set was previously part of a database produced by the BIOMASS Data Centre at BAS. However, up until recently this database was not available to users as it was stored as individual data tables. As part of the Southern Oceans data rescue project these data tables were collated along with appropriate metadata and integrated in a similar way to the original BIOMASS database.

Main BIOMASS data areas.

The BIOMASS data set is divided into a number of distinct subject areas as follows:

- Cruise details – Stations and ship tracks
- Oceanographic data – CTD and chlorophyll data
- Net haul data – Krill length-frequency and ichthyoplankton data
- Acoustic survey data
- Bird observation data

Each subject area is composed of a number of data tables. The relationships between the main subjects covered by the BIOMASS database are indicated in Figure 1.

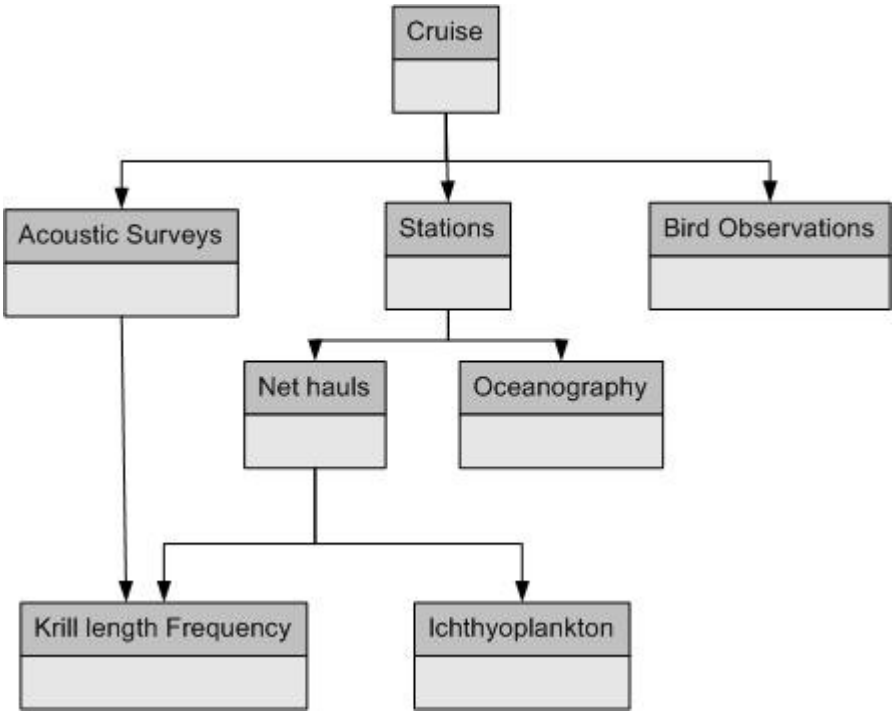


Figure 2: Relationships between the main BIOMASS subject areas.

Cruise details

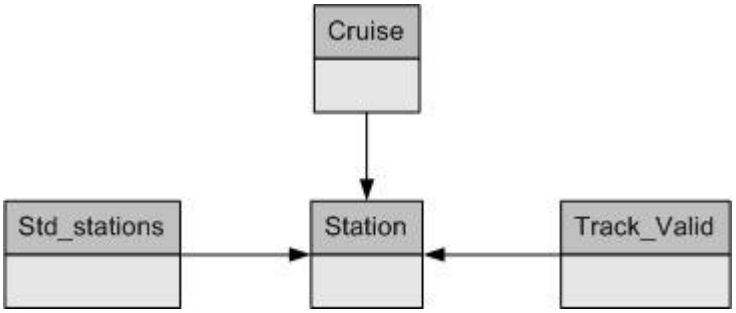


Figure 3: Relationships between main tables associated with cruise details

Data standardisation

All dates and times in the data set are in Greenwich mean time, and there is an indicator to show if this was a local day or night time. For every cruise, latitude and longitude positions are given for all dates and times in the data set. For those date and time values where no latitude and longitude were supplied, the original BIOMASS Data centre interpolated values.

The Scientific Advisory Group for SIBEX stated that monitoring of the physio-chemical environment could only be carried out on grids of fixed stations. This lead to the definition of a series of standard stations and transects for the Bransfield Strait and southern Drake Passage. It was also decided that there should be a series of standard oceanographic stations and survey transects for the Prydz Bay region. However, it is not clear if the latter were ever implemented. Therefore, in order to be able to analyse spatially related observations in the Prydz Bay region, the BIOMASS Data Centre grouped clusters of stations by assigning them retrospectively to standard stations. This was carried out in preparation for the SIBEX physical oceanographic workshop. Much less use has been made of the standard stations for the Prydz Bay as opposed to those for the Bransfield Strait. There are 53 standard stations defined for the Bransfield Strait and southern Drake Passage and 127 for the Prydz Bay region.

Known data limitations

There is no information available on how latitude and longitude positions supplied to the BIOMASS Data centre were determined. Care should be taken when plotting cruise tracks, as for some cruises there can be a time interval of several days between some consecutive latitude and longitude positions.

Cruise

The CRUISE table contains details about each BIOMASS cruise within the dataset.

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project identifier
CRUISETITLE	Char(16)	Standard BIOMASS cruise title
CRUISENAME	Char(24)	Cruise Name
VESSNAME	Char(24)	Vessel Name
COUNTRY	Char(3)	Country of cruise operator
EXPT	Char(2)	BIOMASS experiment code
PURPOSE	Char(20)	Purpose of cruise
FROMPORT	Char(15)	Starting port of cruise
TOPORT	Char(15)	Finishing port of cruise
CRUISESTART	Date	Start date/time of cruise
CRUISEEND	Date	End date/time of cruise
REGION	Char(4)	Study region
SPECIES	Char(6)	Cruise target species
RLATN	Num(9,4)	Northerly latitude limit of cruise area
RLATS	Num(9,4)	Southerly latitude limit of cruise area
RLONE	Num(9,4)	Easterly longitude limit of cruise area
RLONW	Num(9,4)	Westerly longitude limit of cruise area

Track_Valid

The TRACK_VALID table contains the geographic location for each date and time value for each cruise in the data set. The OBSTYPE column distinguishes between data supplied to the BIOMASS Data centre and data interpolated at the Data Centre.

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
DATETIME	Date	Start date/time of observation (GMT)
RLAT	Num(9,4)	Decimal latitude
RLON	Num(9,4)	Decimal longitude
OBSTYPE	Char(1)	Observation type code
DAYNIGHT	Char(1)	Indicates local day (D) or night (N) time

Station

The STATION table contains details of national stations.

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
STATION	Char(10)	National station identifier
STATTYP	Char(4)	Type of station
BDCSTATN	Char(10)	BIOMASS standard station identifier
STATIONSTART	Date	Start date/time at station
STATIONEND	Date	End date/time at station

Std_Stations

The STD_STATIONS table contains details about the SIBEX standard stations. For the Bransfield Strait region it also contains details of BIOMASS standard transects.

Column	Data type	Remarks
BDCSTATN	Char(10)	BIOMASS standard station identifier
RLAT	Num(9,4)	Decimal latitude
RLON	Num(9,4)	Decimal latitude
REGION	Char(4)	Region code
STD_TRANSECT	Char(5)	BIOMASS standard transect identifier

Country_Code

The COUNTRY_CODE table contains the description of the country codes used within the data set. Country codes are used within the CRUISE table to associate ships to countries.

Column	Data type	Remarks
COUNTRY	Char(3)	Country code
TEXT	Char(40)	Full description

Expt_code

The EXPT_CODE table contains the description of the BIOMASS experiment codes used within the data set.

Column	Data type	Remarks
EXPT	Char(2)	BIOMASS experiment code
EXPTSTART	Date	Start date/time of experiment
EXPTEND	Date	End date/time of experiment
TEXT	Char(40)	Full description

Obstype_Code

The OBSTYPE_CODE table contains the description of the observation type codes used in the TRACK_VALID table. This is to distinguish positional data interpolated by the BIOMASS data Centre from that supplied by investigators.

Column	Data type	Remarks
OBSTYPE	Char(1)	Observation type code
TEXT	Char(40)	Full description

Region_Code

The REGION_CODE table contains the descriptions of the study region code used within the data set and the approximate limits of these regions.

Column	Data type	Remarks
REGION	Char(4)	Region code
RLATN	Num(9,4)	Northerly latitude limit of study area
RLATS	Num(9,4)	Southerly latitude limit of study area
RLONE	Num(9,4)	Easterly longitude limit of study area
RLONW	Num(9,4)	Westerly longitude limit of study area
TEXT	Char(40)	Full description

Species_Code

The SPECIES_CODE table contains the description of the species codes used within the data set.

Column	Data type	Remarks
SPECIES	Char(6)	Species code
TEXT	Char(40)	Full description

Stationtype_Code

The STATIONTYPE_CCODE table contains the description of the station type codes, oceanographic, biological or both, used within the data set.

Column	Data type	Remarks
STATTYP	Char(4)	Station type code
TEXT	Char(40)	Full description

Oceanography

Data standardisation

BIOMASS (1987) indicates that erroneous SIBEX oceanographic data values were replaced by interpolated values. Priddle et al. (1993) made corrections to chlorophyll and nutrient data values which were of the wrong order-of-magnitude. Some corrections to temperature and salinity values, again of the wrong order-of-magnitude, were also made by the BIOMASS Data Centre. The DEPTHTYPE code value in the OCEANOGRAPHY table indicated corrected records.

Known data limitations

A significant problem with the data set is a lack of documented information about how the data were collected. There are various methods which could have been used for measuring the oceanographic parameters, but the information on which method was used for each cruise is not contained within the data set. However, Priddle et al. (1993)give information about methods used for determination of chlorophyll concentrations.

Another major problem arises when attempting to distinguish between observed and interpolated data. Oceanographic data were provided to the BIOMASS Data Centre in two forms. Data recorded at observed depths and data were interpolated to the NODC standard depths. In addition, some data were interpolated to standard depths by the BIOMASS data centre. The DEPTHTYPE code value of a record was intended to indicate the category to which it belongs. However, for some cruises, where data are recorded at observed depths, the depth values are suspiciously regular and would suggest data interpolated to standard depth or water-bottle data with no independent depth sensor.

The data for the FIBES cruises are recorded as being either at observed depths (DEPTHTYPE = “O”) or interpolated to standard depths (DEPTHTYPE = “S”). For the SIBEX cruises data were also interpolated at the BIOMASS Data Centre (DEPTHTYPE = “I”) or were modified in some other way (DEPTHTYPE = “V”). For cruise UMS1, DEPTHTYPE is used to indicate the equipment used (XBT or CTD) rather than the status of the observation.

The report of the SIBEX Physical Occeanography Workshop (BIOMASS, 1987) reports that not all vessels were equipped with electronic conductivity-temperature-depth profiling equipment. Therefore, some temperature data were obtained by reversing thermometer and some salinity data by laboratory analysis of water bottle samples from standard depths. Consequently, all the SIBEX oceanography data used were assumed to have and accuracy of ±0.05˚C and ±0.05 NSU.

A total of 26 cruises have temperature and salinity data, but only 18 of these have nutrient data. In addition, some nutrient values are recorded as zero. This is especially true for nitrate, where 6 of the 13 cruises with nitrate data have zero values, and chlorophyll-*a*, with 6 out of 14 cruises having zero values. It is assumed that a zero value indicates that the nutrient level was below the limit of detection, because for cruises with zero values, there are also null values, indicating that no data were recorded.

Table 1 of Priddle et al. (1993) gives details of the methodologies used for the determination of chlorophyll concentration for 7 of the 14 cruises which collected chlorophyll data. Chlorophyll concentration was determined by *in-vitro* fluorometry for cruises ITFX, AS1, BES1, BES2 and JBS2, and spectrophotometrically for cruises SIFX and SIS1. Further details are not available within the data set, but may be obtained from some of the publications cited by Priddle et al (1993).

Cruises ACS1, ACS2, BES1 and BES2 use the TEMPTYPE flag. This is defined in BIOMASS (1981a) as a code to describe the depth measurement. It indicates if the depth was measured thermometrically, from the depth of unprotected thermometers, or if the depth value is considered by the originator to be inaccurate. It is not known if this information was ever used.

BIOMASS (1987) indicates that data for the Australian SIBEX 1 cruises (NDS1) were analysed but gives no results for this cruise. These data are not present in the BIOMASS data set and it is uncertain if they were loaded. The Chinese SIBEX 2 (CHS2) temperature and salinity data were only loaded in 1993 and were not validated or analysed during the SIBEX workshop.

Sometime between the end of the SIBEX oceanography workshop in March 1987 and March 1990 the German SIBEX 1 (PSS1) temperature data on the BIOMASS database became corrupted. These data have now been reloaded from archive files which pre-date the workshop and therefore would not contain any corrections made during the workshop. However, Dr M. Stein, (Institut für Seefischerei, Hamburg Germany) who was co-convener of the SIBEX oceanography workshop, can remember no corrections being made to the PSS1 data during the workshop. Therefore, the BIOMASS Data Centre is confident about the validity of the PSS1 temperature data.

Data organisation

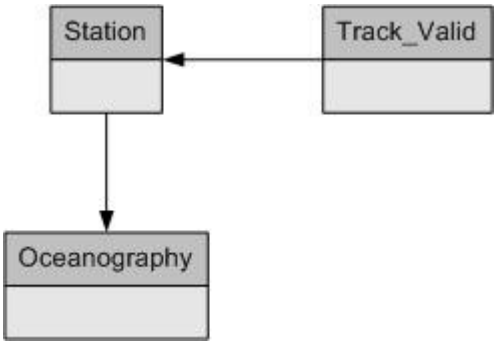


Figure 4 – Organisation of major tables associated with oceanography**Oceanography**

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
STATION	Char(10)	National station identifier
DEPTH	Num(5,0)	Depth in water (m)
DEPTHTYPE	Char(1)	Depth type code
TEMP	Num(6,3)	Temperature (degrees Celsius)
TEMPTYPE	Char(1)	Temperature type measurement code
SALINITY	Num(6,3)	Salinity
OXYGEN	Num(6,2)	Oxygen (ml)
INPHOS	Num(6,2)	Inorganic phosphate (mmol m^{-3})
NITRITE	Num(6,2)	Nitrite (mmol m^{-3})
NITRATE	Num(6,1)	Nitrate (mmol m^{-3})
AMMONIUM	Num(6,2)	Ammonium (mmol m^{-3})
SILICATE	Num(6,1)	Silicate (mmol m^{-3})
PH	Num(6,2)	pH value
CHLORIDE	Num(6,2)	Chlorinity value
CHPHYLLA	Num(6,2)	Chlorophyll-a (mg m^{-3})

Depthtype_Code

Column	Data type	Remarks
DEPTHTYPE	Char(1)	Depth type code
TEXT	Char(40)	Full description

Temptype_Code

Column	Data type	Remarks
TEMPTYPE	Char(1)	Temperature
TEXT	Char(40)	Full description

Net Hauls

Data standardisation

In preparation for the BIOMASS non-acoustic krill data analysis workshop (BIOMASS, 1991),all krill maturity stage code were converted to those used by Morris et al (1988). Table 3 in the workshop report (BIOMASS, 1991) gives the original code values and their Morris et al equivalents. Net volumes, where available, were standardised to m^3. Weights were standardised to grams.

Known data limitations

The krill length measurement used varied between cruises. The Australian SIBEX cruises (NDS1 and NDS2) used the "Standard1" (S1) measure, whilst the UK SIBEX 2 cruise (JBS2) used the "total length" (AT) measure. These are defined in Morris et al (1988). For the rest of the cruises, no indication is given of the length measure used. BIOMASS (1979) recommended the use of the "Standard 1" measure for fresh or recently preserved *Euphausia superba.* However, BIOMASS (1989) states that the SIBEX length measurements were transformed to the standard BIOMASS method where necessary.

BIOMASS (1981b) refers to FIBEX ichtyoplankton data being available for Polish, German and French cruises. These data are not present in the data set and it is uncertain if they were ever supplied to the BIOMASS Data Centre.

Within the NET_CATCH table most nets have top and bottom depth figures. However, 9 nets do not have top depth figures and 20 nets do not have any bottom depth figures. For AFS2, haul 12, net 20, the time that the net was opened occurs before the time that the haul was recorded as having started.

Some columns within the tables contain very little data. For example in the NET_CATCH table there are volume data for SIBEX only. Within the FISH_COMP table the VOLCATCH and WGTCATCH olumns are mutually exclusive and only 37% of the records have data for these fields. The FISH_SPEC table was designed to hold an extensive range of parameters from both juvenile and adult fish, but only a small amount of the relevant data were made available to the BIOMASS Data Centre. The result of this is that within the FISH_SPEC table, for the majority of records, the TOTALLEN, TOTALWGT, EVISCWGT, STOMEWGT, STOMFWGT, STOMFULL, STOMITEM, GONAD, GONADWGT and EGGDIAM columns contain no data

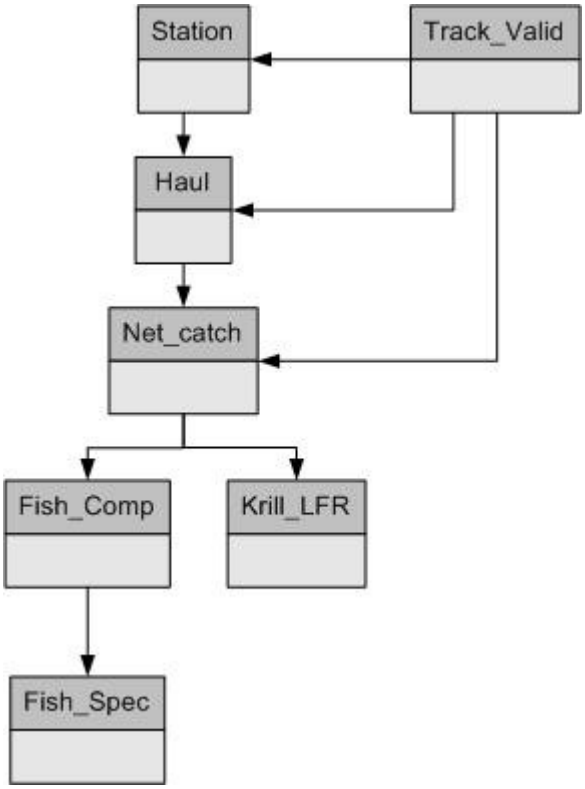
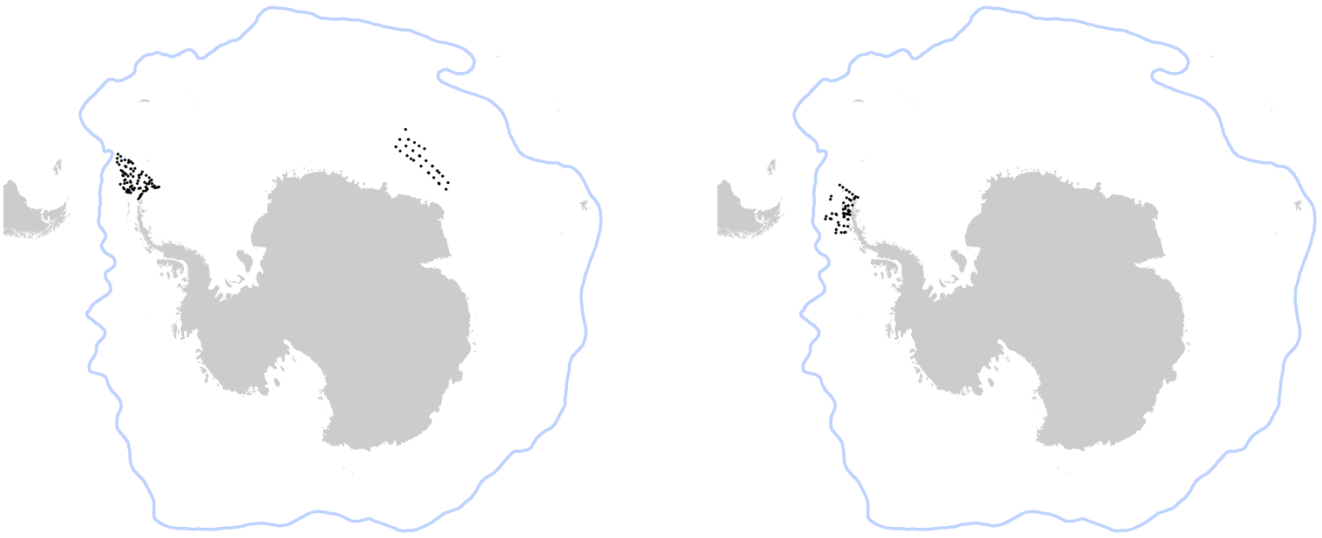


Figure 5 – Relationships between major tables associated with net hauls

(a)

(b)



(c)

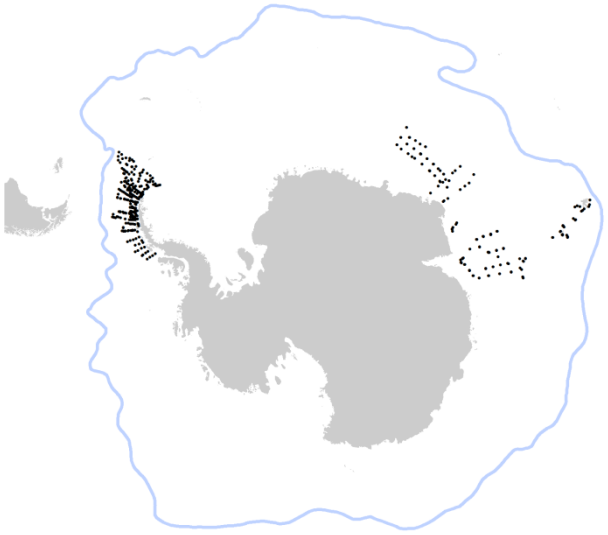


Figure 6: The geographic location of net hauls made during the (a) FIBEX (1980-81) (b) SIBEX 1 (1983-84) and (c) SIBEX 2 (1984-85) elements of the BIOMASS programme. Each point represents the location of an observation; the light blue line represents the average position of the polar front.

Table descriptions

Haul

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & Project data identifier
HAULNO	Num(4)	Haul sequence number, system generated
STATION	Char(10)	National station identifier
HAULID	Char(8)	National haul identifier
HAULTYP	Char(4)	Haul classification
QTARG	Char(1)	Haul directed at a specific target (1=targeted)
HAULSTART	Date	Haul start date/time

Net_Catch

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
NETNO	Num(4)	Net sequence number, system generated
HAULNO	Num(4)	Haul sequence number, system generated
QFULL	Char(1)	Ichthyoplankton sample fully analysed (1 = fully analysed)
MESH	Num(5)	Net mesh used (Micrometers)
TOPDEPTH	Num(5)	Top depth in water (m)
BOTDEPTH	Num(5)	Bottom depth in water (m)
TRAJECT	Char(1)	Net trajectory code
OPENTIME	Date	Net open date/time
SHUTTIME	Date	Net close date/time
VOLFILT	Num(12)	Volume filtered by net (m^3)
VOLSWEPT	Num(12)	Volume swept by net (m^3)
VOLCATCH	Num(12)	Volume of net contents (catch) (m^3)
NUMSPECIES	Num(8)	Number of species in net

Krill_LFR

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
NETNO	Num(4)	Net sequence number, system generated
SPECIES	Char(6)	Species code
SEX	Char(1)	Sex code
MATSTAGE	Char(4)	Maturity stage code
SPECLEN	Num(5,1)	Specimen length (mm)
NUMSPECIMENS	Num(8)	Number of specimens within a length class
LENCODE	Char(2)	Krill length measurement type code; standard one length (S1) or total length (TL)

Fish_Comp

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
NETNO	Num(4)	Net sequence number, system generated
SPECIES	Char(6)	Species code
SEX	Char(1)	Sex code
MATSTAGE	Char(4)	Maturity stage code
NUMSPECIMENS	Num(8)	Number of specimens within a species, sex and maturity stage grouping.
VOLCATCH	Num(12,3)	Volume of ichthyoplankton (ml)
WGTCATCH	Num(12,3)	Weight of ichthyoplankton (g)

Fish_Spec

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project identifier
NETNO	Num(4)	Net sequence number, system generated
SPECIES	Char(6)	Species code
SEX	Char(1)	Sex code
MATSTAGE	Char(4)	Maturity stage code
SPECNO	Num(4)	Ichthyoplankton specimen sequence number, system generated
TOTALLEN	Num(12,2)	Specimen total length (mm)
STANDLEN	Num(12,2)	Specimen standard length(mm)
TOTALWGT	Num(12,2)	Specimen total weight (g)
EVISCWGT	Num(12,2)	Specimen eviscerated weight (g)
STOMEWGT	Num(12,2)	Specimen stomach weight empty (g)
STOMEFWGT	Num(12,2)	Specimen stomach weight full (g)
STOMFULL	Char(1)	Specimen stomach fullness index
STOMITEM	Num(12)	Number of prey items in specimen stomach
GONAD	Char(1)	Specimen gonad condition
GONADWGT	Num(12,2)	Specimen gonad weight (g)
EGGDIAM	Num(12,2)	Specimen egg diameter (mm)

Gonad_Code

Column	Data type	Remarks
SEX	Char(1)	Sex code
GONAD	Char(1)	Gonad code
CONDITION	Char(20)	Condition of gonad
DESCRIPTION	Char(65)	Full description of gonad condition

Haultype_Code

Column	Data type	Remarks
HAULTYP	Char(4)	Haul type code
TEXT	Char(40)	Full description

Matstage_Code

Column	Data type	Remarks
MATSTAGE	Char(4)	Maturity stage code
TEXT	Char(75)	Full description

Net_Code

Column	Data type	Remarks
NETTYP	Char(4)	Net type code
TEXT	Char(40)	Full description

Sex_Code

Column	Data type	Remarks
SEX	Char(1)	Sex code
TEXT	Char(40)	Full description

Species_Code

Column	Data type	Remarks
SPECIES	Char(6)	Species code
TEXT	Char(40)	Full description

Stomfull_Code

Column	Data type	Remarks
STOMFULL	Char(1)	Stomach fullness code
TEXT	Char(40)	Full description

Traject_Code

Column	Data type	Remarks
TRAJECTORY	Char(1)	Net trajectory
TEXT	Char(40)	Full description

Acoustic surveys

Workshops

The FIBEX data were initially analysed at the post-FIBEX data interpretation workshop (BIOMASS, 1981b) and were subsequently analysed in greater detail at the post-FIBEX acoustic workshop (BIOMASS, 1986). Details of the preparatory work carried out for this workshop can be found in BIOMASS (1984). At the request of the Krill Working Group of the Commision for the Conservation of Antarctic Marine Living Resources (CCAMLR), the FIBEX abundance data have also been reanalysed in the light of new acoustic target strength estimates for Krill (see Greene et al., 1990). The results of this reanalysis are detailed in Trathan et al (1993) and Trathan & Everson (1993).

Data standardisation

The details of the standardisations applied to the FIBEX data as part of the Post-FIBEX acoustic workshop are detailed in BIOMASS (1986). For the re-analysis of the FIBEX data requested by CCAMLR, mean volume back-scattering strength (MVBS) values for cruises HOFX and ODFX were recalculated from original data. For HOFX, values were recalculated using mm deflections taken from the original acoustic logs for the cruise (Everson & Madirolas, 1993). These data were of 2 types:

(i) Deflection values for existing integration period (resets), which replaced the tonnes nautical mile^{-2} figures originally supplied to the Data centre.

(ii) Deflection values for new, shorter resets, which replaced existing longer reset in the data sets. For example, the reset which was detailed as starting at 03:14 on February 10, 1981, was originally given as 18 nautical miles long. This has now been replaced by 1 reset of 4 nautical miles and 7 resets each of 2 nautical miles.

The mm deflection values were converted to MVBS (*Sv*) values using modified version of the formula given in BIOMASS (1986):

$$Sv = 10\log - R - SL + TVG - 10\log\left(\frac{c\tau}{2}\right) - 10\log\psi - 10\log L + 10\log C - G$$

Where: D =deflection (mm)
R =depth range = 100-4=96 m
SL =source level=215 dB
VR =voltage response=-108.1 db
TVG =time varied gain=47dB
C =speed of sound=1500 m s^{-1}
τ =pulse length=0.0006 s
ψ =beam pattern factor=-18 dB
L =integration distance (nautical miles)
C =factor to convert from old scale=1.54
G =gain=10 dB

This reduces to the equation: $Sv = 10\log D - 10\log L - 66.5$

For the cruise PDFX, density values (ρ_s) expressed as tonnes nautical mile^{-2} were used to calculate MVBS (S_v) values following the reverse of the procedure given in BIOMASS (1986):

$$Sv = 10\log(\rho_v) + TS$$

Where the following 120 KHz *TS* to length relationship applies:

$$TS = 20\log l - 77.2 \text{ (with } l \text{ in cm)}$$

and

$$\rho_v = \frac{\rho_s}{(3.43w\Delta R)}$$

The conversion from nautical mile^2 to km^2 is 3.43 (ie: 1.852^2) and ρ_v is density in g m^{-2}, ρ_s is density in tonnes nautical mile^{-2}, w is mean weight (g) and ΔR is the integration depth range.

The following constants were used for particular regions:

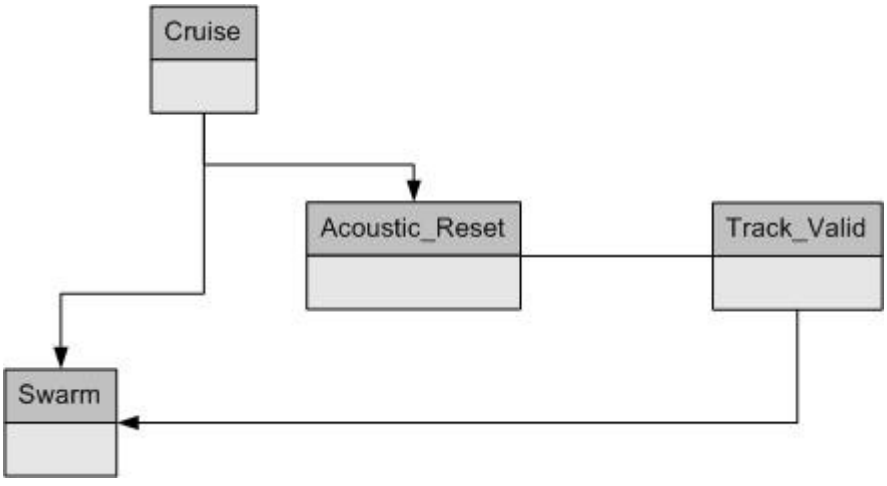
For SE Scotia Sea data: w = 0.61g, l = 4.3cm
For South Georgia data: w = 0.36g, l=3.7cm

For further details see Trathan et al (1993)The details of standardisations applied to the SIBEX abundance data are given in BIOMASS (1990).

Known data limitations

BIOMASS (1986)reports that the MVBS values for the cruise NDFX were revised after a number of artefacts were identified, however, the nature of the artefacts and the revisions made were not recorded in BIOMASS (1986).The NDFX data were not used in the reanalysis for CCAMLR (Trathan et al., 1993).

Details of the links made to krill net-hauls during the FIBEX and SIBEX workshops (BIOMASS, 1986, 1990)to calculate the length-frequency distributions for specific resets are not available in the data set. The original FIBEX data transfer formats (BIOMASS, 1981) allowed for references to be made to raw acoustic data held outside of the BIOMASS data set. This information is not available and it is not known if it was ever supplied.



Acoustic_Reset

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
RESETSTART	Date	Acoustic reset observation start date/time
RESETEND	Date	Acoustic reset observation end date/time
TOPDEPTH	Num(5)	Top depth of acoustic reset (m)
BOTDEPTH	Num(5)	Bottom depth of acoustic reset (m)
ECCHOSOUNDER	Char(4)	Echo sounder used for observation
EDSU	Num(6)	Integrator interval distance (m)
MVBS	Num(8,2)	Mean Volume Back-scattering Strength (decibels per cubic metre (db m^{-3}))
TRANSECT	Char(5)	National transect identifier

Swarm

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
SWARMSTART	Date	Swarm reset observation date/time
UPPERLIMIT	Num(5)	Upper limit of swarm (m)
THICKNESS	Num(5)	Swarm thickness (m)
EXTENT	Num(5)	Horizontal swarm extent (m)
Density	Num(7,2)	Calculated volume density (g m^{-3}), from FIBEX workshop

Echosounder_Code

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
ECHOSOUNDER	Char(4)	Echo sounder code
FREQUENCY	Num(6)	Echo sounder frequency used

Acoustic_Equipment

Column	Data type	Remarks
ECHOSOUNDER	Char(4)	Echo sounder code
MODEL	Char (20)	Echo sounder model used for observations
INTEGRATION	Char(20)	Integrator model used for observations
INTEGRATOR_TYPE	Char(1)	Integrator type used, digital (D) or analogue (A)

Bird Observations

Known data limitations

The FIBEX workshop report (BIOMASS, 1985) reviews the status of the FIBEX data at that time and states that the limitations of the data available precluded many detailed and rigorous analysis.

The FIBEX bird card data were transferred from the BIOMASS data set held the University of Frankfurt to the University of Cape Town for the workshop in 1985. There is no record of any of the corrections applied to the data in Cape Town being made to the data set held in Frankfurt or subsequently in Cambridge. Table 1 of BIOMASS (1985) gives details of the number of bird card records for FIBEX. Table ?, below, gives the figures for the number of FIBEX bird card records currently in the BIOMASS data set as compared to the figures given in BIOMASS (1985).

The difference in the number of records, apart from the cruises AGFX and ODFX, is due to some records being deleted during the validation undertaken by the BIOMASS Data Centre. During the validation it was found that the South African data set (AGFX) included data from a cruise undertaken in 1980, prior to FIBEX. Once these pre-FIBEX data were removed, the number of records was reduced from 1050 to 17. It seems that the analyses undertaken at the FIBEX workshop included these pre-FIBEX South African data. The ODFX data were lost between transfer of the data set from Frankfurt to the BIOMASS Data Centre in Cambridge.

A large number of the cruises did not record the distance that the birds were observed from the ship, ie: the transect distance, or an unknown transect distance code was used.

There were facilities on the 10-minute bird cards to record weather, sea-state and sea-depth observations. The numbers of weather and sea-state observations are similar to those reported in Table 1 of BIOMASS (1985). However, the sea depth data are not available to the BIOMASS Data centre. Further information about the methods used to collect the FIBEX data can be found in the BIOMASS handbook on recording observations of birds at sea (BIOMASS, 1982). Details of the methods used to collect the SIBEX data are given in BIOMASS Working Party on Bird Ecology (1992).

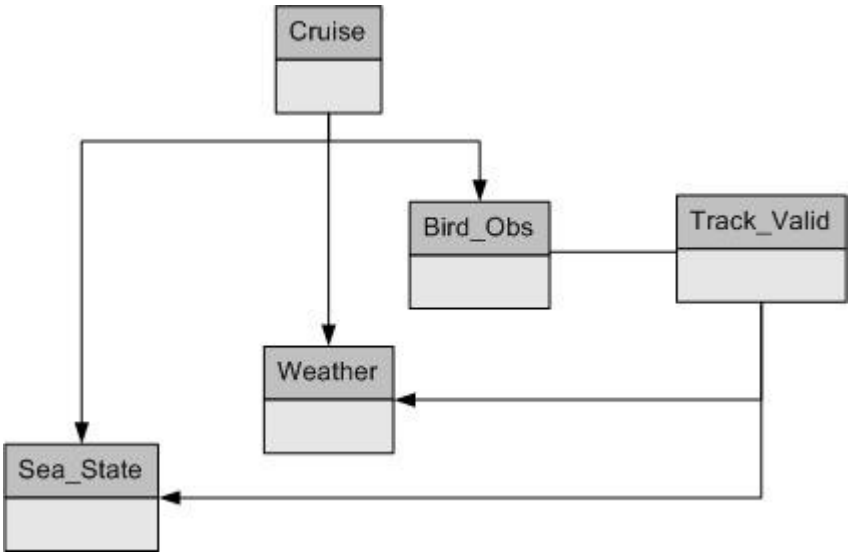


Figure 7 – Organisation of major data tables associated with bird observations

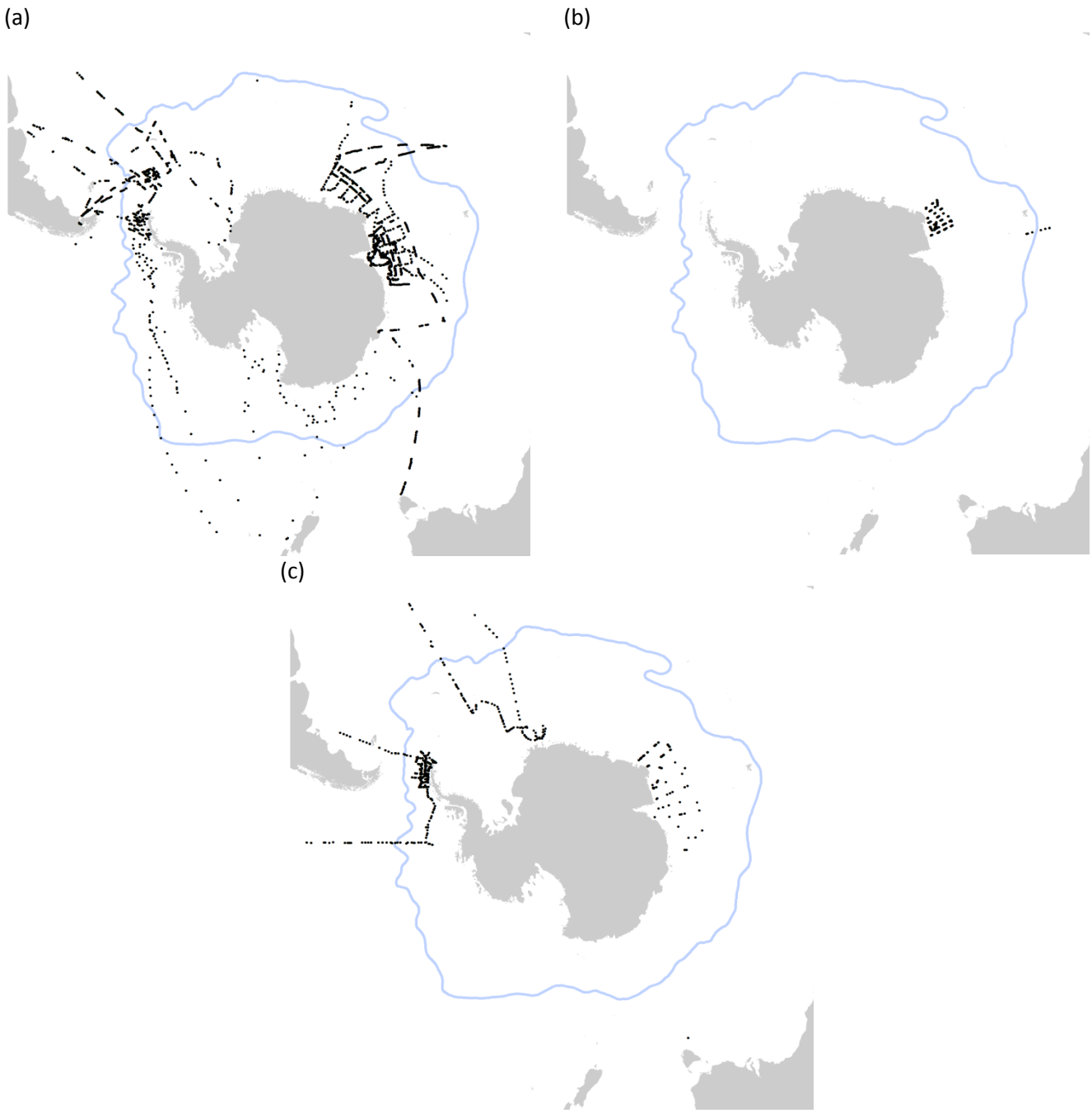


Figure 8: The geographic location of at sea bird observations made during the (a) FIBEX (1980-81) (b) SIBEX 1 (1983-84) and (c) SIBEX 2 (1984-85) elements of the BIOMASS programme. Each point represents the location of an observation; the light blue line represents the average position of the polar front.

Bird_Obs

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
BIRDSTART	Date	Start date/time of bird observation
SPECIES	Char(6)	Species code
AGE	Char(1)	Specimen age code
DISTANCE	Char(1)	Observation distance code
OBSERVER	Char(4)	Observer name code
SHIPACT	Char(1)	Ship activity code
TOTAL	Num(4)	Total number of birds recorded
COUNTTYPE	Char(1)	Type of activity count
ONWATER	Num(4)	Number of birds on water
ONICE	Num(4)	Number of birds on ice
ONSHIP	Num(4)	Number of birds sitting on ship
ACCOMP	Num(4)	Number of birds accompanying ship
FOLLOW	Num(4)	Number of birds following ship
PASSING	Num(4)	Number of birds passing ship
FEEDING	Num(4)	Number of birds feeding

Age_Code

Column	Data type	Remarks
AGE	Char(1)	Age code
TEXT	Char(40)	Full description

Counttype_Code

Column	Data type	Remarks
COUNTTYPE	Char(1)	Bird activity count type code
TEXT	Char(40)	Full description

Distance_Code

Column	Data type	Remarks
DISTANCE	Char(1)	Distance code
TEXT	Char(40)	Full description

Observer_Code

Column	Data type	Remarks
OBSERVER	Char(4)	Observer name code
TEXT	Char(40)	Full description

Shipact_Code

Column	Data type	Remarks
SHIPACT	Char(1)	Ship activity code
TEXT	Char(40)	Full description

Species_Code

Column	Data type	Remarks
SPECIES	Char(6)	Species code
TEXT	Char(40)	Full description

Weather

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
WEATHERTIME	Date	Date/time of weather observation
WEATHER	Char(2)	Weather code
AIRTEMP	Num(6,2)	Air temperature (degrees C)
WINDDIR	Num(3)	Wind direction
WINDSPD	Num (3)	Wind speed (knots)
PRESSURE	Num(7,2)	Barometric pressure (mB)
CLOUDCVR	Char(1)	Cloud cover code
CLOUDTYP	Char(1)	Cloud type code
HUMIDITY	Num(5,2)	Wind force code
VISIB	Num(6)	Visibility from ship

Seastate

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project identifier
SEASTATETIME	Date	Date/time of seastate observation
SURFTEMP	Num(6,2)	Surface temperature (degrees C)
TOPSALIN	Num(6,3)	Surface salinity (ppt)
ICE	Char(1)	Ice coverage code
SEASTATE	Char(1)	Seastate code
TRANSPAR	Num(6,2)	Sea transparency

Cloudvr_Code

Column	Data type	Remarks
CLOUDCVR	Char(1)	Cloud cover code
TEXT	Char(40)	Full description

Cloudtyp_Code

Column	Data type	Remarks
CLOUDTYP	Char(1)	Cloud type code
TEXT	Char(40)	Full desciption

Ice_Code

Column	Data type	Remarks
ICE	Char(1)	Ice coverage code
TEXT	Char(40)	Full description

Seastate_Code

Column	Data type	Remarks
SEASTATE	Char(1)	Seastate code
TEXT	Char(40)	Full description

Biases

The Biases table is a quality flag indicating the proportion of variables used to indicate the Biases which are available for each data point

Column	Data type	Remarks
CRUISE	Char(4)	Vessel & project data identifier
DATE_TIME	Date	Date and time of observation
BIAS_COUNT	Num(2)	Percentage of bias measures recorded

Weather_Code

Column	Data type	Remarks
WEATHER	Char(2)	Weather code
TEXT	Char(40)	Full description

Windforc_Code

Column	Data type	Remarks
WINDFORC	Char(2)	Wind force code
TEXT	Char(72)	Full description

References

BIOMASS. (1979) Antactic krill biology. First report of the Working Party on Krill Biology. *BIOMASS Report Series*, **10**.
BIOMASS. (1981a) Methods for the Transmission of Data to the Post-FIBEX Data Interpretation Workshop. *BIOMASS Handbook*, **16**.
BIOMASS. (1981b) Post-FIBEX Data Interpretation Workshop. Report of the workshop. *BIOMASS Report Series*, **20**.
BIOMASS. (1984) Meeting of the Working Party on Acoustics to Prepeare for Post-Fibex Acoustic Workshop, 1984. Report of the Working party. *BIOMASS Report Series*, **37**.
BIOMASS. (1986) Post-SIBEX Acoustic Workshop. Report of the workshop. *BIOMASS Report*, **40**.
BIOMASS. (1987) SIBEX Physical Oceanography Workshop. Report of the Workshop. *BIOMASS Report Series*, **62**.
BIOMASS. (1990) SIBEX Acoustic Data Validation and Analysis Workshop. Report of the workshop. *BIOMASS Report Series*, **62**.
BIOMASS. (1991) Non-Acoustic Krill Data Analysis Workshop. Report of the workshop. *BIOMASS Report Series*, **66**.
Everson, I. & Madirolas, A.O. (1993). Report of the examination of the acoustic data from RV *Eduardo L. Holburg* collected during the FIBEX study. In *Document WG-Krill-93/20.* CCAMLR, Hobart, Australia.
Greene, C.H., Stanton, T.K., Wiebe, P.H. & McClatchie, S. (1990) Acoustic estimates of Antarctic krill. *Nature*, **349**, 110.
Morris, D.J., Watkins, J.L., Ricketts, C., Buchhloz, F. & Priddle, J. (1988) An assesment of the merits of length and weight measurements of Antarctic krill *Euphausia superba*. *British Antarctic Survey Bulletin*, **79**, 27-50.
Priddle, J., Brandini, F., Lipski, M. & Thorley, M.R. (1993). Pattern and variability of phytoplankton biomass in the Antarctic Peninsula region - an assesment of the BIOMASS cruises. In *Southern Ocean Ecology - The BIOMASS Perspective* (ed S.Z. El-Sayed). Cambridge University Press, Cambridge.
Thorley, M.R. & Trathan, P.N. (1993). The history of the BIOMASS Data Centre and lessons learned during it's lifetime. In *Southern Ocean Ecology - The BIOMASS perspective* (ed S.Z. El-Sayed). Cambridge University Press, Cambridge.
Trathan, P.N., Agnew, D., Miller, D.G.M., Watkins, J.L., Everson, I., Thorley, M.R., Murphy, E., Murray, A.W.A. & Goss, C. (1993). Krill biomass in Area 48 and Area 58: Recalculation of FIBEX data. In *Selected Scientific Papers, 1992 (SC-CAMLR-SSP/9).* pp. 157-81. CCAMLR, Hobart, Australia.
Trathan, P.N. & Everson, I. (1993). Status of the FIBEX aoustic data for the west Atlantic. In *Document WG-Krill-93/31*. CCAMLR, Hobart, Australia.