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An integrated compilation of data sources for the development of a marine protected area in the Weddell Sea

Katharina Teschke[1,2], Hendrik Pehlke[1,2], Volker Siegel[3], Horst Bornemann[1], Rainer Knust[1], and Thomas Brey[1,2,4]

[1]Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 12, 27570 Bremerhaven, Germany
[2]Helmholtz Institute for Functional Marine Biodiversity at the University Oldenburg (HIFMB), Ammerländer Heerstraße 231, 26129 Oldenburg, Germany
[3]Thünen Institute of Sea Fisheries, Herwigstraße 31, 27572 Bremerhaven, Germany
[4]University of Bremen, Bibliothekstraße 1, 28359 Bremen, Germany

Correspondence: Katharina Teschke (katharina.teschke@awi.de)

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Abstract. The Southern Ocean may contribute a considerable amount to the proposed global network of marine protected areas (MPAs) that should cover about 10 % of the world's oceans in 2020. In the Antarctic, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is responsible for this task, and currently Germany leads a corresponding scientific evaluation of the wider Weddell Sea region. Compared to other marine regions within the Southern Ocean, the Weddell Sea is exceptionally well investigated. A tremendous amount of data and information has been produced over the last 4 decades. Here, we give a systematic overview of all data sources collected in the context of the Weddell Sea MPA planning process. The compilation of data sources is comprised of data produced by scientists and institutions from more than 20 countries that were either available within our institutes, downloaded via data portals or transcribed from the literature. It is the first compilation for this area that includes abiotic data, such as bathymetry and sea ice, and ecological data from zooplankton, zoobenthos, fish, birds and marine mammals. All data layer products based on this huge compilation of environmental and ecological data are available from the data publisher PANGAEA via the six persistent identifiers at https://doi.org/10.1594/PANGAEA.899595 (Pehlke and Teschke, 2019), https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a), https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b), https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c), https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a) and https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b). This compilation of data sources including the final data layer products will serve future research and monitoring well beyond the current MPA development process.

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1 Introduction

Marine protected areas (MPAs) have experienced a significant increase in number and coverage at a global scale during recent decades (e.g. Mora and Sale, 2011; McDermott et al., 2018; UNEP-WCMC and IUCN, 2019). The number of MPAs has increased almost 1.5 times since the 1990s and the total area protected is currently almost 30 million km^2. At the United Nations World Summit on Sustainable Development in 2002 the international community of states reached an agreement about the establishment of a representative network of MPAs for the purpose of long-term conservation of marine biodiversity by 2012 (A/CONF.199/20, 2002). The adopted "strategic plan for biodiversity 2011–2020" of the Convention on Biological Diversity aims for the conservation of at least 10 % of coastal and offshore marine areas by 2020 based on a MPA network (CBD, 2010). The Southern Ocean may contribute a considerable proportion of this MPA network due to its size, and the uniqueness of the Antarctic environment renders its conservation the more urgent.

The Weddell Sea represents the southerly part of the Atlantic Sector of the Southern Ocean. About a quarter of the Weddell Sea's entire marine area covers the continental shelf along the eastern contour of the Antarctic Peninsula and the Antarctic continent up to 20° E as a heuristically chosen non-topographic delineation. The Weddell Sea is deserving of protection in multiple respects. On the one hand, all arguments for the conservation of the Southern Ocean hold true for the Weddell Sea as well; i.e. it is an extreme environment that is mostly dominated by the seasonal dynamic of the sea ice and has an excellently adapted biota. The biodiversity is – particularly in the benthos – very high (e.g. Brey et al., 1994; Brandt et al., 2007), and there is a significant number of endemic species, i.e. unique to the Antarctic or even to the Weddell Sea (e.g. Arntz et al., 1994; Clarke and Johnston, 2003; Linse et al., 2006). Moreover, the Weddell Sea plays an important role for seabirds, penguins and marine mammals. Almost one-third of the entire population of emperor penguins (Fretwell et al., 2012) and a major part of the population of crabeater seals (cf. Bester and Odendaal, 2000; Southwell et al., 2012; Gurarie et al., 2017a, b) apparently are found in the Weddell Sea. Sponge associations that are comparable to tropical reef systems in terms of their structural and functional complexity occur along the eastern Weddell Sea shelf (Barthel and Gutt, 1992), and on the broad shelf in the southern Weddell Sea a special benthic community – adapted to very cold water temperatures – seems to be resident (Teschke et al., 2016).

The Weddell Sea is – despite being one of the most remote and inaccessible places on Earth – relatively well investigated compared to other Antarctic regions. For approximately 30 years the Weddell Sea has been the geographical focus area of German Antarctic research. In addition, there are manifold research activities of other nations. Consequently, we were able to compile a tremendous amount of environmental and ecological data to support the development of a Weddell Sea MPA (WSMPA) under the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Here, we present a systematic overview of all environmental and ecological data sources collected for the development of a WSMPA and provide data layer products that are based on this data compilation.

2 Data description

2.1 Study site

The WSMPA Planning Area in which we acquired the environmental and ecological data is located between the Antarctic Peninsula and 20° E (Fig. 1). The northern border is at 64° S and the continental margin forms the southern border. This area is defined by CCAMLR's MPA Planning Domains in the CCAMLR Convention Area (SC-CAMLR-XXX, 2011) and by aiming at a bio-geographically homogeneous area, particularly on the shelf (Teschke et al., 2016). In addition to the WSMPA Planning Area (approx. 4.2 million km^2 in size) we compiled data for a 200 km wide buffer area near the Antarctic Peninsula, which is part of an MPA initiative led by Argentina and Chile (CCAMLR-XXXVII/31, 2018). This buffer zone is adjacent to the northern border of the WSMPA Planning Area and has eastern and western boundaries at 30 and 60° W, respectively. Some data (e.g. seal tracking data) extend beyond the WSMPA Planning Area (plus buffer) and originate from adjacent regions of the Weddell Sea, such as the Bellinghausen Sea along the western side of the Antarctic Peninsula.

2.2 Data compilation

All raw data sets of environmental and ecological parameters collected by the end of 2016 and further processed as part of the WSMPA planning process are systematically described, and the primary reference is mentioned, such as the data portal from which the data are freely available or the website of the institute or organisation from which the data can be requested (see Tables 1 and 2; see all data records in Figs. 2 and S1 in the Supplement). For each individual raw data set in Tables 1 and 2, the accessibility status is indicated; i.e. it is immediately clear which data sets are directly freely available and which data sets must first be requested.

In addition, we offer data layer products that we developed on the basis of the raw data sets whose sources are described here. The methods used to process and analyse the data and to develop each data layer are described in detail in the Supplement. All data layer products with a metadata description are freely available from the data publisher PANGAEA via the six persistent identifiers at https://doi.org/10.1594/PANGAEA.899595 (Pehlke and Teschke, 2019), https://doi.org/10.1594/PANGAEA.899667 (Teschke et

Table 1. Data collection of environmental parameters compiled for the development of a marine protected area (MPA) in the wider Weddell Sea (Antarctica). For each raw data set, the name of the data source, the primary reference, such as the data portal or website on which the data are available, and examples of publications that have used the respective raw data set are listed. In addition, DOI links are provided to the final WSMPA data layer products where the respective environmental raw data sets have been mapped (as in the pelagic regionalisation approach) or used as explanatory variables for the development of species distribution data layers.

Content	Name	Reference to raw data	Availability of raw data	Reference(s) to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Depth	International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0	Arndt et al. (2013b), https://doi.org/10.1594/PANGAEA.805736 (data request: April 2013)	freely available	Arndt et al. (2013a) Jerosch et al. (2016)	https://doi.org/10.1594/PANGAEA.899595 (Pehlke and Teschke, 2019) https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a) https://doi.org/10.1594/PANGAEA.899591
Sea ice concentration	Daily AMSR-E Sea Ice Maps	https://seaice.uni-bremen.de/data/ (data request: 18 December 2013)	freely available	Spreen et al. (2008)	https://doi.org/10.1594/PANGAEA.899595 (Pehlke and Teschke, 2019) https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Temperature, salinity, current velocity	Finite Element Sea Ice – Ocean Model (FESOM)	https://www.awi.de/forschung/klimawissenschaften/klimadynamik (data delivery: 20 November 2013)	request necessary	Danilov et al. (2004) Timmermann et al. (2009) Haid and Timmerman (2013)	https://doi.org/10.1594/PANGAEA. 899595(Pehlke and Teschke, 2019) https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b) https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a) https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Dissolved oxygen, phosphate, nitrate	World Ocean Atlas 2013 version 2 (WOA13 V2)	https://www.nodc.noaa.gov/OC5/woa13/woa13data.html (data request: 11 to 18 July 2013)	freely available	Garcia et al. (2014a, b)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a) https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Total organic carbon content		Seiter et al. (2004b), https://doi.org/10.1594/PANGAEA.199835	freely available	Seiter et al. (2004a)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Calcium carbonate, silica		Seiter et al. (2004c), https://doi.org/10.1594/PANGAEA.186024	freely available	Seiter et al. (2004a)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Biogenic silica		Geibert et al. (2005b), https://doi.org/10.1594/PANGAEA.230042	freely available	Geibert et al. (2005a)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Chlorophyll *a* concentration	Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) measurements	https://oceandata.sci.gsfc.nasa.gov/SeaWiFS/ (data request: 9 September 2014)	registration necessary	Moore and Abbott (2000) Gregg and Casey (2004)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)

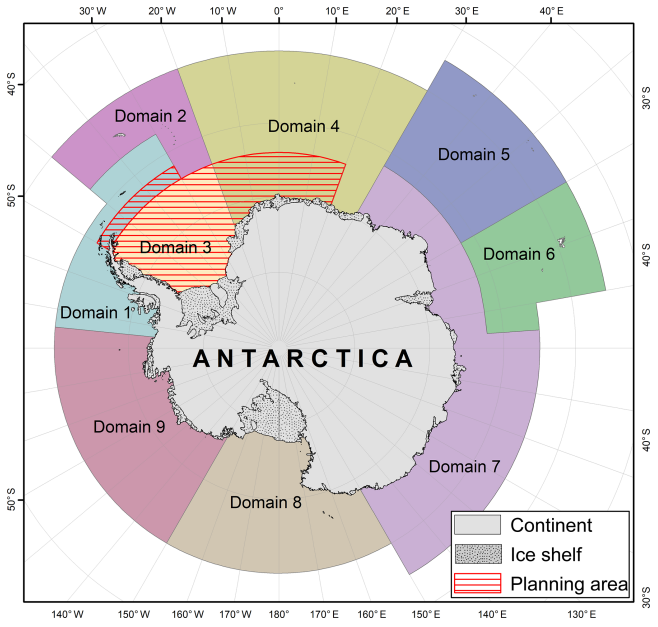

Figure 1. CCAMLR Convention Area, showing the marine protected area (MPA) Planning Domains and the planning area (including a 200 km wide buffer area near the Antarctic Peninsula) for the development of a MPA in the wider Weddell Sea (red-shaded area). Domain 1 – Western Peninsula–South Scotia Arc; Domain 2 – North Scotia Arc; Domain 3 – Weddell Sea; Domain 4 – Bouvet Maud; Domain 5 – Crozet–del Cano; Domain 6 – Kerguelen Plateau; Domain 7 – Eastern Antarctica; Domain 8 – Ross Sea; Domain 9 – Amundsen–Bellingshausen.

al., 2019a), https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b), https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c), https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a) and https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b) (see Tables 1 and 2). The data layers are available either as ArcMap packages (as a .mxd file, containing a map document with all associated files) or as individual GIS files for those who use GIS software other than the ESRI software (ArcMap). The shape and raster files, all of which have the same spheroid (WGS 1984, EPSG 4326) and projection (South Pole Lambert Azimuthal Equal Area, EPSG 102020), were processed in such a way that they can be easily used for the analysis of MPA scenarios or other geostatistical analyses in the Weddell Sea without direct access to the underlying raw data. For example, the shape and raster files could be stacked to identify hotspots and cold spots of biodiversity, or certain layers could be used as explanatory variables in species distribution models.

2.3 Environmental data

2.3.1 IBCSO data

The bathymetric data used in the context of the WSMPA planning initiative originate from the first regional digital bathymetric model (DBM) established in the International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0 programme (data request: April 2013) (Table 1; Fig. 3a). This chart model is based upon bathymetric data of different origins, such as multi-beam and single-beam data; digitised depths from nautical charts; and predicted bathymetry from many hydrographic offices, scientific institutions, and data centres. The IBCSO Version 1.0 DBM has a horizontal resolution of 500 m × 500 m and a vertical resolution of 1 m based on a polar stereographic projection with true scale at 65° referenced to the WGS84 ellipsoid (Arndt et al., 2013a, b).

2.3.2 AMSR-E sea ice maps

Daily high-resolution sea ice maps of the Antarctic Ocean are provided by the PHAROS group (PHysical Analysis of RemOte Sensing images) at the Institute of Environmental Physics, University of Bremen, Germany. The sea ice raster maps, which were used in the context of the WSMPA planning initiative, are derived from satellite observations of daily sea ice concentration by the Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-EOS) instrument on board the Aqua satellite. Daily AMSR-E sea ice maps (2013) (June 2002–October 2011) were downloaded from IUP, University of Bremen (data request: 18 December 2013) (see Table 1; Fig. 3b). The ARTIST Sea Ice (ASI) concentration algorithm was used with a spatial resolution of 6.25 km × 6.25 km (Spreen et al., 2008) and a polar stereographic projection (EPSG: 3976).

2.3.3 FESOM data

Monthly mean values of seawater temperature, salinity and current velocity from 1990 to 2009 were derived from the Finite Element Sea Ice – Ocean Model (FESOM) (Table 1; Fig. 3c, d). The model run was initialised on 1 January 1980 with hydrographic data from the Polar Science Center Hydrographic Climatology (Steele et al., 2001), and forced with NCEP daily atmospheric re-analysis data (Kalnay et al., 1996) for 1980 to 2009. For more information on FESOM and the atmospheric-forcing data sets, see, e.g. Timmermann et al. (2009) and Haid and Timmermann (2013), respectively. The FESOM raster has a resolution of 0.18° (x) × 0.05° (y); in the vertical, two z levels (i.e. sea surface and sea bottom) are used. The raster is based on the WGS84 geographic coordinate system (EPSG: 4326).

IBCSO data, AMSR-E sea ice maps and FESOM data were used in a pelagic regionalisation analysis of the Weddell Sea. The respective data layer products are avail-

Table 2. Data collection of ecological parameters compiled for the development of a marine protected area (MPA) in the wider Weddell Sea (Antarctica). For each raw data set, the name of the data source, the primary reference, such as the data portal or website on which the data are available, and the respective cruise reports and/or examples of publications that have used the respective raw data set are listed. In addition, DOI links to the final WSMPA data layer products are provided, including the respective raw data sets.

Content	Name	Reference to raw data	Availability of raw data	Cruise report	Reference to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Zooplankton						
Adult Antarctic krill (abundances)	KRILLBASE (https://doi.org/brg8) See detailed list of data in Table S2 in Supplement	Atkinson et al. (2017)	request necessary		Atkinson et al. (2004) Atkinson et al. (2008) Piñones and Fedorov (2016) Atkinson et al. (2019)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill (catch and effort)	Japanese, Norwegian and Soviet fisheries data	https://www.ccamlr.org/ (data request: 3 October 2013)	request necessary			https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill (abundances)	Soviet cruises: RV *Gizhiga* 1977 and RV *Volny Vetter* 1983	https://www.thuenen.de/en/sf/	request necessary			https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill (abundances)	ANT-XVIII/4	https://www.thuenen.de/en/sf/	request necessary	Fahrbach et al. (2003)		https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill and ice krill (abundances)	MV *Polarsirkel* 1976/1977	Fevolden (1979), https://doi.org/10.1080/00364827.1979	freely available			https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill and ice krill (abundances)	Lazarev Sea Krill Study (LAKRIS) data (ANT-XXI/4, ANT-XXIII/2, ANT-XXIII/6, ANT-XXIV/2)	https://www.thuenen.de/en/sf/	request necessary	Smetacek et al. (2005) Strass (2007) Bathmann (2008, 2010)	Siegel (2012)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill and ice krill (abundances)	ANT-XXIX/3	https://www.thuenen.de/en/sf/	request necessary	Gutt (2013)	Siegel et al. (2013)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill and ice krill (abundances)	ANT-V/3	https://www.thuenen.de/en/sf/	request necessary	Schnack-Schiel (1987)		https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult Antarctic krill and ice krill (abundances)	ANT-VII/4	https://www.thuenen.de/en/sf/	request necessary	Arntz et al. (1990)		https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult ice krill (abundances)	RV *Walther Herwig* 1975/1976	https://www.thuenen.de/en/sf/	request necessary			https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Adult ice krill (abundances)	MV *Polarsirkel* 1979/1980	https://www.thuenen.de/en/sf/	request necessary		Siegel (1982) Hempel et al. (1983)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)

Table 2. Continued.

Content	Name	Reference to raw data	Availability of raw data	Cruise report	Reference to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Larval Antarctic krill (abundances)	MV *Polarsirkel* 1976/1977	Fevolden (1979), https://doi.org/10.1080/00364827.1979	freely available			https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Larval Antarctic krill (abundances)	MV *Polarsirkel* 1979/1980	https://www.thuenen.de/en/sf/	request necessary		Siegel (1982)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Larval Antarctic krill (abundances)	First International BIOMASS Experiment survey (FIBEX), RV *Walther Herwig* 1981	https://www.thuenen.de/en/sf/	request necessary		Trathan and Everson (1994) Siegel (2005)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Larval Antarctic krill (abundances)	ANT-VII/4	https://www.thuenen.de/en/sf/	request necessary	Arntz et al. (1990)		https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Larval Antarctic krill (abundances)	ANT-VIII/2 and RV *Akademik Fedorov*, 1989	https://www.thuenen.de/en/sf/	request necessary	Augstein et al. (1991)	Menshenina (1992)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Larval Antarctic krill (abundances)	Lazarev Sea Krill Survey (LAKRIS) data (ANT-XXI/4, ANT-XXIII/6)	https://www.thuenen.de/en/sf/	request necessary	Smetacek et al. (2005) Bathmann (2008)	Siegel (2012)	https://doi.org/10.1594/PANGAEA.899667 (Teschke et al., 2019a)
Zoobenthos						
Sponges (abundances)		Gerdes (2014a–p),	freely available		Gerdes et al. (1992) Gerdes et al. (2003)	https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b)
	WH068/1	https://doi.org/10.1594/PANGAEA.834061		–		
	WH068/2	https://doi.org/10.1594/PANGAEA.834065		–		
	ANT-III/2	https://doi.org/10.1594/PANGAEA.834009		Hempel (1985)		
	ANT-V/1	https://doi.org/10.1594/PANGAEA.717708		Schnack-Schiel (1987)		
	ANT-VI/3	https://doi.org/10.1594/PANGAEA.834017		Fütterer (1988)		
	ANT-VII/4	https://doi.org/10.1594/PANGAEA.834021		Arntz et al. (1990)		
	ANT-IX/3	https://doi.org/10.1594/PANGAEA.834013		Bathmann et al. (1992)		
	ANT-X/3	https://doi.org/10.1594/PANGAEA.834025		Spindler et al. (1993)		
	ANT-XIII/3	https://doi.org/10.1594/PANGAEA.834029		Arntz and Gutt (1997)		
	ANT-XIII/4	https://doi.org/10.1594/PANGAEA.834033		Fahrbach and Gerdes (1997)		
	ANT-XV/3	https://doi.org/10.1594/PANGAEA.834041		Arntz and Gutt (1999)		
	ANT-XVII/3	https://doi.org/10.1594/PANGAEA.834074		Arntz and Brey (2001)		
	ANT-XIX/5	https://doi.org/10.1594/PANGAEA.834069		Arntz and Brey (2003)		
	ANT-XXI/2	https://doi.org/10.1594/PANGAEA.834049		Arntz and Brey (2005)		
	ANT-XXIII	https://doi.org/10.1594/PANGAEA.834053		Gutt (2008)		
	ANT-XXVII	https://doi.org/10.1594/PANGAEA.834057		Knust et al. (2012)		
Sponges (semi-quantitative data)	ANT-VII/4 ANT-IX/3 ANT-XIII/3 ANT-XV/3 ANT-XXI/2	Teschke and Brey (2020), https://doi.org/10.1594/PANGAEA.911801	freely available	Arntz et al. (1990) Bathmann et al. (1992) Arntz and Gutt (1997) Arntz and Gutt (1999) Arntz and Brey (2005)	Galéron et al. (1992)	https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b)

Table 2. Continued.

Content	Name	Reference to raw data	Availability of raw data	Cruise report	Reference to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Echinoderms – Asteroids (presence–absence)	ANT-I/2 ANT-II/4 ANT-V/3 ANT-VI/3 ANT-XV/3 ANT-XVII/3	Teschke and Brey (2019a), https://doi.org/10.1594/PANGAEA.898629	freely available	Drescher et al. (1983) Kohnen (1984) Schnack-Schiel (1987) Fütterer (1988) Arntz and Gutt (1999) Arntz and Brey (2001)	Voß (1988)	https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b)
Echinoderms – Ophiuroids (abundances)	ANT-I/2 ANT-II/4 ANT-V/3 ANT-V/4 ANT-VI/3 ANT-VII/4 ANT-IX/3 ANT-X/3	Teschke and Brey (2019b), https://doi.org/10.1594/PANGAEA.898773	freely available	Drescher et al. (1983) Kohnen (1984) Schnack-Schiel (1987) Miller and Oerter (1990) Fütterer (1988) Arntz et al. (1990) Bathmann et al. (1992) Spindler et al. (1993)	Brey et al. (1994) Dahm (1996)	https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b)
Echinoderms – Holothurians (abundances)	ANT-I/2 ANT-II/4 ANT-III/3	Gutt et al. (2014), https://doi.org/10.3897/zookeys.434.7622	freely available	Drescher et al. (1983) Kohnen (1984) Hempel (1985)	Gutt (1988) Piepenburg et al. (1997)	https://doi.org/10.1594/PANGAEA.899645 (Teschke et al., 2019b)
Fishes						
Pleuragramma antarctica and demersal fishes (abundances)	ANT-XIII/3	Balguerías and Knust (2020), https://doi.org/10.1594/PANGAEA.911965	freely available	Arntz and Gutt (1997)	Mintenbeck et al. (2012) Caccavo et al. (2018)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
	ANT-XV/3	Knust and Schröder (2020), https://doi.org/10.1594/PANGAEA.911966	freely available	Arntz and Gutt (1999)		
	ANT-XVII/3	Knust et al. (2020a), https://doi.org/10.1594/PANGAEA.911967	freely available	Arntz and Brey (2001)		
	ANT-XIX/5	Knust et al. (2020b), https://doi.org/10.1594/PANGAEA.911968	freely available	Arntz and Brey (2003)		
	ANT-XXI/2	Knust et al. (2020c), https://doi.org/10.1594/PANGAEA.911969	freely available	Arntz and Brey (2005)		
	ANT-XXVII/3	Knust et al. (2020d), https://doi.org/10.1594/PANGAEA.911970	freely available	Knust et al. (2012)		
Pleuragramma antarctica and demersal fishes (abundances)	ANT-I/2	Drescher et al. (2012), https://doi.org/10.1594/PANGAEA.786877	freely available	Drescher et al. (1983)	Ekau (1988) Caccavo et al. (2018)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
	ANT-III/3	Ekau et al. (2012a), https://doi.org/10.1594/PANGAEA.786883	freely available	Hempel (1985)		
	ANT-V/3	Ekau et al. (2012b), https://doi.org/10.1594/PANGAEA.786884	freely available	Schnack-Schiel (1987)		
	ANT-VII/4	Hureau et al. (2012), https://doi.org/10.1594/PANGAEA.786886	freely available	Arntz et al. (1990)		
	ANT-IX/3	Wöhrmann et al. (2012), https://doi.org/10.1594/PANGAEA.786887	freely available	Bathmann et al. (1992)		
	ANT-XXIII/8	Kock et al. (2012), https://doi.org/10.1594/PANGAEA.786888	freely available	Gutt (2008)		

Table 2. Continued.

Content	Name	Reference to raw data	Availability of raw data	Cruise report	Reference to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Fish larvae – *Pleuragramma antarctica* (abundances)	ANT-I/2	https://www.thuenen.de/en/sf/	request necessary	Drescher et al. (1983),	Boysen-Ennen and Piatkowski (1988)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Fish larvae – *Pleuragramma antarctica* (abundances)	ANT-III/3	Hubold et al. (1988), https://doi.org/10.1007/BF00443454	freely available	Hempel (1985)		https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Fish larvae – *Pleuragramma antarctica* (abundances)	Lazarev Sea Krill Study (LAKRIS) data: ANT-XXI/4, ANT-XXIII/6, ANT-XXIV/2	https://www.awi.de/forschung/biowissenschaften/polare-biologische-ozeanographie (data request: 13 December 2013)	request necessary	Smetacek et al. (2005) Bathmann (2008, 2010)	Flores et al. (2014)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Antarctic toothfish (catch per unit effort)	Japanese, Korean, Norwegian and South African fishing data	https://www.ccamlr.org (data request: 3 August 2016)	request necessary			https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
Demersal fish nesting sites	PS82 (ANT-XXIX/9)	Knust and Schröder (2014), https://doi.org/10.2312/BzPM_0680_2014	freely available	Schröder (2016)	La Mesa et al. (2019)	https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
	PS96 (ANT-XXXI/2)	Piepenburg (2016), https://doi.org/10.1594/PANGAEA.862097	freely available			
Demersal fish nesting sites		Daniels (1978, 1979), https://doi.org/10.1111/j.1095-8649.1978.tb04190.x https://doi.org/10.1126/science.205.4408.831	freely available			https://doi.org/10.1594/PANGAEA.899591 (Teschke et al., 2019c)
		Jones and Near (2012), https://doi.org/10.1111/j.1095-8649.2012.03282.x	freely available			
Birds						
Adélie penguin colonies (estimated abundances of breeding pairs)		Lynch and LaRue (2014), https://doi.org/10.1642/AUK-14-31.1	freely available			https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Breeding and non-breeding Adélie penguins (tracking data)	US AMLR Program (ID 910)	http://www.seabirdtracking.org/ (data request: 20 October 2015)	request necessary		Hinke et al. (2015)	https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Breeding and non-breeding Adélie penguins (tracking data)	BAS / Instituto Antártico Argentino data (ID 753)	http://www.seabirdtracking.org/ (data request: 20 October 2015)	request necessary		Warwick-Evans et al. (2019)	https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Breeding and non-breeding Adélie penguins (tracking data)	BAS Inventory (754, 773, 779)	http://www.seabirdtracking.org/ (data request: 20 October 2015)	request necessary		Dunn et al. (2011)	https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Breeding Adélie penguins (tracking data)	BAS Inventory (ID 764)	http://www.seabirdtracking.org/ (data request: 20 October 2015)	request necessary		Lynnes et al. (2002)	https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)

Table 2. Continued.

Content	Name	Reference to raw data	Availability of raw data	Cruise report	Reference to publications that have used the raw data (exemplarily)	DOI link to ArcMap packages
Pinnipeds						
Emperor penguin colonies (populations estimates)		Fretwell et al. (2012), https://doi.org/10.1371/journal.pone.0033751 Fretwell et al. (2014), https://doi.org/10.1371/journal.pone.0085285	freely available freely available			https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Antarctic petrel colonies (estimated number of breeding pairs)		Van Franeker et al. (1999), https://doi.org/10.2307/1521989	freely available			https://doi.org/10.1594/PANGAEA.899520 (Pehlke et al., 2019a)
Seal taxa (tracking data)	Data from: Australia (ct109, ct96), Brazil (ct56, ct46, ct39, ct22), China (ct105), UK (ct1, ct8, ct27, ct27x, ct40, ct43, ct45, ct49, ct58, ct70), France (ct16, ct62, ft01, ft02, ft11, ft12), Germany (ct21, ct35, ct35b, ct44, ct54, ct68, ct87, ct99, ct102, ct113, wd06, wd07), Norway (ct34), South Africa (ct33, ct50, ct73), USA (ct9, ct14, ct25, ct29, ct37, ct48)	http://www.meop.net/ (data request: 14 November 2016)	registration necessary		Treasure et al. (2017) Nachtsheim et al. (2019) Boehme et al. (2016)	https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)
Southern elephant seals (tracking data)		Tosh et al. (2009a), https://doi.org/10.1594/PANGAEA.692856 James et al. (2012a), https://doi.org/10.1594/PANGAEA.785852	freely available freely available		Tosh et al. (2009b) James et al. (2012b)	https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)
Weddell seals (tracking data)		McIntyre et al. (2013a), https://doi.org/10.1594/PANGAEA.818467	freely available		McIntyre et al. (2013b)	https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)
Crabeater seals (tracking data)		Nachtsheim et al. (2016a), https://doi.org/10.1594/PANGAEA.854842	freely available		Nachtsheim et al. (2016b),	https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)
Pack-ice seals (aerial surveys)	Antarctic Pack Ice Seals (APIS) programme EMAGE-I to -V	Plötz et al. (2011a–e), https://doi.org/10.1594/PANGAEA.760097 https://doi.org/10.1594/PANGAEA.760098 https://doi.org/10.1594/PANGAEA.760099 https://doi.org/10.1594/PANGAEA.760100 https://doi.org/10.1594/PANGAEA.760101	freely available		Southwell et al. (2012) Gurarie et al. (2017a, b)	https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)
Crabeater seal densities (predicted or observed)		Bester et al. (1995, 2002), https://doi.org/10.1017/S0954102095000502 https://doi.org/10.1017/S0954102002000676 Flores et al. (2008), https://doi.org/10.1016/j.dsr2.2007.12.024 Forcada et al. (2012), https://doi.org/10.1016/j.biocon.2012.02.002	freely available freely available freely available			https://doi.org/10.1594/PANGAEA.899619 (Pehlke et al., 2019b)

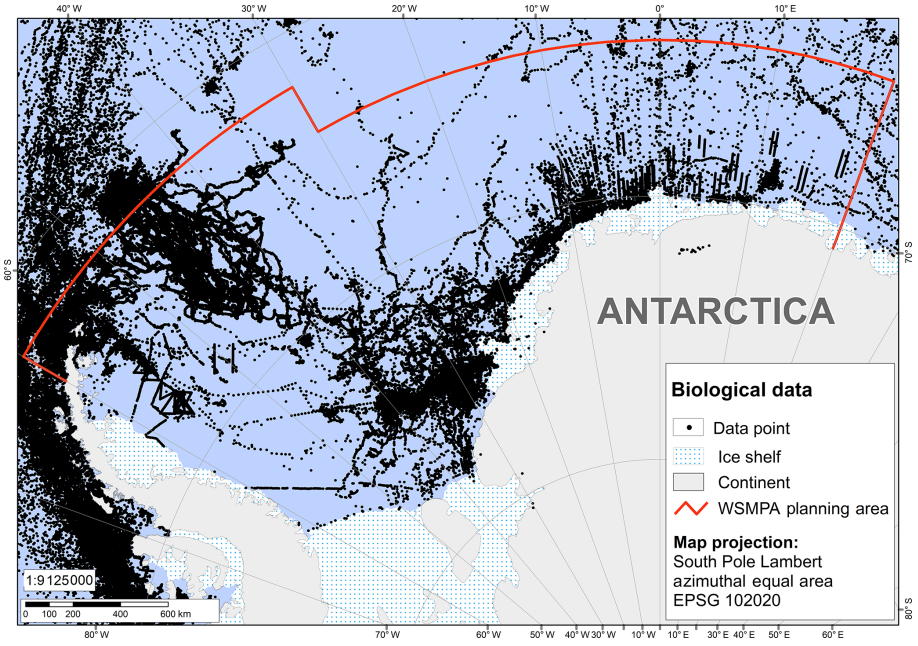

Figure 2. Distribution of all data recordings across the wider Weddell Sea region compiled in the context of the WSMPA planning initiative. Figure S1 in the Supplement provides the distribution of data recordings per higher taxonomic group, i.e. zooplankton, zoobenthos, fishes, birds and pinnipeds.

able at https://doi.org/10.1594/PANGAEA.899595 (Pehlke and Teschke, 2019) ("Pelagic regionalisation – clustering approach"). The clustering approach to classifying different pelagic provinces is described in the Supplement. In addition, the data sets were used as environmental variables in various geostatistical approaches to develop spatial distribution maps for (i) adult Antarctic krill (AMSR-E), (ii) ice krill (IBCSO, FESOM), (iii) echinoderms (FESOM), (iv) demersal fish (IBCSO, FESOM), (v) Antarctic toothfish (IBCSO), (vi) Antarctic petrel (IBCSO, AMSR-E, FESOM) and (vii) emperor penguins (AMSR-E). The methods used to develop the different spatial distribution maps are described in the Supplement, and the PANGAEA link to the respective data layer products (including file names) is given in the corresponding subsection under Sect. 2.4.

2.3.4 SeaWiFS data

Near-surface chlorophyll a concentration values stem from the Sea-Viewing Wide Field-of-View Sensor (SeaWiFS) measurements on board the OrbView-2 (formerly SeaStar) spacecraft (Table 1). The monthly aggregated data (1997 to 2010) were downloaded as level 3 standard mapped images (L3SMI) with a spatial resolution of 9 km × 9 km (data request: 9 September 2014).

2.3.5 WOA13 data

Data on dissolved oxygen, phosphate and nitrate were obtained from the World Ocean Atlas 2013 version 2 (WOA13 V2) (Garcia et al., 2014a, b) (Table 1). The data (1955 to 2012) were downloaded as monthly statistical means with a horizontal resolution of $1°\,(x) \times 1°\,(y)$ and 57 and 37 vertical (z) levels between 0 to 1500 and 0 to 500 m for dissolved oxygen and phosphate or nitrate, respectively. The data requests were made on 11 July 2013 (dissolved oxygen), 17 July 2013 (nitrate) and 18 July 2013 (phosphate), respectively.

2.3.6 Data on chemical sediment components

A data compilation of total organic carbon content and calcium carbonate and silica in surface sediments was downloaded from the data archive PANGAEA (Seiter et al., 2004a, b, c, and references therein) (see Table 1). Data on biogenic silica of the sediment surface were obtained from PANGAEA as well (Geibert et al., 2005b).

The data described under Sect. 2.3.4 to 2.3.6 were used as explanatory variables in the Antarctic krill species distribution model (SDM) (SeaWiFS, WOA13, chemical sediment components) and in the demersal fish SDM (WOA13, chemical sediment components). The SDMs are described in detail in the Supplement and the PANGAEA link to the respective data layer products (including file names) is given in the corresponding subsection under Sect. 2.4.

2.4 Ecological data

In the following, we describe the sources of raw data sets used in the WSMPA planning process and indicate which

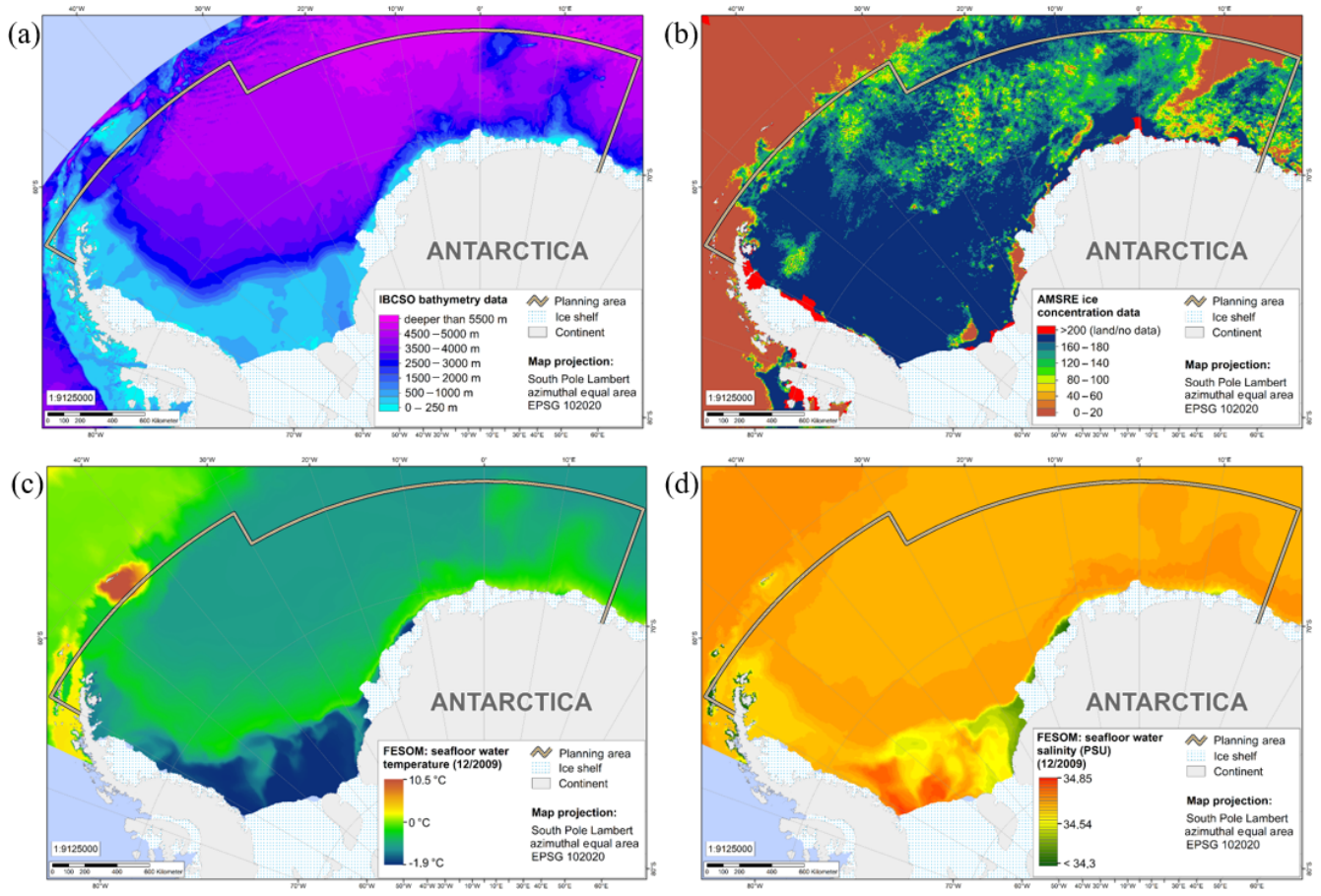

Figure 3. Raster data sets of environmental parameters, which have been used as basic data in a regionalisation analysis of environmental provinces in the context of the WSMPA planning: IBCSO bathymetry **(a)**, AMSR-E sea ice maps (exemplarily for 15 December 2009) **(b)**, FESOM sea bottom temperature and salinity data (exemplarily for December 2009) **(c, d)**.

data layer product was developed on the basis of which raw data sets. In addition, the methods for processing and analysing the data and for developing each data layer are described in detail in the Supplement.

2.4.1 Zooplankton

Antarctic krill (adults)

The WSMPA data collection of adult Antarctic krill (*Euphausia superba*) originates from (i) historical UK data from "Discovery Expeditions" (1928–1939) and data collected during the SIBEX cruise by British Antarctic Survey; (ii) five South African data sets from the 1990s; (iii) four Soviet data sets from 1998 and 1990; (iv) Polish data (Witek et al., 1985); and (v) German data from location discovery cruises with MV *Polarsirkel* in 1979/1980 and 1980/1981 (Siegel, 1982), RV *Walther Herwig* cruises (1975/1976, 1977/1978), and the 2004 Lazarev Sea Krill Survey (LAKRIS) (RV *Polarstern* cruise ANT-XXI/4) (Siegel, 2012). All of the data are publicly available via the database KRILLBASE (2013, https://doi.org/brg8) (Atkinson et al., 2017) (see Table S2 in the Supplement, which provides a detailed list of data used from KRILLBASE). The data from KRILLBASE were complemented by abundance data on *E. superba*, which were collected (a) during the Norwegian Antarctic research expedition 1976/1977 (MV *Polarsirkel*); (b) during two Soviet research cruises in 1977 and 1983; (c) in the context of the Lazarev Sea Krill Survey; and (d) during the RV *Polarstern* cruises ANT-V/1-3, ANT-VII/4, ANT-XVIII/4, and ANT-XXIX/3 (Table 2). Furthermore, fisheries data on *E. superba* for the WSMPA Planning Area (i.e. Statistical Subarea 48.5 and the southern part of Subarea 48.6) stem from the CCAMLR database (https://www.ccamlr.org; data request: 3 October 2013) (Table 2).

All of these data were used in a species distribution model (SDM) of adult Antarctic krill and ultimately led to a data layer product showing habitat suitability for adult Antarctic krill in the WSMPA Planning Area (see https://doi.org/10.1594/PANGAEA.899667, Teschke et al., 2019a; "Adult Antarctic krill, *Euphausia superba* – habitat suitability prediction").

Antarctic krill (larvae)

Abundance data on Antarctic krill larvae stem from (a) the Antarctic research expeditions 1976/1977 and 1979/1980 with MV *Polarsirkel*, (b) the First International BIOMASS Experiment survey (FIBEX), (c) the Lazarev Sea Krill Survey (LAKRIS), and the (d) RV *Polarstern* cruise ANT-VII/4 and the combined RV *Polarstern* (ANT-VIII/2) and RV *Akademik Fedorov* cruises (see Table 2).

All of the data on Antarctic krill larvae were used for an interpolation approach and led to a map of the interpolated abundances of krill larvae in the WSMPA Planning Area (see https://doi.org/10.1594/PANGAEA.899667, Teschke et al., 2019a; "Antarctic krill larvae, *Euphausia superba* – interpolated abundance").

Ice krill

Abundance data on adult ice krill (*Euphausia crystallorophias*) originate from pelagic trawl surveys during (a) the German Antarctic research cruise 1975/1976 with RV *Walther Herwig*; (b) the "Pre-Site Survey" 1979/1980 with MV *Polarsirkel*; (c) the Lazarev Sea Krill Survey; and (d) RV *Polarstern* cruises ANT-V/1-3, ANT-VII/4, and ANT-XXIX/3 (Table 2).

The abundance data on *E.crystallorophias* were used for an interpolation approach and led to a map showing the interpolated abundances of ice krill (see https://doi.org/10.1594/PANGAEA.899667, Teschke et al., 2019a; "Ice krill, *Euphausia crystallorophias* – interpolated density"). In addition, the abundance data on *E. crystallorophias* were used for "ground truthing" of the potential ice krill habitat (https://doi.org/10.1594/PANGAEA.899667, Teschke et al., 2019a; "Ice krill, *Euphausia crystallorophias* – pot habitat").

All data on *E. superba* and *E. crystallorophias* that were used, in addition to KRILLBASE and the CCAMLR database, are stored in the data warehouse of the Thünen Institute of Sea Fisheries (https://www.thuenen.de/de/sf, last access: 9 March 2020) and can be requested on demand.

2.4.2 Zoobenthos

Sponges

Abundance data and semi-quantitative data on sponges (higher taxonomic groups) that were compiled in the context of the WSMPA planning initiative, originate from zoobenthos data sets. The abundance data (Gerdes, 2014a–p) and the semi-quantitative data set (Teschke and Brey, 2020) are publicly available via PANGAEA (see Table 2).

Based on these data, we developed a map of the occurrence of sponges in the WSMPA Planning Area (https://doi.org/10.1594/PANGAEA.899645, Teschke et al., 2019b; "Sponges, Porifera – interpolated presence").

Echinoderms

The compiled data set on echinoderms consists of presence–absence data on a species level for asteroids and abundance data on ophiuroid taxa and holothurian taxa. The first two data sets are freely available in PANGAEA (Teschke and Brey, 2019a, b), and the latter is available from the following information system: http://biodiversity.aq/ (last access: 9 March 2020) (Gutt et al., 2014).

These data were used in a clustering approach to ultimately identify the potential habitat for echinoderms in the WSMPA Planning Area by environmental proxies (https://doi.org/10.1594/PANGAEA.899645, Teschke et al., 2019b; "Special echinoderm assemblage – pot habitat").

2.4.3 Fish

Antarctic silverfish and demersal fish

The WSMPA data collection on Antarctic silverfish larvae (*Pleuragramma antarctica*) originates from quantitative zooplankton data sets obtained during the RV *Polarstern* cruises ANT-I/2 and ANT-III/3 and during the Lazarev Sea Krill Survey (LAKRIS) (Table 2). The ANT-I/2 data are stored in the data warehouse of the Thünen Institute of Sea Fisheries and can be requested on demand (https://www.thuenen.de/de/sf). Data on fish larvae from ANT-III/3 are available from Hubold et al. (1988), and the LAKRIS data can be requested from https://www.awi.de/forschung/biowissenschaften/polare-biologische-ozeanographie (data request: 13 December 2013).

Abundance data on demersal fish and adult *P. antarctica* stem from benthic and pelagic trawl surveys from six RV *Polarstern* cruises between 1996 and 2011 (Table 2) and are published in PANGAEA (Knust, 2020 and references therein, i.e. Balguerías and Knust, 2020; Knust and Schröder, 2020; Knust et al., 2020a–d). This data compilation was complemented by data on demersal fish and *P. antarctica* derived from trawl and dredge surveys published in PANGAEA (Drescher et., 2012; Ekau et al., 2012a, b; Hureau et al., 2012; Kock et al., 2012; Wöhrmann et al., 2012).

All abundance data on Antarctic silverfish (adults and larvae) were used for an interpolation approach and led to a map of the interpolated abundances of *P. antarctica* in the WSMPA Planning Area (https://doi.org/10.1594/PANGAEA.899591, Teschke et al., 2019c; "Antarctic silverfish, *Pleuragramma antarctica* – interpolated abundance").

All data on demersal fish were used in a SDM and led to a data layer product showing the habitat suitability for demersal fish in the WSMPA Planning Area (see https://doi.org/10.1594/PANGAEA.899591, Teschke et al., 2019c; "Demersal fish – habitat suitability prediction").

Antarctic toothfish (adults)

Fishery data on the Antarctic toothfish (*Dissostichus mawsoni*) for the WSMPA Planning Area (i.e. Statistical Subarea 48.5 and southern part of Subarea 48.6) were taken from the CCAMLR database (https://www.ccamlr.org; data request: 3 August 2016) (Table 2).

The data were used to determine the potential habitat of *D. mawsoni* in the WSMPA Planning Area (see https://doi.org/10.1594/PANGAEA.899591, Teschke et al., 2019c; "Adult toothfish, *Dissostichus mawsoni* – pot habitat").

Demersal fish nesting sites

Information about nesting sites of demersal fish was collected during the RV *Polarstern* cruises PS82 (Knust and Schröder, 2014) and PS96 (Piepenburg, 2016). The data collected during the RV *Polarstern* cruises were supplemented by data from the literature (Daniels, 1978, 1979; Jones and Near, 2012). The map with the locations of the nesting sites of demersal fish is available at PANGAEA (https://doi.org/10.1594/PANGAEA.899591, Teschke et al., 2019c; "Demersal fish – observation of nesting sites") and is also shown in the Supplement (see Fig. S12).

2.4.4 Flying and non-flying seabirds

Breeding and non-breeding Adélie penguins

Tracking data on breeding and non-breeding Adélie penguins (*Pygoscelis adeliae*) originate from (i) British Antarctic Survey (BAS) inventory data (ID 754, 764, 773, 779), (ii) a data set from BAS and Instituto Antártico Argentino (ID 753), and (iii) a data set from the US AMLR Program (NOAA) (ID 910) (see also Table 2). All the data are stored in Birdlife International's Seabird Tracking Database (http://www.seabirdtracking.org/; data request: 20 October 2015). Adélie penguin breeding locations and estimated abundances of breeding pairs were derived from Lynch and LaRue (2014).

The tracking data on *P. adeliae* were used to model the probability of breeding and non-breeding *P. adeliae* occurrence during foraging (https://doi.org/10.1594/PANGAEA.899520, Pehlke et al., 2019a; "Breeding Adélie penguin, *Pygoscelis adeliae* – modelled foraging trip" and "Non-breeding Adélie penguin, *Pygoscelis adeliae* – modelled foraging trips"). The final data layer product for breeding *P. adeliae* also depicts breeding locations, estimated abundances of breeding pairs and buffer areas around each colony.

Breeding emperor penguins

Data on emperor penguin (*Aptenodytes forsteri*) colony locations and breeding population estimates were derived from Fretwell et al. (2012, 2014) (Table 2).

These data were used to develop a probability map of foraging areas for *A. forsteri* (https://doi.org/10.1594/PANGAEA.899520, Pehlke et al., 2019a; "Breeding emperor penguin, *Aptenodytes forsteri* – modelled foraging areas").

Antarctic petrels

Information on breeding locations and estimated number of breeding pairs of the Antarctic petrel (*Thalassoica antarctica*) is published in Van Franeker et al. (1999) (Table 2).

The information on breeding pairs and their colony locations is shown in the final data layer product next to modelled foraging habitats of *T. antarctica* (https://doi.org/10.1594/PANGAEA.899520, Pehlke et al., 2019a; "Antarctic petrel, *Thalassoica antarctica* – modelled foraging areas").

2.4.5 Pinnipeds

Tracking data from pinnipeds were obtained from the MEOP data portal "Marine Mammals Exploring the Oceans Pole to Pole" available via http://www.meop.net/ (data request: 14 November 2016) (see Table 2 for a detailed list of data used). Furthermore, the data from the MEOP data portal were complemented by tracking data sets on southern elephant seals (Tosh et al., 2009a, b; James et al., 2012a, b), Weddell seals (McIntyre et al., 2013a, b) and crabeater seals (Nachtsheim et al., 2016a, b) stored in PANGAEA.

All of these tracking data were used to model the probability of seal occurrence during foraging (https://doi.org/10.1594/PANGAEA.899619, Pehlke et al., 2019b; "Seal abundance – modelled prediction values").

Point data from pack-ice seals (unspecified taxa) based on aerial surveys are from Plötz et al. (2011a–e) and were downloaded from PANGAEA (Table 2). These data were sampled during five flight campaigns from 1996 to 2001 within the Antarctic Pack Ice Seals (APIS) programme. Additionally, information on crabeater seal density (predicted or observed) was derived from Bester et al. (1995, 2002), Flores et al. (2008) and Forcada et al. (2012; Table 2).

All the APIS point data and information on seal densities were used to develop a map showing the distribution patterns of seals in the WSMPA Planning Area (https://doi.org/10.1594/PANGAEA.899619, Pehlke et al., 2019b; "Seal abundance – modelled and interpolated prediction values").

3 Data availability

Detailed information on how the data were compiled can be found in Sect. 2.2.

4 Outlook

This is the first compilation of data sources for the Antarctic Weddell Sea and adjacent seas that considers data across the entire ecosystem, i.e. from abiotic data, such as bathymetry and sea ice, to ecological data, ranging from zooplankton and zoobenthos to fish, birds, and marine mammals. The effort to create such a compilation of data sources was directly coupled with the initiative to develop a WSMPA. However, our compilation of data sources will facilitate the future research on fauna, ecology and nature conservation in the Weddell Sea. Using our systematic overview of available data for the development of a specific data collection, future projects can avoid performing this time-consuming multi-parameter data search from scratch. In addition, our work serves to guide future studies aimed at closing data gaps in the wider Weddell Sea region and/or simply pointing to specific data sets that may be of particular interest to future generations (baseline is a particular issue). For example, some of the ecological data sets were collected in the 1980s and earlier, when the Weddell Sea was still almost pristine and hardly affected by any anthropogenic activities, thus these data sets are optimally suited to describe a reference state for assessing the effect of pressures on the Weddell Sea ecosystem. In addition, the ecological data – with a few exceptions – provide information on abundances of the respective taxa and are therefore better suited for use as an indicator for environmental changes than presence–absence data or presence data only. Ultimately, the compilation of data sources serves to motivate researchers to incorporate further data, both from existing "paper sources" and from future measurements, into existing data repositories and archives.

Subsequent work will focus on the development of an efficient and tailor-made management system for the storage of these complex and heterogeneous data and information on WSMPA data compilation and automated data mining, handling and analysis. This system will serve three purposes: (i) to better enable a more holistic and integrative approach towards ecosystem research in the Weddell Sea in general; (ii) to enable the management of the WSMPA to carry out the tasks of the Research and Monitoring Programme as a mandatory part of an MPA under CCAMLR when adopting the MPA; and (iii) to provide key stakeholders and the public with access to data, information, and management measures related to the ecosystem of the Weddell Sea region in general and the WSMPA in particular. The CCAMLR MPA Information Repository (CMIR) currently being developed by the CCAMLR Secretariat will also be available in the future as a suitable storage location for metadata on CCAMLR MPAs in Antarctica.

Supplement. The supplement related to this article is available online at: https://doi.org/10.5194/essd-12-1003-2020-supplement.

Author contributions. KT collected all of the data together, described the metadata and led the writing of the paper. HP took over the technical part of the data acquisition (retrieval, storage, processing). VS collected and prepared the data on zooplankton for further analyses within the WSMPA planning process. HB and RK were significantly involved in the collection of the data on pinnipeds and fishes, respectively. TB contributed to the writing of the paper.

Competing interests. The authors declare that they have no conflict of interest.

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