DOI 10.15517/RBT.V67IS5.38937
Artículo

Polychaetes from Burdwood Bank: "Namuncurá I" Marine Protected Area and slope, SW Atlantic Ocean
Poliquetos del Banco Burdwood: Área Marina Protegida "Namuncurá I" y Talud. SO del Oceano Atlántico

Claudia Bremec[1]
Rodolfo Elías[2]
Sofía Calla[3]
Gabriel Genzano[1]
Alejandro Puente Tapia[1]
Laura Schejter[4]

[1] Estación Costera J.J. Nagera, Universidad Nacional de Mar del Plata. Funes 3350, 7600 Mar del Plata, Argentina. Instituto de Investigaciones Marinas y Costeras, Consejo Nacional de Investigaciones Científicas y Técnicas (IIMyC- CONICET), Argentina; claudiasilviabremec@gmail.com
[2] Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Mar del Plata, Deán Funes 3350, B7602AYL Mar del Plata, Argentina; roelias@mdp.edu.ar
[3] Museo Argentino de Ciencias Naturales «Bernardino Rivadavia", Av. Ángel Gallardo 470, C1405DJR Buenos Aires, Argentina. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET); sofialcalla@gmail.com
[4] Instituto Nacional de Investigación y Desarrollo Pesquero (INIDEP). Paseo Victoria Ocampo N°1, 7600, Mar del Plata, Argentina. Instituto de Investigaciones Marinas y Costeras, Consejo Nacional de Investigaciones Científicas y Técnicas (IIMyC- CONICET), Argentina; corresponding author, schejter@inidep.edu.ar

Received 30-XI-2018
Corrected 03-V-2019
Accepted 30-VI-2019

Abstract
Introduction: The first open-sea (non-coastal) Marine Protected Area in Argentina, named "Namuncurá I" (NMPA), was created in 2013 at Burdwood Bank (BB), an undersea plateau located about 200 km south from Malvinas Islands (Falkland Islands) and 150 km east from Staten Island, SW Atlantic Ocean. It comprises three different management areas: the central one ("core", strict protection, only control and monitoring activities), surrounded by a "buffer" area (authorized activities, e.g. scientific research) and an external "transition" area (productive and extractive activities contemplated in the Management Plan). Beyond the transition area, only the southern shelf-break is protected, after the creation of the "Namuncurá II" MPA in December 2018. **Objective:** provide the inventory of polychaetes collected during 2016 and 2017 at the core (98 m depth), buffer (128 m depth), transition (133 m-189 m depth) areas of the Namuncurá I MPA, together with slope areas (220 m-798 m depth). **Methods:** taken with a trawl net used to characterize the faunal assemblages and to compare results with other Magellan areas.

Multidimensional Scaling (MDS) and Cluster Analysis (CA) were applied to a Bray-Curtis similarity index to assess polychaete assemblages in the NMPA - BB slope and Magellan region respectively; SIMPER (Similarity Percentage Analyses) and ANOSIM (Analysis of Similarities) were performed. **Results:** A total of 918 individuals, which correspond to 39 taxa distributed in 22 families, were recorded in samples from NMPA and BB slope, mainly epibenthic or associated with the large corals collected. *Ampharete kerguelensis* McIntosh, 1885; *Hyalinoecia artifex* Verrill, 1880; *Idanthyrsus macropaleus* (Schmarda, 1861); *Laetmonice producta* Grube, 1877; *Onuphis pseudoiridescens* Averincev, 1972; *Pista mirabilis* McIntosh 1885 and *Terebellides malvinensis* Bremec & Elias, 1999 constitute new records for Burdwood Bank. A similar polychaete assemblage characterized the three areas of NMPA and slope locations, while *H. artifex* characterized locations at the NW deepest slope of the bank. **Conclusions:** These results indicate strong connections between the fauna collected at NMPA and the polychaetes assemblage in other Magellan areas dominated by soft bottoms. The biogeographic importance of the BB as connection for benthic polychaete species between South America and the Antarctic Peninsula merits future investigation.

Key words: new Marine Protected Area; Burdwood Bank; polychaetes; SW Atlantic Ocean.

Resumen

Introducción: La primera Área Marina Protegida de mar abierto (no costera) en Argentina, llamada "Namuncurá I" **(**AMPN), fue creada en 2013 en el Banco Burdwood (BB), una plataforma sumergida ubicada unos 200 km al sur de las Islas Malvinas y 150 km al Este de la Isla de los Estados. En el Océano Atlántico SO. El área comprende tres diferentes áreas de manejo: la central ("el núcleo", con protección estricta, solo Control y actividades de monitoreo), rodeada por un área "de amortiguación" (solo actividades autorizadas, como investigación científica) y un área externa de "transición" (se contemplan actividades productivas y extractivas en el Plan de Manejo). Más allá del área de transición, el talud y las áreas adyacentes no presentan medidas de protección. **Objetivos:** proporcionar un inventario de poliquetos colectados durante 2016 y 2017 en el Núcleo (98 m de profundidad), de Amortiguación (128 m), de Transición (133 m-189 m) y Talud (220 m-798 m). **Métodos:** las muestras fueron obtenidas con una red de arrastre para caracterizar las asociaciones faunísticas y para compararlas con otras áreas Magallánicas. Análisis de Escalamiento Multidimensional y de agrupamiento aglomerativo jerárquico fueron aplicados a una matriz de similaridad de Bray-Curtis para determinar las asociaciones de poliquetos en el AMP – Talud del BB y región Magallánica, respectivamente. **Resultados:** Un total de 918 individuos, que corresponden a 39 taxones distribuidos en 22 familias, fueron registrados en las muestras del AMPN y talud del BB, mayormente epibentónicos o asociados a grandes corales. *Ampharete kerguelensis* McIntosh, 1885; *Hyalinoecia artifex* Verrill, 1880; *Idanthyrsus macropaleus* (Schmarda, 1861); *Laetmonice producta* Grube, 1877; *Onuphis pseudoiridescens* Averincev, 1972; *Pista mirabilis* McIntosh 1885 y *Terebellides malvinensis* Bremec & Elias, 1999 constituyen nuevos registros para el Banco Burdwood. Un ensamble de poliquetos similar caracteriza a las tres áreas del AMPN y talud, mientras que *H. artifex* caracteriza los sitios más profundos del talud del banco. **Conclusiones:** Estos resultados indican una fuerte conexión entre la fauna colectada en el NMPA y los ensambles de poliquetos de sustratos blandos de otras áreas Magallánicas. La importancia biogeográfica del BB como una conexión entre Sudamérica y la Península Antártica justifican futuras investigaciones.

Palabras clave: Nueva Área Marina Protegida; Banco Burdwood; Poliquetos; Océano Atlántico Sudoccidental.

Introduction

Most of the research on polychaetes (annelids) collected in southern regions refers to subantarctic species from the Patagonian shelf, the Strait of Magellan and Antarctica collected during international exploratory cruises (Blake, 1983; Bremec & Elías, 1999; Gambi & Mariani, 1999; Hartman, 1953, 1966; Hartmann-Schroeder, 1983; Hartmann-Schroeder & Hartmann, 1962; Lana & Bremec, 1994; Mariani, Gambi, Lorenti, & Mazzella, 1996; Montiel, Gerdes, Hilbig, & Arntz, 2005, Montiel, Gerdes, & Arntz, 2005; Montiel, Quiroga, & Gerdes, 2011; Orensanz, 1974, 1990; Rozbaczylo, Ríos, & Mutschke, 1997; Sanfilippo, 1994; Uschakov, 1962; Wesenberg-Lund, 1962; Bremec, Elías, & Gambi, 2000; Bremec, Souto, & Genzano, 2010; Elías, Bremec, Lana, & Orensanz, 2003). In particular at Burdwood Bank (BB), a few locations were sampled in the last decades during "Walther Herwig" (1978, stations 595 and 596; Hartmann-Schroeder, 1983), "Shinkai Maru" (1978-1979, stations 133, 135 and 138; Bremec et al., 2010) and "Polarstern" (2002, stations 145 and 150; Montiel et al., 2003) cruises. The plateau represents one of the "stepping stones" linking the southern tip of South America with the Antarctic Peninsula (Thomson, 2004; Arntz, Lovrich, & Thatje, 2005; Griffiths, Linse, & Barnes, 2008) and, in the case of polychaetes, faunal relationships between the Magellan region and the Antarctic continent were not established. Apart from a single taxon, orbiniid species found in the Southern Ocean are effectively isolated from South American species (Blake, 2017). It was suggested that comparable studies are needed to investigate affinities between both neighboring ecosystems, separated only by the Drake Passage and the Antarctic Convergence (Cañete, Leighton, & Aguilera, 1999; Montiel, Gerdes, Hilbig et al., 2005; Montiel, Gerdes et al., 2005).

BB is a segment of the North Scotia Ridge in the SW Atlantic Ocean, located between 54°-55° S and 56°-62° W. This undersea plateau is located about 200 km south from Malvinas Islands (Falkland Islands) and about 150 km east from Staten Island, Tierra del Fuego Province. The rocky slopes of the bank rise from more than 4 000 m depth in the Yaghan Basin (Drake Passage) to form a wide plateau with depths that vary between 50 m and 200 m, where the bottom abruptly breaks into a wall reaching 1 100 m to more than 3 000 m depth. The direct influence of the Antarctic Circumpolar Current and persistent westerlies blowing at 50° S make the region an extremely dynamic environment of subantarctic water, fairly homogeneous vertically in the plateau (without a thermocline), ranging seasonally from 4 to 9 ºC and with a mean salinity of 34 (Piola & Gordon, 1989; Guerrero, Baldoni, & Benavides, 1999). BB is surrounded by the Malvinas Current, a branch of the Circumpolar Antarctic Current that flows from the Drake Passage, which is one of the most important and nutrient rich currents of the sea (Piola & Gordon, 1989; Lutz et al., 2010). Although the existence of BB has been known since 1842 (Findlay, 1867), the benthic realm has been only scarcely studied.

The first open-sea (non-coastal) Marine Protected Area in Argentina, named "Namuncurá I" (NMPA, National Law 26875, Argentina), was created in 2013 at Burdwood Bank, Argentine Sea, and comprises nearly 28 000 km^2 circumscribed by the 200 m isobath. It comprises three different management areas according to the protection level required: the central "core" (strict protection, only control and monitoring activities), surrounded by a "buffer" area (authorized activities, e.g. scientific research) and an external "transition" area (productive and extractive activities contemplated in the Management Plan). Beyond the transition area, only the southern shelf-break is protected since December 2018, when the "Namuncurá II" MPA was created (National Law

27490, Argentina). After recent research cruises, Schejter et al. (2016) preliminary recorded nearly 250 species of epibenthic organisms, and particular studies on Peracarida (Doti et al., 2014; Chiesa, Urteaga, Martínez, Doti, & Roccatagliata, 2015), Cnidaria (Cairns, 2012), Porifera (Schejter, Bertolino, & Calcinai, 2017) and Asteroidea (Fraysse, Calcagno, & Pérez, 2018) were developed. The present objectives are to provide the inventory of polychaetes collected at the core (98 m depth), buffer (128 m depth) and transition (133-189 m depth) areas of NMPA and BB slope (220-798 m depth), where intensive sampling with trawls was performed to characterize the faunal assemblages and to explore affinities of the polychaete fauna between BB and other Magellanic areas.

Materials and methods

The NMPA and BB slope (S) were sampled during three research cruises onboard the GC-189 "Pr. García" (December 2015) and RV "Puerto Deseado" (March-April 2016; April-May 2017). Samples were taken in 30 stations (Fig. 1, Table 1) with bottom trawls of 10 mm mesh size. Faunal comparison with other Magellan areas was made using presence-absence data (due to the different sampling tools employed) from neighboring areas (N), Staten Island and coastal waters of Tierra del Fuego (TDF), and the Patagonian shelf (PS) (Table 2). Samples from N were collected during the "Puerto Deseado" 2017 expedition. Samples collected during "GC-189 Pr. García" 2015 and used for this regional comparison were collected with bottom trawls of 2mm mesh size (Güller, Abelando, Urcola, & Zelaya, 2015). Other additional polychaete data come from "Shinkai Maru" cruises IV, V, X and XI, collected with Picard dredge from soft bottoms and sieved with 1mm mesh screen (Bremec et al., 2010). Specimens collected during "Puerto Deseado" 2016-2017 and "GC-189 Pr. García" 2015 cruises were fixed in 4 % formaldehyde, preserved in alcohol 70 % and identified at the lowest taxonomic level possible. Taxonomic determinations were made based on Hartman, 1953, 1966; Wesenberg-Lund, 1962; Blake, 1983; Lana & Bremec, 1994; Bremec & Elías, 1999; Boggemann & Orenzanz, 2007; Barnich, Orensanz, & Fiege, 2012. Taxonomy and distribution were matched against the Register of Antarctic Marine Species (Clarke & Johnston, 2003), Bremec & Giberto (2008), Orensanz, Diez, Ferrando, & Trovant (2012), World Register of Marine Species (Horton et al., 2018) and Ocean biogeographic information system [OBIS] (2018) to ensure that synonymies or misspellings were removed, as well as to compare the known distribution to that recorded in this study.

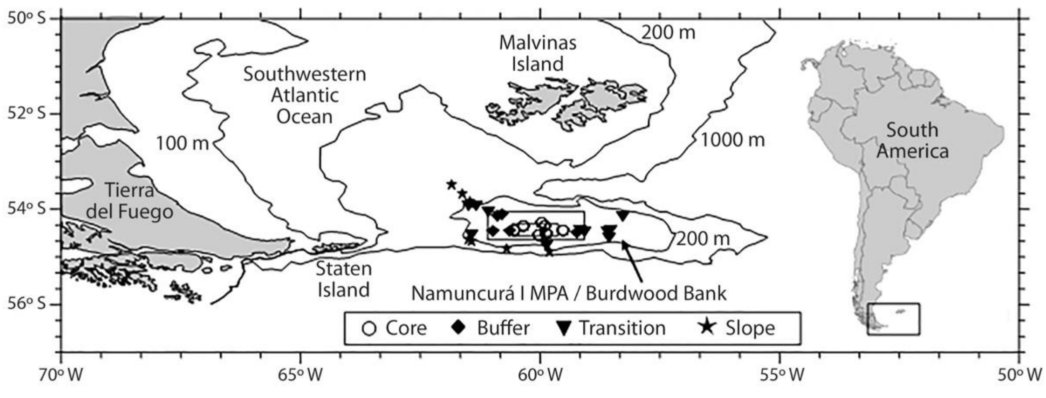

Fig. 1. Location of the sampling sites at Burdwood Bank in the different areas of Namuncurá Marine Protected Area and slope.

Table 1
Geographical position, depth and cruise information of the stations sampled at Burdwood Bank Slope (BBS), Transition (MPA-T), Buffer (MPA-B) and Core (MPA-C) areas during cruises "Puerto Deseado 2016" (BBB 16), "Puerto Deseado 2017" (PD BB 17) and "GC Pr. García 2015" (GC 15)

Site	Cruise	Date (d/m/y)	Station	Haul	Sub-area	Lat. °S	Long. °W	Depth (m)
A	BBB16	13/04/2016	18	266	BBS	-54.8209833	-60.7035833	607
B	BBB16	13/04/2016	21	239	BBS	-54.8869667	-59.815	785
C	BBB16	13/04/2016	23	226	MPA-T	-54.7596	-59.8689167	182
D	BBB16	29/03/2016	26	27	MPA-T	-54.4158	-58.5151667	137
E	BBB16	28/03/2016	27	11	MPA-T	-54.16775	-58.2726167	100
F	BBB16	30/03/2016	28	52	MPA-B	-54.4593833	-59.2201667	128
G	BBB16	10/04/2016	30	184	MPA-C	-54.2884833	-59.9507833	96
H	BBB16	10/04/2016	31	197	MPA-C	-54.4993667	-59.8588667	109
I	BBB16	30/03/2016	32	77	MPA-C	-54.5433167	-60.0213167	98
J	BBB16	8/04/2016	33	159	MPA-B	-54.4295333	-60.6477167	101
K	BBB16	7/04/2016	34	146	MPA-B	-54.4543	-60.9803333	100
L	BBB16	31/03/2016	35	89	MPA-T	-54.5319833	-61.4385167	125
M	BBB16	19/04/2016	36	306	MPA-T	-53.9298833	-61.4956	185
N	BBB16	29/04/2016	38	39	MPA-T	-54.5887333	-58.5472167	135

O	BBB16	19/04/2016	40	320	BBS	-54.6167667	-61.4208333	415
P	PD BB 17	28/04/2017	16	131	BBS	-54.600012	-61.5100102	294
Q	PD BB 17	1/05/2017	23	173	MPA-C	-54.43342	-59.5033434	91
R	PD BB 17	1/05/2017	24	184	MPA-C	-54.33334	-59.8950179	97
S	PD BB 17	9/05/2017	25	304	MPA-C	-54.3450069	-60.3450069	104
T	PD BB 17	9/05/2017	26	317	MPA-B	-54.100002	-60.7100142	120
U	PD BB 17	9/05/2017	27	326	MPA-B	-54.1066688	-60.8783509	128
V	PD BB 17	8/05/2017	29	283	MPA-T	-53.8150163	-61.3200064	197
W	PD BB 17	8/05/2017	30	273	BBS	-53.8216831	-61.4733428	209
X	PD BB 17	7/05/2017	31	269	BBS	-53.66668	-61.6366794	642
Y	PD BB 17	7/05/2017	33	256	BBS	-53.466676	-61.8416835	595
Z	PD BB 17	30/04/2017	21	157	MPA-T	-54.4250085	-58.5250105	138
A´	GC 15	12/12/2015	14	8b	MPA-C	-54.439467	-60.652217	99
B´	GC 15	13/12/2015	17	1	MPA-T	-54.4855	-59.081217	138
C´	GC 15	13/12/2015	17b	2	MPA-T	-54.45215	-59.1285	138
D´	PD BB 17	8/05/2017	28	287	MPA-T	-54.0533344	-61.0950019	140

Table 2

Geographical position and depth of the stations sampled at Burdwood Bank Neighboring locations (N), Tierra del Fuego (TDF), Patagonian Shelf (PS) and Namuncurá Marine Protected Area (MPA) during “Puerto Deseado 2017” (PD), “GC Pr. García 2015” (GC) and “Shinkai Maru 1978-1979” (SM) cruises

Cruise	Station	Area	Lat °S	Long. °W	Depth (m)
PD	34	N	-53.5680114	-62.9656026	516
PD	35	N	-53.5747782	-63.9987033	236
PD	36	N	-53.7297479	-64.5076435	137
GC	1	TDF	-54.894583	-67.675783	75
GC	2	TDF	-54.9124	-67.235733	38
GC	3	TDF	-54.958333	-66.919817	64
GC	4	TDF	-55.065433	-66.68285	38
GC	4B	TDF	-55.09805	-66.3373	45
GC	5	TDF	-55.041333	-66.074417	86
GC	6	TDF	-55.006767	-65.828	103
GC	6B	TDF	-54.956267	-65.4572	56
GC	FH	TDF	-54.8965	-67.313883	25
SM V	36	PS	-43.4504234	-63.4682603	72
SM V	37	PS	-43.51677	-61.9843635	91
SM X	40	PS	-43.45009	-59.53344	145
SM X	44	PS	-44.5001	-62.48343	103
SM IV	55	PS	-46.55011	-65.5171034	79
SM XI	55	PS	-46.51677	-65.45009	72
SM XI	57	PS	-46.5001	-63.43342	115
SM X	59	PS	-46.46676	-61.5001	121
SM IV	60	PS	-46.48343	-60.46676	155
SM XI	78	PS	-49.48343	-64.48343	120
SM V	79	PS	-49.4505901	-62.4675935	152
SM V	81	PS	-49.5001	-60.5337734	178
SM XI	82	PS	-49.46676	-60.46676	188
SM IV	89	PS	-50.483343	-65.50001	117
SM XI	92	PS	-50.450009	-63.583345	154
SM IV	93	PS	-50.516677	-60.483343	154
SM X	95	PS	-50.483343	-59.483343	152
SM IV	96	PS	-50.533344	-57.933352	143
SM V	99	PS	-51.5339401	-67.5842835	100
SM V	101	PS	-51.4847636	-65.5337734	134
SM V	102	PS	-51.5014336	-63.3175635	180

SM XI	101	PS	-51.40008	-65.48343	135
SM XI	105	PS	-51.48343	-61.8335	192
SM X	106	PS	-51.63346	-57.30006	189
SM IV	108	PS	-52.516677	-67.300006	92
SM IV	111	PS	-52.483343	-64.583345	183
SM XI	111	PS	-52.616679	-65.516677	125
SM IV	119	PS	-53.516677	-66.450009	95
SM XI	120	PS	-53.416675	-66.550011	92
SM X	122	PS	-53.300006	-64.416675	169
SM IV	128	TDF	-54.5001	-64.41675	111
SM X	128	PS	-54.33334	-65.466676	93
SM X	133	MPA	-54.26672	-60.05001	100
SM X	135	MPA	-54.5001	-58.5001	133
SM X	138	MPA	-54.5001	-56.58345	135
SM V	Ad3	PS	-49.4177502	-63.4344202	145
SM XI	Ad3	PS	-44.56678	-65.01667	82
SM XI	Ad5	PS	-47.06668	-65.45009	70
SM XI	Ad11	TDF	-54.21671	-66.55011	55
SM XI	Ad14	PS	-43.55011	-59.8335	116

Multidimensional Scaling (MDS) and Cluster Analysis (CA) were applied to a Bray-Curtis similarity index to assess polychaete assemblages in the NMPA - BB slope and Magellan region respectively. Similarity Percentage Analyses (SIMPER) was applied to describe the contribution of species to the dissimilarity between groups of stations. An Analysis of Similarities (ANOSIM) was carried out between samples located in the NMPA and BB slope to assess polychaete assemblages inside and outside the NMPA, and between samples from NMPA, S, N, TDF and PS to analyze polychaete distribution patterns in the Magellan region, considering the null hypothesis of no differences between areas. We used PRIMER version 6.1 (Clarke & Gorley, 2006) with presence-absence data, excluding unique findings.
Voucher specimens of the polychaetes collected during recent cruises were deposited at the Museo Argentino de Ciencias Naturales “Bernardino Rivadavia”, Buenos Aires, Argentina.

Results

A total of 918 individuals, which correspond to 39 taxa distributed in 22 families, were recorded in samples from NMPA and BB slope (Table 3). Terebellidae and Polynoidae were the most diverse families, represented by five taxa each. *Polyeunoa laevis* McIntosh, 1885 and *Serpula* *narconensis* Baird, 1865 were most frequently collected in the different zones of NMPA and BB slope. *Nicolea chilensis* (Schmarda, 1861), *Trypanosyllis gigantea* McIntosh, 1885, *Eunereis patagonica* (McIntosh, 1885) and *Eucranta* sp. were commonly registered within the MPA, although present once at the slope of the bank. *Chaetopterus antarcticus* Kinberg, 1866 (see Moore, Nishi, & Rouse, 2017) was frequent in samples taken at the core zone of NMPA, where the total number of taxa was 22. The number of taxa was 13 and 32 at the buffer and transition zones of NMPA respectively. Samples from the slope included 14 polychaete taxa, with *H. artifex* and *Nicon maculata* Kinberg, 1866 as exclusive species. According to the current literature (Bremec & Giberto, 2008; Orensanz et al., 2012; Horton et al., 2018; OBIS, 2018), *A. kerguelensis* (ampharetid), *H. artifex* (onuphid), *I. macropaleus* (sabellariid), *L. producta* (aphroditid), *O. pseudoiridescens* (onuphid), *P. mirabilis* (terebellid) and *T. malvinensis* (trichobranchid) constitute new records for BB (Fig. 2).

Table 3

Polychaete taxa recorded at the sites (see Table 1) sampled at Burdwood Bank Slope (BB-Slope), Transition (MPA-Transition), Buffer (MPA-Buffer) and Core (MPA-Core) areas during the cruises and sites referred in Table 1

Taxa recorded	MPA-Core	MPA-Buffer	MPA-Transition	BB-Slope	N° Sites
Aglaophamus virginis (Kinberg, 1866)	A′		E,B′		3
Ampharete kerguelensis Mclntosh, 1885			B′		1
Anobothrus sp.			C		1
Boccardia sp.	S		D′,V		3
Chaetopterus antartcticus Kinberg, 1866	H, I, Q, R	F			5
Eteone aurantiaca Schmarda, 1861	H, Q, R, S	U	D′, T		7
Eucranta sp.	Q, R, S	J, K, T, U	C, D, E, M, D′		12
Eunereis patagonica (Mclntosh, 1885)	Q, R, A′	J, K, T, U	E, M, N, D′, Z	P	13
Eunice pennata (Muller, 1776)			C, E		2
Glycera capitata Orsted, 1843			C, E, B′		3
Harmothoe sp.			V	X	2
Hermadion magalhaensi Kinberg, 1855	I	F	L	O	4
Hyalinoecia artifex Verrill, 1880				X,Y	2

Idanthyrsus macropaleus (Schmarda, 1861)	S		D′		2
Laetmonice producta Grube, 1877	A′				1
Lanice sp.			E		1
Lumbrineridae unid.			D, N, B′		3
Maldanidae unid.			B′		1
Nephtys sp.		F			1
Nicolea chilensis (Schmarda, 1861)	I, R, S	J, K, T, U	E, M, N, D′, Z	W	13
Nicon maculata Kinberg, 1866				B, O, A, W	4
Oenonidae unid.			D, N		2
Onuphis pseudoiridescens Averincev, 1972	A′		B′		2
Paraonidae unid.			B′		1
Phyllodocidae unid.	A′		B′		2
Pista mirabilis Mdntosh, 1855			C, D′, V, B′	W, P	6
Polyeunoa laevis Mclntosh, 1855	G, H, I, Q, S, A′	J, T, U	C, D, M, N, L, D′, V, Z, B′, C′	B, A, O, W, P	24
Polynoidae unid.	A′		B′	Y	3
Sabellidae 1	I, A′		B′		3
Sabellidae 2	I				1
Sabellidae Fabricinae	Q, R, S	K, T, U	E, D	P	9
Serpula narconensis Baird, 1865	H, I, Q, S	J, F, T, U	C, E, M, L, N, Z, B′, C′	O, W, P	19
Spionidae unid.	H, R		E		3
Syllidae unid.	I, A′	J	B′	O	5
Terebellidae unid.	Q				1
Terebellides malvinesis Bremec & Elias, 1999			B′		1
Thelepus sp.		J, F, T, U	N, V	O, W	8

Travisia kerguelensis Mclntosh, 1855			B´		1
Trypanosyllis gigantea Mdntosh, 1855	I	J, U	C, E, N, D´, V, Z	P	10

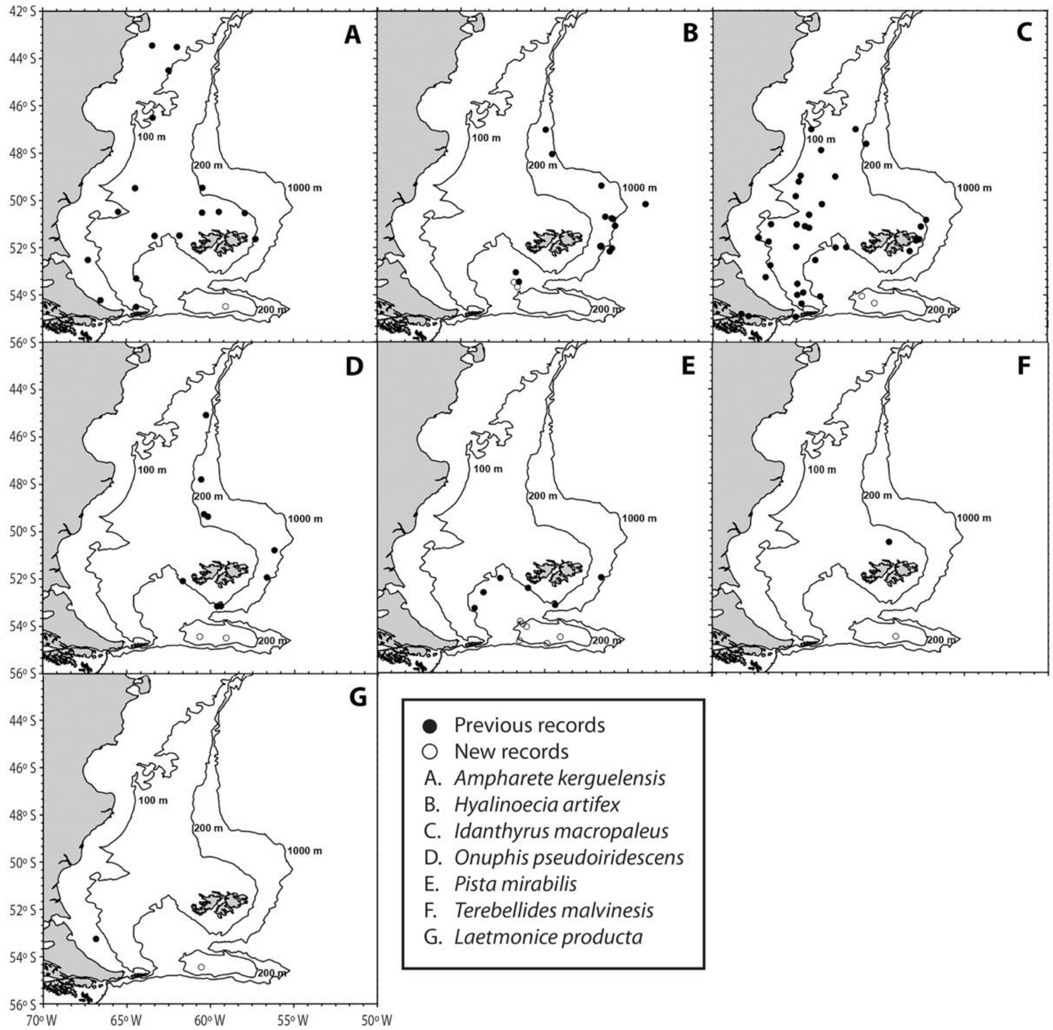

Fig. 2. Previous and new records of polychaete species for Burdwood Bank.

MDS analysis among sites shows one main group of sampling stations from BB slope and the core, buffer and transition areas of NMPA (group 1), from which only two samples from the slope of the bank are excluded (31 and 33, group 2) (Table 1, Fig. 3A). The SIMPER test (presence-absence data) resulted in an average dissimilarity of 99.04 % between both groups. *P. laevis*, *S. narconensis*, *E. patagonica*, *N. chilensis*, *T. gigantea* and *Eucranta* sp. contributed 82 % to the average similarity (0.32) of group 1. *H. artifex* contributed 100 % to the average similarity (0.50) of group 2. The results of the ANOSIM between stations from NMPA and BB Slope (Global R = 0.398; p = 0.3 %) show no differences in the polychaetes species composition.

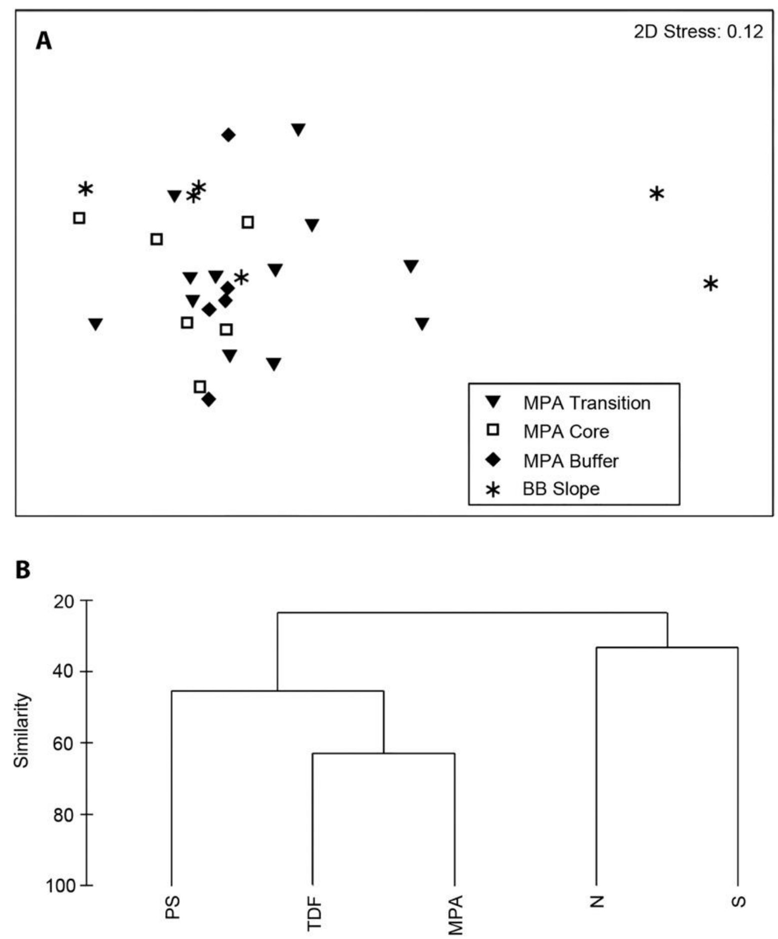

Fig. 3. A. Multidimensional Scaling among samples collected in the different zones of Namuncurá Marine Protected Area and Burdwood Bank slope during 2015, 2016 and 2017. **B.** Cluster analysis among polychaete data (presence-absence) from different Magellan areas: Patagonian Shelf (PS), Tierra del Fuego (TDF), Marine Protected Area (MPA), Burdwood Bank Neighboring Area (N) and Burdwood Bank Slope (S).

The regional comparison was performed with a data matrix of 82 samples from different Magellan areas (Tables 1, 2) and 73 polychaete taxa (Table 4). Cluster analysis (Fig. 3B) grouped NMPA-TDF (similarity > 60 %) and PS in group 1 (~0.50 similarity). *Kinbergonuphis dorsalis* (Ehlers, 1897), *Aglaophamus virginis* (Kinberg, 1866), *A. kerguelensis*, *E. patagonica*, *S. narconensis*, *Travisia kerguelensis* McIntosh, 1885 and *P. laevis* contributed 65 % to the average similarity (0.15). Deep areas S and N clustered at lower similarity in group 2 (Fig. 3). *P. laevis*, *S. narconensis*, *E. patagonica*, *Thelepus* sp., *H. artifex* and *N. maculata* contributed 87% to the average similarity (0.21). The results of the ANOSIM developed to compare different Magellan areas does not show statistical differences among stations from NMPA, PS, TDF, S and N (Global R = 0.42; p = 0.1 %).

Table 4
Polychaete taxa recorded at Magellan areas: Patagonian Shelf (PS), Tierra del Fuego (TDF), NMPA, BB Slope (BBS) and neighboring locations (N) during the cruises referred in Tables 1 and 2

	PS	TDF	AMP	BBS	N
Aglaophamus virginis (Kinberg, 1866)	X	X	X		
Ampharete kerguelensis McIntosh, 1885	X	X	X		
Amphicteis gunneri antarctica Hessle, 1917	X				
Anobothrus sp.			X		
Armandia sp.	X				
Boccardia sp.			X		
Chaetopterus antarcticus Kinberg, 1866	X	X	X		
Cistenides ehlersi (Hessle, 1917)	X	X			
Drilonereis tenuis (Ehlers, 1900)	X				
Eteone aurantiaca Schmarda, 1861	X		X		
Eucranta sp.			X		
Eunereis patagonica (McIntosh, 1885)		X	X	X	X
Eunice frauenfeldi Grube, 1866	X				
Eunice pennata (Muller, 1776)	X				
Euphrosine armadilloides Ehlers, 1900	X				
Euzonus sp.	X				
Glycera americana Leidy, 1855	X				
Glycera capitata Orsted, 1843		X	X		
Glycera papillosa Grube, 1857	X	X	X		
Glycinde sp.	X				
Harmothoe sp.	X		X	X	
Hemipodus sp.	X				
Hermadion magalhaensi Kinberg, 1855			X	X	
Hyalinoecia artifex Verril, 1880				X	
Idanthyrsus macropaleus (Schmarda, 1861)	X	X	X		X
Kinbergonuphis dorsalis (Ehlers, 1897)	X	X	X		
Laetmonice producta Grube, 1877			X		
Lanice sp.			X		

Lumbriclymenella robusta Arwidsson, 1911	X				
Lumbriclymeninae	X				
Lumbrineriidae sp. 1		X	X		
Lumbrineriidae sp. 2		X			
Lumbrineris cingulata Ehlers, 1897	X				
Magelonidae unid.		X			
Maldaniidae unid.	X	X	X		
Melinna cristata (M. Sars, 1851)	X				
Neanthes kerguelensis (McIntosh, 1885)		X			
Nephtys magellanica Augener, 1912	X				
Nephtys sp.	X		X		
Nereididae unid.	X	X	X		
Nicolea chilensis (Schmarda, 1861)			X		
Nicomache sp.	X				
Nicon maculata Kinberg, 1866				X	
Nothria anoculata Orensanz, 1974	X		X		
Notocirrus lorum Ehlers, 1897	X	X			
Notocirrus virginis (Kinberg, 1865)	X				
Oenonidae unid.			X		
Onuphis pseudoiridescens Averincev, 1972		X	X		
Ophelina syringopyge (Ehlers, 1901)	X				
Orbiniidae unid.	X	X			
Paraonidae unid.		X	X		
Perkinsiana antarctica (Kinberg, 1867)	X	X			
Phyllocomus crocea Grube, 1877		X			
Phyllodoce patagonica (Kinberg, 1866)	X				
Phyllodocidae unid.		X	X		
Phylo felix Kinberg, 1866	X	X			
Pista corrientis McIntosh, 1885	X		X		
Pista mirabilis McIntosh, 1885		X	X	X	

Polyeunoa laevis McIntosh, 1885		X	X	X	X
Polynoidae unid.		X	X	X	X
Potamilla antarctica (Kinberg, 1866)	X				
Sabellidae sp. 1	X	X	X		
Sabellidae sp. 2			X		
Sabellidae Fabricinae			X	X	
Serpula narconensis Baird, 1865	X	X	X	X	X
Sphaerodoridae	X				
Spionidae unid.			X		
Syllidae unid.	X	X	X	X	
Terebellidae unid.			X		X
Terebellides malvinensis Bremec & Elias, 1999	X		X		
Thelepus sp.	X	X	X	X	X
Travisia kerguelensis McIntosh, 1885	X	X	X		
Trypanosyllis gigantea McIntosh, 1885		X	X	X	

Discussion

This research gives faunistic information on polychaetes from BB, including NMPA –a wide area delineated by the 200m isobath– and the slope of the bank. Data from recent monitoring cruises, particularly developed to conduct benthic sampling in the study area, have led to baseline knowledge about the invertebrate assemblages inhabiting a variety of substrates. A preliminary inventory of the most conspicuous benthic species collected during 2013 in NMPA and BB slope included nearly 250 taxa (Schejter et al., 2016), of which 19 were polychaetes mostly identified to family level. In the present study, a total of 39 polychaete taxa were identified, 20 of them to species level and previously recorded from other Subantarctic or Antarctic locations (Clarke & Johnston, 2003; Orensanz et al., 2012; Horton et al., 2018; OBIS, 2018). However, some of them, collected in different zones of NMPA and/or BB slope (*A. kerguelensis*, *H. artifex*, *I. macropaleus*, *L. producta*, *O. pseudoiridescens*, *P. mirabilis* and *T. malvinensis*) constitute new records for BB. Recent investigations showed that BB is home to more than 90 species of small organisms belonging to Peracarida (Doti et al., 2014; Chiesa et al., 2015), more than 280 species of small mollusks (Zelaya & Guller, 2018) -most of them new records for the area or new species to science- and two new coral (Cairns, 2012) and sponge (Schejter, Bertolino et al., 2017) species. The bathymetric ranges of Asteroidea were extended for two species while the geographic distribution was updated for seven of them, being their first record in the NMPA (Fraysse et al., 2018). A new genus and species of cheilostome bryozoan showing an obligate association with a hermit crab was also described for the area (Lopez-Gappa, Liuzzi, & Zelaya, 2017). It becomes clear that studies on polychaetes, and invertebrates in general, should continue in order to properly assess species richness in the MPA.

Some of the polychaete species were frequently collected and were distributed throughout the depth range (91-785 m) considered in this sampling (*P. laevis*, *S. narconensis*, *E. patagonica*, *Thelepus* sp.), while others were only collected within NMPA: *C. antarcticus*, *N. chilensis*, *T. gigantea*, *Eucranta* sp., *Boccardia* sp., *Hermadion* sp., *Nephtys* sp. and Sabellidae (two species). In fact, MDS shows a similar polychaete assemblage characterizing the study area (three zones of NMPA and slope locations), and *H. artifex* characterizing two locations at the NW deepest slope of the bank. Due to the sampling procedure, the taxa registered are mainly epibenthic or associated with other large colonial organisms collected in the area. In general, sponges were conspicuous components (40 % to 88 % of the total catch) in locations of the MPA, and cnidarians (mainly corals) were a dominant group in the catches at stations located at > 300 m depth (Schejter, Genzano, Gaitán, Perez, & Bremec, 2018a). The high diversity both of sponges (López Gappa & Landoni, 2005; Schejter, Bertolino, Calcinai, Cerrano, & Pansini, 2012) and cnidarians (López-González, Rodriguez, & Vert, 2003; Margolin et al., 2014) in BB was previously reported. These sessile and three dimensional branched organisms are habitat-forming, as they provide substrate and refuge to a variety of associated species (see Buhl-Mortensen et al., 2010). In this sampling, the most frequent free living polynoid *P. laevis*, nereidid *E.patagonica* and syllid *T. gigantea*, as well as the epibiotic serpulid *S. narconensis*, were mostly associated with octocorals or sponges. Ongoing studies registered 109 taxa, of which 19 were polychaete species, associated with octocorals (*Thouarella* sp., *Dasystenella* sp., *Bayergorgia* sp.) and hydroids (*Amphisbetia* sp., *Sertularella* sp., *Symplectoscyphus* sp., *Grammaria* sp., *Abietinella* sp., *Halecium* sp., *Acryptolaria* sp., *Plumularia* sp.) between 90-650 m depth in BB (Martin Sirito, 2019). *P. laevis*, widely distributed in the SW Atlantic (northwards up to Buenos Aires) and the Magellan, Sub-Antarctic and Antarctic regions, is often associated with corals (Barnich, Gambi, & Fiege, 2012), which are also present and frequent beyond the shelf break of Argentina (Portela et al., 2012; Portela et al., 2015). Interspecific relationships between polychaetes and colonial hosts, like Cnidaria and Porifera, are numerous and include commensalism, endobiosis or epibiosis that facilitate, for instance, feeding strategies (Martin & Britayev, 1998). Polychaetes can have a large variety of feeding modes (Fauchald & Jumars, 1979); they were assumed to consume all suspended sources and the biofilm in a quantitative food-web analysis of a cold-water coral community in NE Atlantic, where biodiversity appears to be higher than in surrounding soft sediments (Oevelen et al., 2009). The nature and functionality of the associations between polychaetes and hosts are fields open to further research in Argentinean waters.

Other polychaete species were exclusively collected in particular locations of the study area. The parchment worm *Chaetopterus antarcticus* inhabited bottoms at nearly 100 m depth of NMPA, where Porifera and Bryozoa were conspicuous, together with other invertebrates (ophiuroids, serpulids, brachiopods, hydroids, peracarids, etc.) (Schejter, Genzano et al., 2018). These worms are active, mucus-net suspension feeders (Jumars, Dorgan, & Lindsay, 2014), usually collected within their U-shaped tubes, typical of an infaunal habit (Fauchald & Jumars, 1979; Rouse, 2001). This species is distributed throughout the shelf break frontal system along the 100m isobath and up to 37 °S (Bremec & Lasta, 2002) in habitats characterized by sandy soft-bottoms, like more than 90 % of the Argentinean continental shelf (Parker, Paterlini, & Violante, 1997), as well as in a submarine canyon located at 43º35’ S - 59º33’ W, 325 m depth (Bremec & Schejter, 2010). On the other hand, deep locations at NW BB slope, characterized by muddy sediments and the presence of pennatulaceans and scleractinid corals (Schejter, Acuña, Garese, Cordeiro, & Pérez, 2018), were inhabited by the onuphid species *H. artifex*. These tubiculous worms are carnivorous or carrion feeders and carry the tubes with them in a clearly discretely motile fashion, often in soft sediments (Jumars et al., 2014). Although information on the types of bottom at BB is still lacking (Falabella, 2018), the heterogeneity of the substrate and the patchiness of the benthic life in the study area appeared evident by means of underwater photographs acquired during a cruise in 2015 (Schejter, Martín, & Lovrich, 2017). Ongoing research into the unknown bottom habitats will permit the appreciation of their true need for conservation.

The polychaete assemblages of BB (NMPA and slope) were compared with those of other Magellanic areas: Beagle Channel, Patagonian Shelf and three neighboring locations. The present analysis does not indicate statistical differences in the polychaete assemblage among locations, and species already known from the Magellanic Biogeographical Province (Orensanz et al., 2012; Bremec et al., 2000; Bremec et al., 2010), were registered at BB for the first time. In an extensive area of the Argentinean shelf between 39º S and 55º S, in bottoms deeper than 100 m, the most frequent species were *K. dorsalis, I. macropaleus, S. narconensis, N. maculata, T. gigantean, E. patagonica* and *T. kerguelensis* (Bremec et al., 2010). Sediment composition on the continental shelf is dominated by sands and silts of < 2 mm grain size, at depths between 50 and 200 m (Bastida, Urien, Lichtschein, Roux, & Arias, 1981; Bastida, Roux, & Martinez, 1992). Other Magellanic habitats, like channels and fjords in the Pacific (42° S-55° S) and the Straits of Magellan (52° S -70° W), are heterogeneous and patchy with different types of sediments and consequently dominance and diversity of austral species is higher when compared with the homogeneous shelf habitats (Mariani et al., 1996; Gambi & Mariani, 1999; Bremec et al., 2000; Montiel, Gerdes, Hilbig, et al., 2005). The polychaete assemblage registered at BB shows affinities with that distributed on the Argentinean continental shelf, on soft homogeneous bottoms. Although it is interesting to point out that most species are distributed in Antarctic waters (Clarke & Johnston, 2003), much taxonomic work is needed to properly establish biogeographical connections. Souto (2014), after an exhaustive historical compilation and analysis of spatial distribution of polychaetes in Argentinean waters, found that Acrocirridae, Alciopidae, Ampharetidae, Arenicolidae, Capitellidae, Chrysopetalidae, Cossuridae, Euphrosinidae, Flabelligeridae, Polynoidae, Maldanidae and Phyllodocidae, among others, have been scarcely registered due to poor sampling coverage. It must be pointed out that high endemism in the distribution of species was showed in a recent revision on austral orbiniids (Blake, 2017).

The present results indicate strong connections between the fauna collected at NMPA and the polychaete assemblages of other Magellan areas dominated by soft bottoms. However, deeper slope areas of BB are inhabited by large species (i.e. *H. artifex*) not registered in the NMPA. Moreover, the slope area of BB was recently highlighted because cold-water coral ecosystems were recorded in several sites, meeting the characteristics of Vulnerable Marine Ecosystems (VME) (Schejter, Genzano, et al., 2018), which must be protected from fishing gears that destroy seafloor habitat (see Hall, 1999). The biogeographic importance of the BB as connection for benthic polychaete species between South America and the Antarctic Peninsula merits future investigation. Trophic relationships and the role of epibiotic relationships in enhancing biodiversity in BB seabeds should also be explored.

Ethical statement: authors declare that they all agree with this publication and made significant contributions; that there is no conflict of interest of any kind; and that we followed all pertinent

ethical and legal procedures and requirements. All financial sources are fully and clearly stated in the acknowledgements section. A signed document has been filed in the journal archives.

Acknowledgements

We thank Jonathan Flores, Esteban Gaitán, Agustín Garese, Ricardo Gonzalez, Marina Güller and Diego Zelaya, for help on board the RV "Puerto Deseado" during sampling procedures and samples from "Pr. García". We are also deeply grateful to scientific and navy crews of the cruises. Anonymous reviewers improved the manuscript. This is INIDEP Contribution Nº 2168. This is Marine Protected Area Namuncurá (National Law 26.875, Argentina) Contribution N° 19.

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