Abyssal Glyceriformia (Annelida)

from the ANDEEP expeditions

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Abstract

The faunas living in the vast deep sea regions around the Antarctic are very poorly known. This is especially true for the biodiversity of polychaetes inhabiting these remote areas. Therefore, new morphological data of Glyceriformia from the ANDEEP and ANDEEP-SYSTCO cruises to the South Atlantic Ocean and the Southern Ocean are reported. Based on benthos samples from four expeditions aboard R/V POLARSTERN, two species of Glyceridae (*Glycera capitata*, *G. diva*) and four species of Goniadidae (*Bathyglycinde sibogana*, *B. stepaniantsae*, *Goniada maculata*, *Progoniada regularis*) were studied. The distribution patterns of the different taxa demonstrated that some species have a high dispersal capability and show an extended level of eurybathy, whereas other species are restricted to the deep sea.

Introduction

Within the framework of the **C**ensus of the **D**iversity of **A**byssal **Mar**ine Life (CeDAMar) programme the ANDEEP (**AN**tarctic benthic **DEEP**-sea biodiversity: colonization history and recent community patterns) and the ANDEEP-SYSTCO (**SYST**em **CO**upling) project investigated the fauna inhabiting sediments in the Antarctic deep sea basins (Fahrbach 2006, Bathmann 2010). This region is one of the least explored parts of the world, but might be a possible source for many of the deep sea benthic taxa in other oceans (Fütterer 2001). Therefore, the first comprehensive survey of meio-, macro- and megafaunal deep-water communities was conducted (Fütterer et al. 2003, Fahrbach 2007). Polychaetes are one of the dominant groups in such habitats and especially some species of the families Glyceridae Grube, 1850 and Goniadidae Kinberg, 1865 are well known and widely distributed (Böggemann 2002, 2005, 2009, 2015, Böggemann & Dietz 2016).

Materials and methods

The ANDEEP I-III and ANDEEP-SYSTCO expeditions in the deep Weddell Sea and adjacent areas aboard the German research vessel POLARSTERN took place in 2002 (ANT XIX-3, 23.I.-26.II.2002; ANT XIX-4, 28.II.-1.IV.2002), 2005 (ANT XXII-3, 21.I.-6.IV.2005), and 2007/8 (ANT-XXIV/2, 28.XI. 2007-4.II.2008) (Fütterer 2001; Fütterer et al. 2003; Lemke 2005; Fahrbach 2006, 2007; Bathmann 2010). Biological collections were obtained from water depths between 774 and 6348 m (Brandt et al. 2007). The deep sea benthos was examined with reference to all size classes (meio-, macro-, and megafauna) by using different types of gear.

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Agassiz trawl
An Agassiz trawl of 3 m width with a cod end mesh size of 500 µm was used for benthic epi- and infaunal megafauna. It was pulled across the seabed for 10 minutes with a mean velocity of about one knot (Brandt et al. 2007).

Box corer
A 50 cm × 50 cm (0.25 m2) Sandia box corer was used for macrofaunal organisms that live on or just below the sediment surface (Fütterer 2001). Specimens were sieved from the sediment with a minimum mesh size of 300 µm.

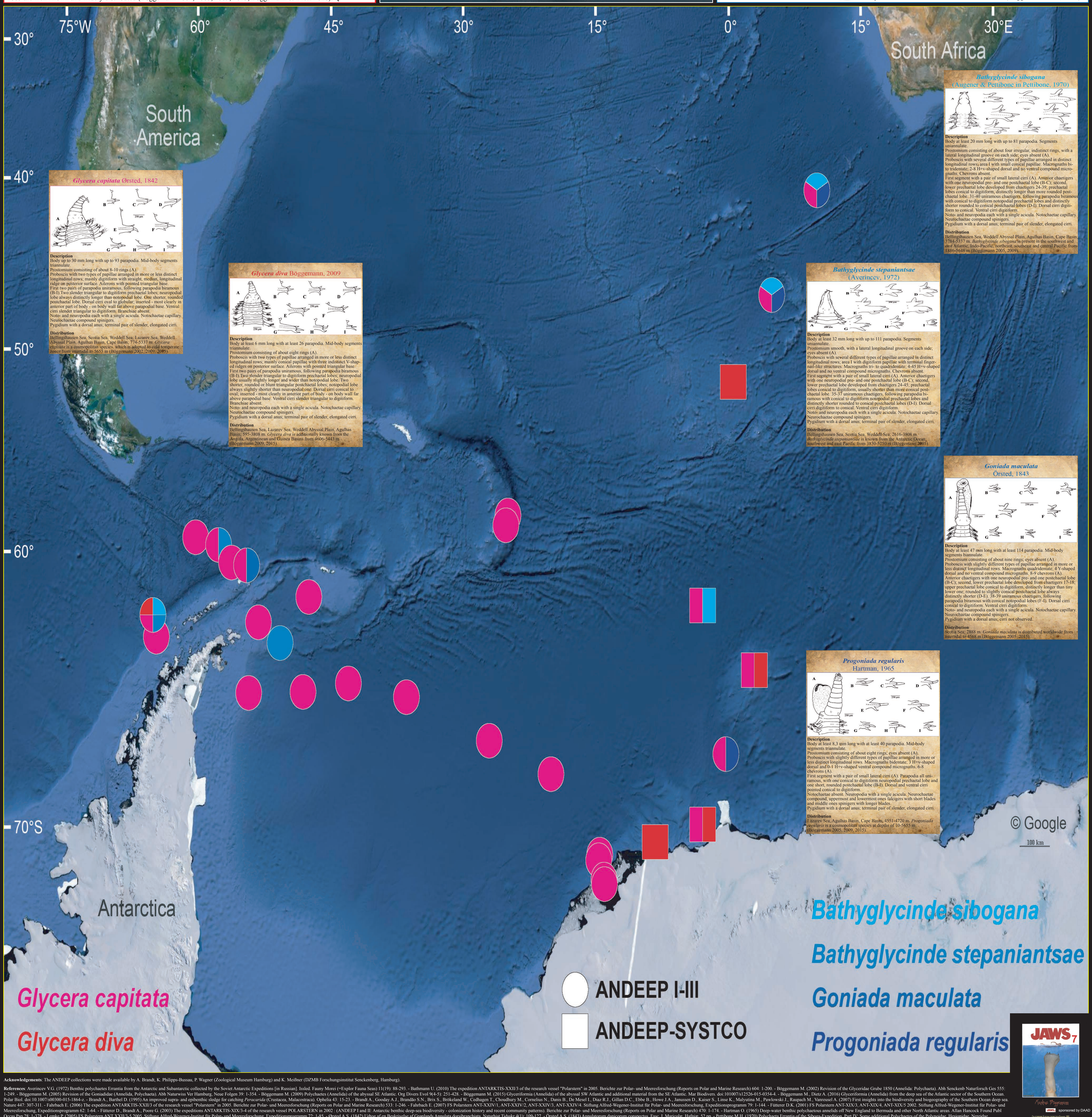
Epibenthic sledge
Meio- and macrofauna organisms were sampled with an epibenthic sledge (Brandt & Barthel 1995). The 1 m wide sledge comprised a lower epibenthic net (500 µm mesh size) and an upper suprabenthic net (300 µm mesh size), both bearing a cod end of 300 µm mesh size. The ocean floor was trawled for 10 minutes with a mean velocity of about one knot (Brandt et al. 2007).

Observations, measurements and figures were made using a Leica Wild M 3 stereo microscope and a Zeiss compound microscope each equipped with a camera lucida.

Conclusion

One of the main aims of the ANDEEP programme was to explore linkages of Antarctic faunas with the bathyal and abyssal neighbouring areas (Fütterer 2001). Because polar waters and deep sea habitats are both environments with similar physical conditions, the ecological constraints for local species are likely the same (Fütterer 2001). First results pointed out that in contrast to other taxa, such as crustaceans, several species of polychaetes are widely distributed due to their eurybathy (Lemke 2005, Bathmann 2010). This also applies to the herein studied Glyceriformia. However, if the data of the DIVA expeditions (Böggemann 2009, 2015) are included, some differences between the taxa become obvious. *B. sibogana* and *G. maculata* more or less occur from north of the Polar Front, whereas *G. capitata* *G. diva*, *B. stepaniantsae* and *P. regularis* are also present south of this boundary, although, this surface ocean feature seems to be no barrier to benthic organisms (Brandt et al. 2007). *G. diva*, *B. sibogana* and *B. stepaniantsae* are typical deep sea taxa, while *G. capitata*, *G. maculata* and *P. regularis* are cosmopolitan species which might be present in intertidal or subtidal areas as well (Böggemann 2002, 2005).

Molecular genetic studies (Böggemann 2009, 2015) supported that especially the previously bipolar arranged *G. capitata* have a global distribution, with individuals of distinctly smaller size in the deep sea. However, Schüller (2011) reported that specimens of *G. kerguelensis* McIntosh, 1885 (synonym for *G. capitata*) from the deep Eastern Weddell Sea are a complex of genetic cryptic species, but these so-called "identical morphospecies" are morphologically only investigated via light microscopy. A reexamination of the material demonstrated, that most of the specimens are very small and belong to different taxa (e.g. *G. capitata*, *G. diva*), but the determination is uncertain because some of the main diagnostic characters (proboscis with ailerons and papillae) are missing.



Glycera capitata Ørsted, 1842

Description
Body up to 30 mm long with up to 93 parapodia. Mid-body segments triannulate.
Prostomium consisting of about 8-10 rings (A).
Proboscis with two types of papillae arranged in more or less distinct longitudinal rows; mainly digitiform with straight, median, longitudinal ridge on posterior surface. Ailerons with pointed triangular base.
First two pairs of parapodia uniramous, following parapodia biramous (B-I).Two slender triangular to digitiform prechaetal lobes; neuropodial lobe always distinctly longer than notopodial lobe. One shorter, rounded postchaetal lobe. Dorsal cirri oval to globular; inserted - most clearly in anterior part of body - on body wall far above parapodial base. Ventral cirri slender triangular to digitiform. Branchiae absent.
Noto- and neuropodia each with a single acicula. Notochaetae capillary. Neurochaetae compound spinigers.
Pygidium with a dorsal anus; terminal pair of slender, elongated cirri.

Distribution
Bellingshausen Sea, Scotia Sea, Weddell Sea, Lazarev Sea, Weddell Abyssal Plain, Agulhas Basin, Cape Basin, 774-5337 m. *Glycera capitata* is a cosmopolitan species, which is adapted to cold temperate zones from intertidal to 3655 m (Böggemann 2002, 2009, 2015).

Glycera diva Böggemann, 2009

Description
Body at least 6 mm long with at least 26 parapodia. Mid-body segments triannulate.
Prostomium consisting of about eight rings (A).
Proboscis with two types of papillae arranged in more or less distinct longitudinal rows; mainly conical papillae with three indistinct V-shaped ridges on posterior surface. Ailerons with pointed triangular base.
First two pairs of parapodia uniramous, following parapodia biramous (B-I).Two slender triangular to digitiform prechaetal lobes; neuropodial lobe usually slightly longer and wider than notopodial lobe. Two shorter, rounded or blunt triangular postchaetal lobes; notopodial lobe always slightly shorter than neuropodial one. Dorsal cirri conical to oval; inserted - most clearly in anterior part of body - on body wall far above parapodial base. Ventral cirri slender triangular to digitiform. Branchiae absent.
Noto- and neuropodia each with a single acicula. Notochaetae capillary. Neurochaetae compound spinigers.
Pygidium with a dorsal anus; terminal pair of slender, elongated cirri.

Distribution
Bellingshausen Sea, Lazarev Sea, Weddell Abyssal Plain, Agulhas Basin; 595-3808 m. *Glycera diva* is additionally known from the Angola, Argentinean and Guinea Basins from 4606-5443 m (Böggemann 2009, 2015).

Bathyglycinde sibogana (Augener & Pettibone in Pettibone, 1970)

Description
Body at least 20 mm long with up to 81 parapodia. Segments uniannulate.
Prostomium consisting of about four irregular, indistinct rings, with a lateral longitudinal groove on each side; eyes absent (A).
Proboscis with several different types of papillae arranged in distinct longitudinal rows; area I with small conical papillae. Macrognaths bi- to tridentate; 2-8 H+v-shaped dorsal and no ventral compound microgmaths. Chevrons absent.
First segment with a pair of small lateral cirri (A). Anterior chaetigers with one neuropodial pre- and one postchaetal lobe (B-C); second, lower prechaetal lobe developed from chaetigers 24-39; prechaetal lobes conical to digitiform, distinctly longer than more rounded postchaetal lobe. 31-40 uniramous chaetigers, following parapodia biramous with conical to digitiform notopodial prechaetal lobes and distinctly shorter rounded to conical postchaetal lobes (D-I). Dorsal cirri digitiform to conical. Ventral cirri digitiform.
Noto- and neuropodia each with a single acicula. Notochaetae capillary. Neurochaetae compound spinigers.
Pygidium with a dorsal anus; terminal pair of slender, elongated cirri.

Distribution
Bellingshausen Sea, Weddell Abyssal Plain, Agulhas Basin, Cape Basin, 3784-5337 m. *Bathyglycinde sibogana* is present in the southwest and east Atlantic, Indo-Pacific, northeast, southeast and central Pacific from 1886-5648 m (Böggemann 2005, 2009).

Bathyglycinde stepaniantsae (Averincev, 1972)

Description
Body at least 32 mm long with up to 111 parapodia. Segments uniannulate.
Prostomium smooth, with a lateral longitudinal groove on each side; eyes absent (A).
Proboscis with several different types of papillae arranged in distinct longitudinal rows; area I with digitiform papillae with terminal fingernail-like structures. Macrognaths tri- to quadridentate; 4-45 H+v-shaped dorsal and no ventral compound microgmaths. Chevrons absent.
First segment with a pair of small lateral cirri (A). Anterior chaetigers with one neuropodial pre- and one postchaetal lobe (B-C); second, lower prechaetal lobe developed from chaetigers 24-45; prechaetal lobes conical to digitiform, usually shorter than more conical postchaetal lobe. 35-37 uniramous chaetigers, following parapodia biramous with conical to digitiform notopodial prechaetal lobes and distinctly shorter rounded to conical postchaetal lobes (D-I). Dorsal cirri digitiform to conical. Ventral cirri digitiform.
Noto- and neuropodia each with a single acicula. Notochaetae capillary. Neurochaetae compound spinigers.
Pygidium with a dorsal anus; terminal pair of slender, elongated cirri.

Distribution
Bellingshausen Sea, Scotia Sea, Weddell Sea; 2616-3808 m. *Bathyglycinde stepaniantsae* is known from the Antarctic Ocean, southwest and east Paeific from 3830-5750 m (Boggemann 2005)

Goniada maculata Örsted, 1843

Description
Body at least 47 mm long with at least 114 parapodia. Mid-body segments biannulate.
Prostomium consisting of about nine rings; eyes absent (A).
Proboscis with slightly different types of papillae arranged in more or less distinct longitudinal rows. Macrognaths quadridentate; 4 Y-shaped dorsal and no ventral compound microgmaths. 8-9 chevrons (A).
Anterior chaetigers with one neuropodial pre- and one postchaetal lobe (B-C); second, lower prechaetal lobe developed from chaetigers 17-18; upper prechaetal lobe conical to digitiform, distinctly longer than tiny lower one; rounded to slightly conical postchaetal lobe always distinctly shorter (D-E). 38-39 uniramous chaetigers, following parapodia biramous with conical notopodial lobes (F-I). Dorsal cirri conical to digitiform. Ventral cirri digitiform.
Noto- and neuropodia each with a single acicula. Notochaetae capillary. Neurochaetae compound spinigers.
Pygidium with a dorsal anus; cirri not observed.

Distribution
Scotia Sea; 2888 m. *Goniada maculata* is distributed worldwide from intertidal to 4568 m (Böggemann 2005, 2015).

Progoniada regularis Hartman, 1965

Description
Body at least 8,3 mm long with at least 40 parapodia. Mid-body segments triannulate.
Prostomium consisting of about eight rings; eyes absent (A).
Proboscis with slightly different types of papillae arranged in more or less distinct longitudinal rows. Macrognaths bidentate; 3 H+v-shaped dorsal and 0-1 H+v-shaped ventral compound microgmaths. 6-8 chevrons (A).
First segment with a pair of small lateral cirri (A). Parapodia all uniramous, with one conical to digitiform neuropodial prechaetal lobe and one short, rounded postchaetal lobe (B-I). Dorsal and ventral cirri pointed conical to digitiform.
Notochaetae absent. Neuropodia with a single acicula. Neurochaetae compound, uppermost and lowermost ones falcigers with short blades and middle ones spinigers with longer blades.
Pygidium with a dorsal anus; terminal pair of slender, elongated cirri.

Distribution
Lazarev Sea, Agulhas Basin, Cape Basin, 4551-4720 m. *Progoniada regularis* is a cosmopolitan species at depths of 10-5655 m. (Böggemann 2005, 2009, 2015).

Glycera capitata

Glycera diva

ANDEEP I-III

ANDEEP-SYSTCO

Bathyglycinde sibogana

Bathyglycinde stepaniantsae

Goniada maculata

Progoniada regularis

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