

*Global Biogeochemicals Cycles*

Supporting Information for

**Benthic marine calcifiers coexist with CaCO3-undersaturated seawater worldwide**

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**7. Supporting information**

**7.1 Full development of the seawater** Ω*i* **calculations**

The seawater saturation state with respect to calcareous mineral phases is defined as: Ω*i*={Mg2+}*x*{Ca2+}(1-*x*){CO32-}/IAP*i* (Eq. 1)

where *i* is the mineralogy (i.e., calcite, aragonite, Mg-calcite), *x* is the skeletal mol % MgCO3 if present, and IAP*i* is the ion activity product at equilibrium with respect to the specific mineral phase.

The ion activities ({}) of Mg2+, Ca2+, and CO32- in Eq. 1 were calculated from the total activity coefficients of each ion [γT(*i*)], and the total concentration in seawater ([*i*]T):

{*i*} = γT(*i*) [*i*]T (Eq. 2)

The γT(*i*) is controlled by the seawater composition. Values were obtained from a chemical equilibrium model of seawater [Millero & Pierrot, 1998]. The equations used to work out γT(*i*) from the corresponding field temperatures (in °C) for each data point and for each ion were:

γT(*CO32-*) = 9\*10-7 T2- 0.0004 T + 0.0521 (Eq. 3)

γT(*Mg2+*) = -0.0008 T + 0.2223 (Eq. 4)

γT(*Ca2+*) = -6\*10-6 T2- 0.0002 T + 0.2078 (Eq. 5)

where T is the individual in situ field temperature at its corresponding depth obtained from the NEAR 3D analysis.

The field [*i*]T for Mg2+ and Ca2+ was calculated following the Marcet's Principle of seawater constant proportions following in situ salinity for each sample:

[*Mg2+*]T = (S 1.295/35.00) / 24.305 (Eq. 6)

[*Ca2+*]T = (S 0.416/35.00) / 40.078 (Eq. 7)

where S is the individual in situ field salinity at its corresponding depth.

The [CO32-] was calculated from in situ total alkalinity (TA) and dissolved inorganic carbon (DIC) measurements from the GLODAP and WAVES database http://cdiac3.ornl.gov/waves/discrete/ (Suppl. Fig. S6) along with the in situ temperature, salinity, and nutrients using the CO2SYS macro (Lewis & Wallace, 1998). The field [*i*]T  was therefore:

[*CO32-*]T = field input data from the NEAR 3D analysis and 20 and 50 % decrease for simulation of future ocean acidification scenarios, calculated in CO2SYS.

The 20 and 50 % decreases in [CO32-] from modern values to represent ocean acidification scenarios were estimated for years 2050-2065 (surface) and 2150-2700 (seafloor), and 2090-2120 (surface) and 2500-3000+ (seafloor), respectively, from a model run using the UVic Earth System Climate Model (Keller *et al.,* 2012) (Suppl. Fig. S4). Only the Representative Concentration Pathway (RCP) 8.5 climate change scenario was used, and the output represented the globally averaged change in [CO32-] over time for surface and seafloor waters. Bear in mind that for seafloor waters there is uncertainty about the exact years owing to the vertical model ressolution.

The Ion Activity Product (IAP*i*) is the product of the ion activities at equilibrium determined at a condition originally referred to as stoichiometric saturation for Mg-calcite (Plummer & Mackenzie, 1974; Morse *et al.,* 2006). For calcite and aragonite we obtained the thermodynamic constants from published equations (Millero 1979; Morse & Mackenzie, 1990), and we corrected for in situ temperature (T). Constants were not corrected for salinity owing to its minor influence, and also because the salinity effect was corrected in the calculation of the field [*i*]T for Mg2+ and Ca2+. The working equations are:

-log IAP*Cal.* (T) = 303.1308 + (-13348.09/T) + (-48.7537 ln T) (Eq. 8)

-log IAP*Arag.* (T) = 303.5363 + (-13348.09/T) + (-48.7537 ln T) (Eq. 9)

where individual temperature (T) is in kelvin (°K). IAPs were taken from the corresponding anti-logs.

The individual IAP*i* for each organism condition was corrected for the pressure effect using published equations [Millero, 1979; Ingle, 1975; Millero, 1995]:

Calcite:

*delta*VKCal. = -48.76 + 0.5304 T°C (Eq. 10)

*kappa*K*Cal.* = (-11.76 + 0.3692 T°C) / 1000 (Eq. 11)

LnK*Cal.*= (- *delta*VKCal. + 0.5 *kappa*KCal. P) P / RT°K (Eq. 12)

where RT°K is the products of the gas constant (83.145) and the Kelvin temperature, while P is pressure in bars. Then, the IAPCal. is the product of the T- and S-corrected values and the exponential of Eq. 12:

IAPCal. (T, S, P) = IAP*Cal.*(T, S) e LnK*Cal.* (Eq. 13)

Aragonite:

*delta*VK*Arag.*= *delta*VK*Cal.* + 2.80 (Eq. 14)

*kappa*K*Arag.* = -*kappa*K*Cal.* (Eq. 15)

LnK*Arag.*= (- *delta*VK*Arag.* + 0.5 *kappa*K*Arag.* P) P / RT°K (Eq. 16)

where RT°K is the product of the gas constant (R = 8.314 m3 Pa / K mol) and the Kelvin temperature TºK), and P is the pressure in bar. The IAPArag. is the product of the T- and S-corrected IAP values and the exponential of Eq. 16:

IAP*Arag.* (T, S) = IAP*Arag.* (T, S) e LnK*Arag.* (Eq. 17)

For each mol % MgCO3, we used the individual IAP*i* based on the biogenic "clean" and biogenic "minimally prepared" experimental solubility curves (Suppl. Fig. S1) [Plummer & Mackenzie, 1974; Bischoff *et al.,* 1987]. These two curves differ in the way the experimental materials dissolved are prepared. There is not enough information on which curve best represents the solubility of Mg-calcite mineral phases, but several published studies support the use of the “minimally prepared” solubility curve [Tribble *et al.,* 1995; Andersson *et al.,* 2007]. Here, we provide results employing both solubility curves, but we focus on the “minimally prepared” results. The IAP*i* was calculated individually for each mol % MgCO3 from the following equations fitted to the "cleaned" and "minimally prepared" curves (Suppl. Fig. S1) at T°C = 25 °C and S = 35.00. Since empirical data only exist from 0 to 20 mol % MgCO3 for the “cleaned” and "minimally prepared” curves, we fitted a curve in this range adjusting the r2 to 0.99, and then a separate curve on samples above mol % MgCO3 with a value of 20 % (Suppl. Fig. S1). Both equations are used in our calculations. For these equations we call mol % MgCO3 the variable “X” for simplicity:

Biogenically cleaned

0–20mol % MgCO3:

-log IAP*Mg-x* (cleaned) = -8\*10-6 X4 + 0.0004 X3 - 0.0072 X2 + 0.0318 X + 8.3617 (Eq. 18a)

> 20 mol % MgCO3:

-log IAP *Mg-x* (cleaned) = -0.0205 X + 8.4978 (Eq. 18b)

Minimally prepared

0–20mol % MgCO3:

-log IAP*Mg-x* (min. prep.) = 2\*10-7 X4 + 0.0003 X3 - 0.0106 X2 + 0.0358 X + 8.4508 (Eq. 19a)

> 20 mol % MgCO3:

-log IAP*Mg-x* (min. prep.) = -0.0404 X + 8.1528 (Eq. 19b)

Because the "cleaned" and "minimally prepared" solubility curves were determined at T°C = 25 °C, S = 35.00, and P = 1 atm, we worked out a T and P correction for the IAP*i* as a function of the mol % MgCO3 (the salinity effect is minor as previously discussed). First, we corrected the IAP*i* for the corresponding mol % MgCO3 (using Eqs. 18 and 19) assuming a similar effect on the solubility by T and P as for calcite. Then, we fitted a curve to the field T data obtained from the NEAR 3D analysis (Suppl. Fig. S5) to work out the IAPCal. vs. temperature equation:

-log IAP*Cal.* = 0.0001 T2 + 0.0001 T + 8.3576 (Eq. 20)

This equation was used to correct the original IAP*i* from the mol % MgCO3 (called variable “X”) in Eqs. 18 and 19 for T and S. This was done by substituting the intercept of Eq. 20 (8.3576) by Eqs. 18 and 19:

Biogenically cleaned

0–20 mol % MgCO3:

-log IAP *Mg-x* (cleaned) (T) = (0.0001 T2 + 0.0001 T) - (-8\*10-6 X4 + 0.0004 X3 - 0.0072 X2 + 0.0318 X + 8.3617) (Eq. 21a)

> 20 mol % MgCO3:

-log IAP*Mg-x* (cleaned) (T) = (0.0001 T2 + 0.0001 T) + (-0.0205 X + 8.4978) (Eq. 21b)

Minimally prepared

0–20mol % MgCO3:

-log IAP*Mg-x* (min. prep.) (T) = (0.0001 T2 + 0.0001 T) - (2\*10-7 X4 + 0.0003 X3 - 0.0106 X2 + 0.0358 X + 8.4508) (Eq. 22a)

> 20 mol % MgCO3:

-log IAP*Mg-x* (min. prep.) (T) = (0.0001 T2 + 0.0001 T) + (-0.0404 X + 8.1528) (Eq. 22b)

The IAP*i* was finally corrected for P assuming a similar behaviour to calcite by using the correction factor calculated in Eq. 12:

Biogenically cleaned

-log IAP*Mg-x* (cleaned) (T, P) = -log IAP*Mg-x* (cleaned) (T, S) e LnK*Cal.* (Eq. 23)

Minimally prepared

-log IAP*Mg-x* (min. prep.) (T, P) = -log IAP*Mg-x* (min. prep.) (T, S) e LnK*Cal.* (Eq. 24)

All Ω*i* calculations were plotted against depth for various mol % MgCO3 values using North Atlantic Ocean profiles taken from the GLODAP (13) dataset at latitude 25 ºN, 70 ºW at 26 discrete depths from 51 to 5600 m (Suppl. Fig. S3). They were also tested against latitude, using the same environmental conditions as for the organisms, but with fixed mol % MgCO3 values. The depth and latitude plots show that our corrections for T and P worked correctly and are representative of vertical and horizontal oceanic profiles. This allows their use in future studies in which the mol % MgCO3 is known until we have more experimental data on Mg-calcite solubilities at in situ T and P.

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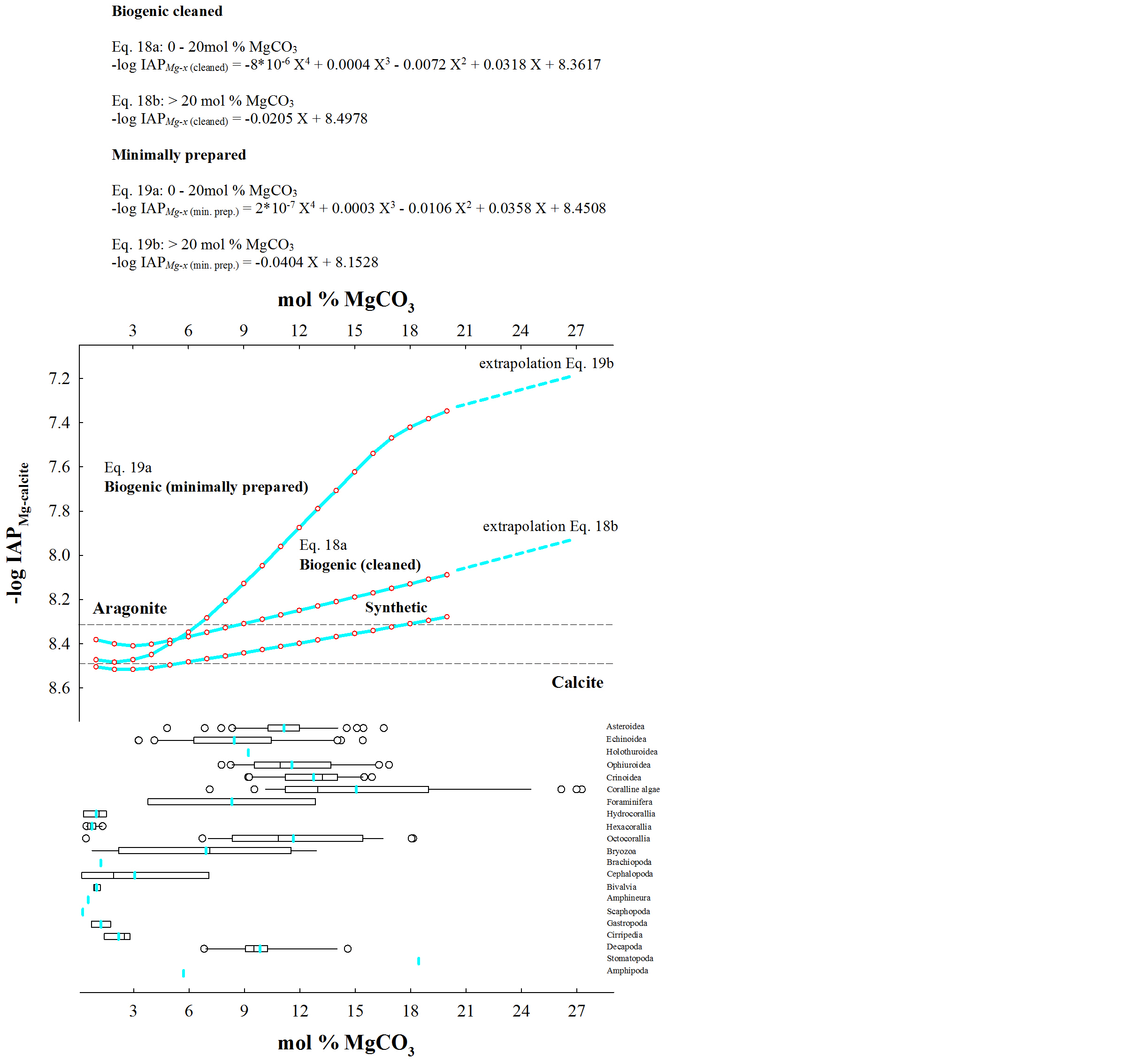
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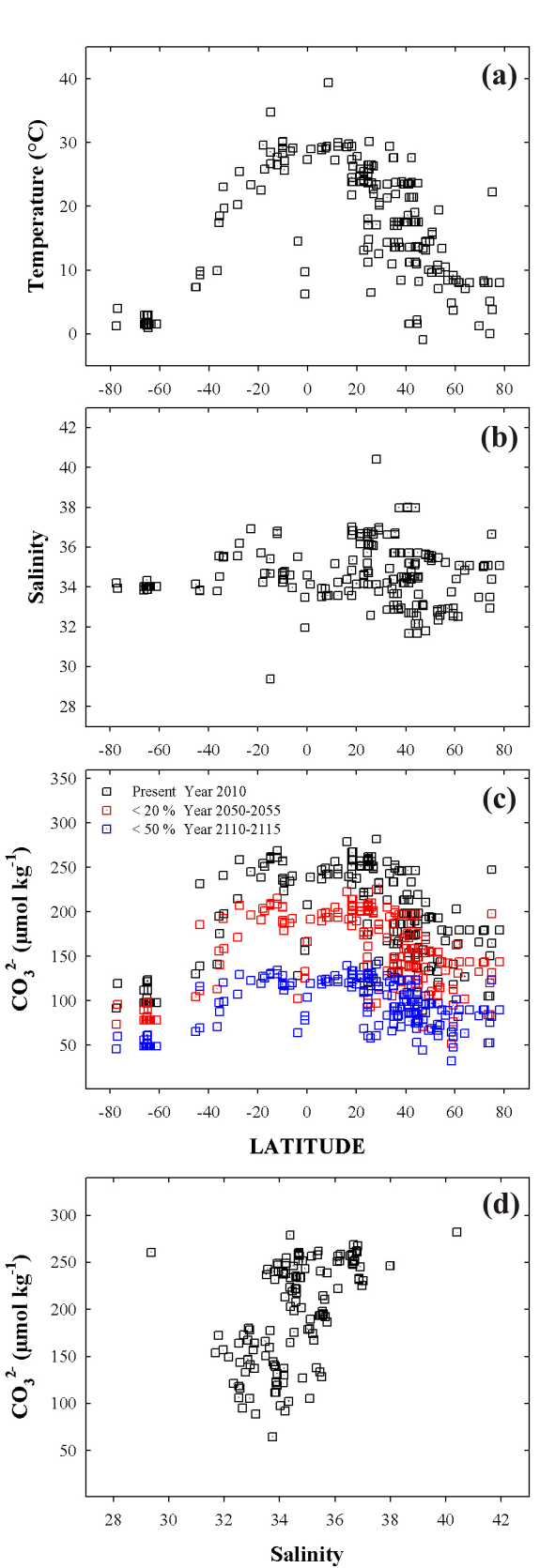
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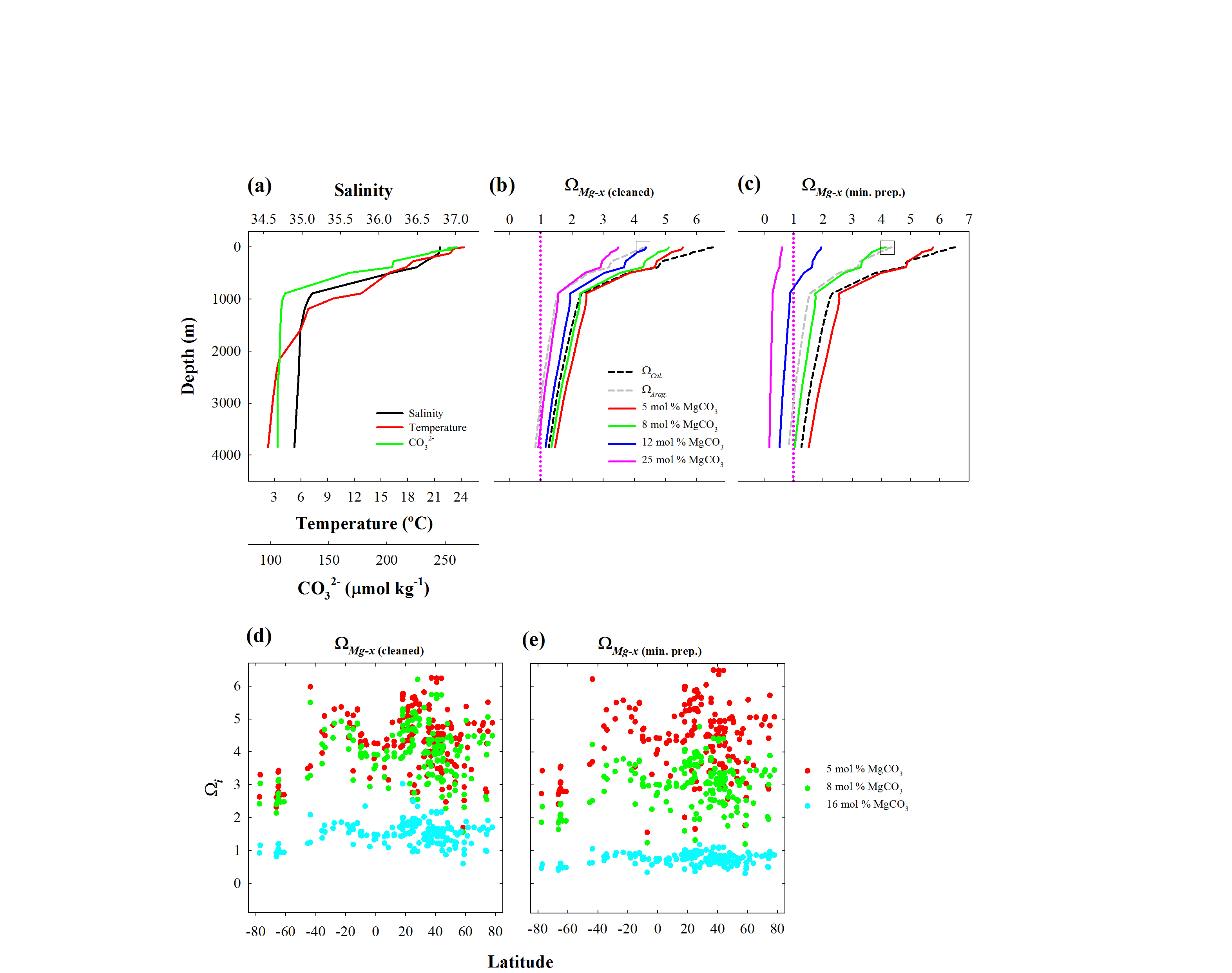
**Fig. S1.** Solubility curves fitted to IAP*i* data to calculate Ω*i* as a function of the mol % MgCO3 in the phase. Also included are the fitted curves to IAP*i* and equations. Note that owing to the shape of the curves we extrapolated linearly after 20 mol % MgCO3 using the last four data points. The box plot shows the range of mol % MgCO3 from all the samples used in this study classified per taxa. See Supplementary Information for the full development of the equations.



**Fig. S2.** Exploratory plots of environmental conditions. (a) Temperature versus latitude. (b) Salinity versus latitude. (c) [CO32-] versus latitude in present and future scenarios. (d) [CO32-] versus salinity.



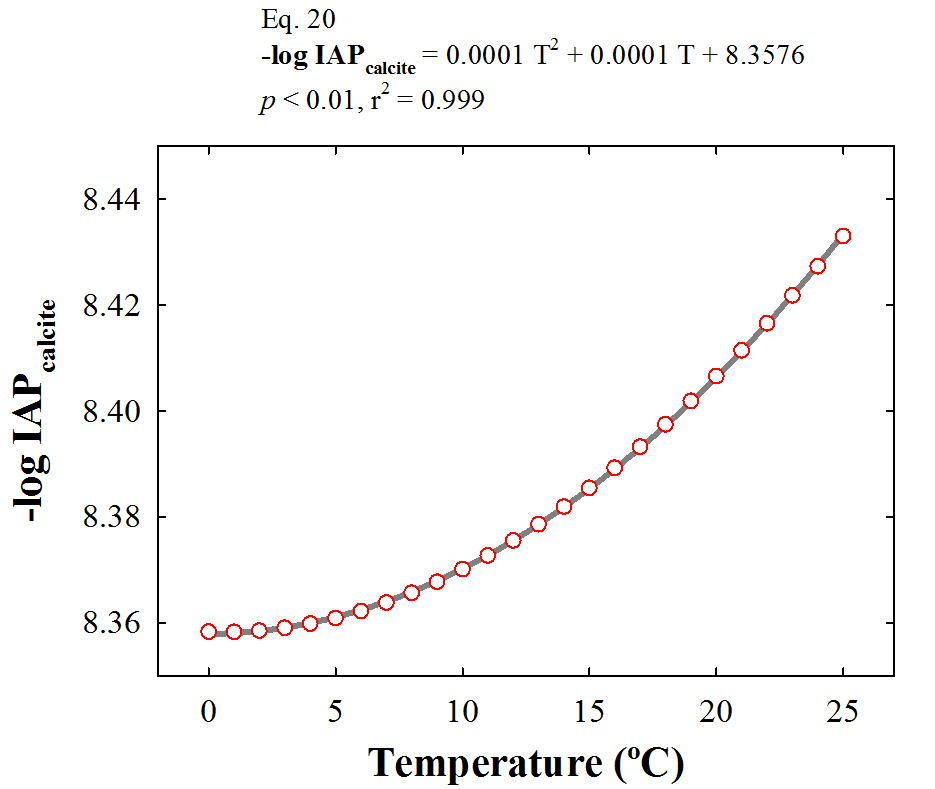
**Fig. S3**. Ω*i* distribution with depth and latitude. (a) Salinity, temperature, and [CO32-] profiles obtained at 25 ºN, 70 ºW (26 depth-levels from 50 to 5600 m) from the GLODAP and WAVES dataset http://cdiac3.ornl.gov/waves/discrete/. (b) and (c) Ω*Mg-x* (cleaned) and Ω*Mg-x* (min. prep.) curves, respectively. All curves are calculated at 5, 8, 12, and 25 mol % MgCO3. (d) Ω*Mg-x* (cleaned) and (e) Ω*Mg-x* (min. prep.) distributions with latitude. In these plots, the same environmental conditions used for the organisms were used with fixed mol % MgCO3 values (5, 8, 12, and 25 mol % MgCO3) to verify the latitudinal signal. Panels (d) and (e) are only meant to show the shape of the relationship. In panels (b) and (c) the box shows that for surface conditions Ω*Arag.* is equivalent to Ω*Mg-x* (cleaned) and Ω*Mg-x* (min. prep.) of 12 and 8 % mol MgCO3, respectively. This is what should be expected from the IAP*i*.



**Fig. S4.** Decline of [CO32-] with time as simulated with the UVic Earth System Model (Keller *et al.,* 2012) forced with CO2 emissions following the Representative Concentration Pathway (RCP) 8.5 scenario, which is a “business-as-usual,” high-CO2-emission scenario (Keller *et al.,* 2014). (a) Global mean (solid black), tropical (30ºS-30ºN; dashed blue) and extra-tropical (dashed red) [CO32-] decline. (b), (d) Regional distribution of the year of emergence of a 20% and 50% reduction in surface [CO32-], respectively. (c), (e) Regional distribution of the year of emergence of a 20% and 50% reduction in seafloor [CO32-], respectively. Note the different time frames for surface and seafloor [CO32-] changes. White areas mean that the bottom does not see the respective change before year 3000.

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**Fig. S5.** Correction of the temperature (T) effect on the Mg-calcite IAP*i* from the calcite data.



**Table S1.** Details of taxa used, skeletal mineralogy, and metadata.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Organisms** | | | | **Field data** | | | **Mg-calcite - Analytics** a | | | **In situ conditions - NEAR 3D analysis** b | | | | | |
| Taxa | Class | Species | *n* | Depth  (m) | Lat. | Long. | CaCO3  % dw | MgCO3  % dw | Mg/Ca  (mol/mol) | S | T  (°C) | T  (°K) | CO32-  (µmol kg-1) c | | |
| Present  Year 2010 | < 20 %  Year 2050-2055 | < 50 %  Year 2110-2115 |
| Echinodermata | Asteroidea | *Labidiaster annulatus* | 9 | 175 | -61.21 | -56.01 | 90.120 | 9.870 | 0.130 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Macroptychaster accrescens* | 3 | 180 | -63.53 | -62.75 | 90.170 | 9.830 | 0.129 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Paralophaster godfroyi* | 1 | 180 | -63.53 | -62.75 | 90.410 | 9.590 | 0.126 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Paralophaster* sp. | 3 | 180 | -63.53 | -62.75 | 90.720 | 9.280 | 0.121 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Perknaster* sp. | 2 | 180 | -63.53 | -62.75 | 91.010 | 8.990 | 0.117 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Acodontaster hodgsoni* | 3 | 160 | -64.15 | -62.74 | 90.150 | 9.850 | 0.130 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Kampylaster incurvatus* | 4 | 160 | -64.15 | -62.74 | 90.720 | 9.280 | 0.121 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Odontaster penicillatus* | 1 | 160 | -64.15 | -62.74 | 90.090 | 9.910 | 0.131 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Porania antarctica* | 3 | 160 | -64.15 | -62.74 | 89.800 | 10.200 | 0.135 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Diplasterias brandti* | 3 | 30 | -64.77 | -64.05 | 90.480 | 9.520 | 0.125 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Granaster nutrix* | 5 | 30 | -64.77 | -64.05 | 91.710 | 8.290 | 0.107 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Neosmilaster georgianus* | 3 | 30 | -64.77 | -64.05 | 90.630 | 9.370 | 0.123 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Odontaster meridionalis* | 3 | 30 | -64.77 | -64.04 | 90.500 | 9.500 | 0.125 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Perknaster aurorae* | 3 | 30 | -64.78 | -63.99 | 91.140 | 8.510 | 0.111 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Acodontaster conspicuus* | 1 | 30 | -65.07 | -63.97 | 90.610 | 9.390 | 0.123 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Perknaster fuscus antracticus* | 1 | 30 | -65.07 | -63.97 | 90.080 | 9.920 | 0.131 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Henricia* sp. | 2 | 155 | -65.67 | -67.40 | 90.180 | 9.820 | 0.129 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Asteroidea | *Diplopteraster verrucosus* | 2 | 900 | -66.29 | -66.60 | 89.630 | 8.120 | 0.108 | 34.03 | 1.54 | 274.69 | 97.85 | 78.28 | 48.93 |
| Echinodermata | Echinoidea | *Diadema setosum* | 3 | 0.5 | -18.85 | 159.75 | 83.070 | 13.300 | 0.190 | 35.71 | 22.56 | 295.71 | 238.74 | 190.99 | 119.37 |
| Echinodermata | Echinoidea | *Evechinus chloroticus* | 3 | 5 | -45.30 | 166.97 | 88.310 | 9.530 | 0.128 | 34.15 | 7.34 | 280.49 | 130.46 | 104.37 | 65.23 |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 2 | 8 | -45.41 | 167.10 | 94.910 | 4.000 | 0.050 | 34.15 | 7.34 | 280.49 | 130.46 | 104.37 | 65.23 |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 3 | 8 | -45.41 | 167.10 | 92.640 | 5.570 | 0.071 | 33.87 | 1.01 | 274.16 | 111.82 | 89.46 | 55.91 |
| Echinodermata | Echinoidea | *Amphineustes similis* | 2 | 685 | -64.75 | -65.47 | 96.300 | 3.700 | 0.046 | 33.87 | 1.01 | 274.16 | 111.82 | 89.46 | 55.91 |
| Echinodermata | Echinoidea | *Amphineustes similis* | 4 | 685 | -64.75 | -65.47 | 92.490 | 7.510 | 0.096 | 33.87 | 1.01 | 274.16 | 111.82 | 89.46 | 55.91 |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 3 | 685 | -64.75 | -65.47 | 96.180 | 3.810 | 0.047 | 33.87 | 1.01 | 274.16 | 111.82 | 89.46 | 55.91 |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 3 | 685 | -64.75 | -65.47 | 92.390 | 7.610 | 0.098 | 34.34 | 1.32 | 274.47 | 102.46 | 81.97 | 51.23 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 3 | 30 | -65.07 | -63.97 | 96.500 | 3.490 | 0.043 | 33.87 | 3.01 | 276.16 | 121.82 | 97.46 | 60.91 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 6 | 30 | -65.07 | -63.97 | 93.960 | 6.040 | 0.076 | 33.92 | 3.99 | 277.14 | 119.53 | 95.62 | 59.76 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 3 | 30 | -65.07 | -63.97 | 94.140 | 2.770 | 0.035 | 33.87 | 3.01 | 276.16 | 121.82 | 97.46 | 60.91 |
| Echinodermata | Ophiuroidea | *Ophionotus victoriae* | 3 | 30 | -64.77 | -64.05 | 90.800 | 9.200 | 0.120 | 36.86 | 20.16 | 293.31 | 232.04 | 185.63 | 116.02 |
| Echinodermata | Ophiuroidea | *Ophiosparte gigas* | 1 | 30 | -64.77 | -64.05 | 90.870 | 9.130 | 0.119 | 37.98 | 17.54 | 290.69 | 246.65 | 197.32 | 123.32 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Echinodermata | Asteroidea | *Asterias linckii* | 1 | 20 | 65.81 | 39.73 | 88.010 | 9.460 | 0.128 | 34.52 | 17.58 | 290.73 | 198.69 | 158.95 | 99.34 |
| Echinodermata | Asteroidea | *Orthasterias tanneri* | 1 | 30 | 61.68 | 3.31 | 86.410 | 10.690 | 0.147 | 35.09 | 8.07 | 281.22 | 179.42 | 143.54 | 89.71 |
| Echinodermata | Asteroidea | *Ctenodiscus crispatus* | 1 | 80 | 46.90 | -59.10 | 88.480 | 8.780 | 0.118 | 33.13 | -0.87 | 272.28 | 88.68 | 70.94 | 44.34 |
| Echinodermata | Asteroidea | *Pisaster giganteus* | 1 | 10 | 34.39 | -119.68 | n/a | 16.85 | n/a | 34.7433 | 34.74 | 24.11 | 297.26 | 248.52 | 198.82 |
| Echinodermata | Asteroidea | *Unidentified* | 1 | 5 | 24.89 | -80.99 | n/a | 10.41 | n/a | 35.2028 | 35.20 | 21.92 | 295.07 | 234.99 | 187.99 |
| Echinodermata | Asteroidea | *Asterias vulgaris* | 1 | 10 | 44.79 | -66.92 | 91.060 | 7.790 | 0.102 | 33.83 | 9.25 | 282.40 | 231.81 | 185.45 | 115.90 |
| Echinodermata | Asteroidea | *Asterias acervata borealis* | 1 | 40 | 43.58 | -65.17 | 86.390 | 9.600 | 0.132 | 35.09 | 8.07 | 281.22 | 179.42 | 143.54 | 89.71 |
| Echinodermata | Asteroidea | *Asterias forbesi* | 1 | 10 | 41.42 | -70.80 | 88.190 | 8.240 | 0.111 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Echinodermata | Asteroidea | *Odontaster hispidus* | 1 | 40 | 41.30 | -70.80 | 87.160 | 10.580 | 0.144 | 33.09 | 17.60 | 290.75 | 163.99 | 131.19 | 81.99 |
| Echinodermata | Asteroidea | *Plutonaster agassizii* | 1 | 10 | 41.30 | -70.80 | 89.180 | 9.090 | 0.121 | 32.71 | 21.39 | 294.54 | 173.17 | 138.53 | 86.58 |
| Echinodermata | Asteroidea | *Pontaster tenuispinus* | 1 | 40 | 41.30 | -70.80 | 89.340 | 8.860 | 0.118 | 34.52 | 17.58 | 290.73 | 198.69 | 158.95 | 99.34 |
| Echinodermata | Asteroidea | *Leptasterias compta* | 1 | 100 | 40.28 | -69.85 | 86.570 | 10.270 | 0.141 | 34.52 | 18.51 | 291.66 | 175.82 | 140.66 | 87.91 |
| Echinodermata | Asteroidea | *Benthopecten spinosus* | 1 | 100 | 39.25 | -68.13 | 86.420 | 9.880 | 0.136 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Echinodermata | Asteroidea | *Astropecten articulatus* | 1 | 200 | 35.71 | -73.50 | 85.080 | 13.020 | 0.182 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Echinodermata | Asteroidea | *Urasterias linckii* | 1 | 200 | 35.71 | -73.50 | 88.250 | 8.910 | 0.120 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Echinodermata | Asteroidea | *Asterias tanneri* | 1 | 200 | 35.71 | -73.50 | 87.440 | 10.280 | 0.140 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Echinodermata | Asteroidea | *Asterina miniata* | 1 | 10 | 35.20 | -121.30 | 88.060 | 11.240 | 0.152 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Echinodermata | Asteroidea | *Astropecten americanus* | 1 | 10 | 26.90 | -82.80 | 87.930 | 10.110 | 0.136 | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Asteroidea | *Asterina minuta* | 1 | 15 | 18.04 | -67.96 | 86.770 | 12.530 | 0.171 | 33.65 | 17.00 | 290.15 | 177.33 | 141.86 | 88.66 |
| Echinodermata | Asteroidea | *Linckia guildingii* | 1 | 30 | 18.04 | -67.96 | 83.420 | 14.310 | 0.204 | 36.63 | 21.94 | 295.09 | 249.23 | 199.39 | 124.62 |
| Echinodermata | Asteroidea | *Acanthaster planci* | 1 | 25 | 5.86 | -162.08 | 85.990 | 13.330 | 0.184 | 33.93 | 28.88 | 302.03 | 247.41 | 197.93 | 123.70 |
| Echinodermata | Asteroidea | *Ctenodiscus procurator* | 1 | 30 | -35.70 | -72.80 | 87.520 | 11.160 | 0.151 | 34.84 | 27.32 | 300.47 | 251.49 | 201.19 | 125.75 |
| Echinodermata | Crinoidea | *Heliometra glacialis* | 1 | 20 | 68.20 | 39.20 | 88.500 | 9.500 | 0.127 | 34.96 | 6.73 | 279.88 | 176.54 | 141.23 | 88.27 |
| Echinodermata | Crinoidea | *Ptilocrinus pinnatus* | 1 | 10 | 53.10 | -130.00 | 88.480 | 7.910 | 0.106 | 32.33 | 7.14 | 280.29 | 121.11 | 96.89 | 60.56 |
| Echinodermata | Crinoidea | *Florometra asperrima* | 1 | 12 | 47.10 | -124.20 | 89.450 | 9.440 | 0.125 | 33.05 | 13.40 | 286.55 | 157.09 | 125.67 | 78.55 |
| Echinodermata | Crinoidea | *Bythocrinus robustus* | 1 | 40 | 42.30 | -70.77 | 87.160 | 10.090 | 0.137 | 32.71 | 21.39 | 294.54 | 173.17 | 138.53 | 86.58 |
| Echinodermata | Crinoidea | *Psathyrometra fragilis* | 1 | 20 | 35.07 | 139.70 | 87.770 | 9.250 | 0.125 | 34.38 | 27.65 | 300.80 | 233.89 | 187.11 | 116.94 |
| Echinodermata | Crinoidea | *Pentametrocrinus japonicus* | 1 | 20 | 34.90 | 138.50 | 87.340 | 10.150 | 0.138 | 32.71 | 21.39 | 294.54 | 173.17 | 138.53 | 86.58 |
| Echinodermata | Crinoidea | *Crinometra concinna* | 1 | 40 | 28.05 | -96.02 | 87.960 | 11.690 | 0.158 | 35.54 | 19.72 | 292.87 | 198.10 | 158.48 | 99.05 |
| Echinodermata | Crinoidea | *Isocrinus decorus* | 1 | 50 | 21.40 | -76.70 | 88.200 | 11.690 | 0.157 | 34.13 | 17.12 | 290.27 | 121.66 | 97.33 | 60.83 |
| Echinodermata | Crinoidea | *Endoxocrinus parra* | 1 | 60 | 21.40 | -76.70 | 88.130 | 11.620 | 0.157 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Tropiometra picta* | 1 | 30 | 21.40 | -76.70 | 87.510 | 11.770 | 0.160 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Promachocrinus kerguelensis* | 1 | 20 | 11.17 | -60.68 | 91.550 | 7.860 | 0.102 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Capillaster multiradiata* | 1 | 30 | 7.85 | 116.90 | 86.320 | 12.690 | 0.175 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Pachylometra patula* | 1 | 30 | 7.85 | 116.90 | 85.810 | 12.200 | 0.169 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Catoptometra ophiura* | 1 | 30 | 7.85 | 116.90 | 86.460 | 11.680 | 0.160 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Crinoidea | *Hypalocrinus naresianus* | 1 | 30 | 7.85 | 116.90 | 89.660 | 10.160 | 0.135 | 36.17 | 25.83 | 298.98 | 251.71 | 201.37 | 125.86 |
| Echinodermata | Crinoidea | *Parametra granulata* | 1 | 30 | 7.85 | 116.90 | 87.860 | 11.080 | 0.150 | 36.17 | 25.83 | 298.98 | 251.71 | 201.37 | 125.86 |
| Echinodermata | Crinoidea | *Craspedometra anceps* | 1 | 30 | 7.85 | 116.90 | 86.930 | 12.340 | 0.169 | 36.17 | 25.83 | 298.98 | 251.71 | 201.37 | 125.86 |
| Echinodermata | Crinoidea | *Zygometra microdiscus* | 1 | 40 | -5.99 | 134.10 | 85.480 | 13.370 | 0.186 | 36.91 | 23.39 | 296.54 | 245.45 | 196.36 | 122.73 |
| Echinodermata | Crinoidea | *Tropiometra carinata* | 1 | 15 | -22.98 | -43.20 | 83.130 | 13.740 | 0.196 | 35.16 | 27.24 | 300.39 | 256.78 | 205.43 | 128.39 |
| Echinodermata | Crinoidea | *Pilometra mülleri* | 1 | 20 | -33.85 | 151.26 | 87.940 | 11.130 | 0.150 | 33.97 | 29.14 | 302.29 | 240.31 | 192.25 | 120.15 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 1 | 3100 | 8.70 | -55.80 | n/a | 8.56 | n/a | 34.73 | 1.63 | 274.78 | 82.32 | 65.86 | 41.16 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 1 | 3100 | 8.70 | -55.80 | n/a | 8.40 | n/a | 34.73 | 1.63 | 274.78 | 82.32 | 65.86 | 41.16 |
| Echinodermata | Echinoidea | *Strongylocentrotus droebachiensis* | 1 | 40 | 64.00 | -38.00 | 93.130 | 5.990 | 0.076 | 34.83 | 7.12 | 280.27 | 127.16 | 101.73 | 63.58 |
| Echinodermata | Echinoidea | *Echinarachnius parma* | 1 | 32 | 59.20 | -165.80 | 92.130 | 6.130 | 0.079 | 32.94 | 8.46 | 281.61 | 141.05 | 112.84 | 70.52 |
| Echinodermata | Echinoidea | *Arbacia pustulosa* | 1 | 15 | 40.76 | 14.35 | 90.080 | 7.720 | 0.102 | 33.85 | 9.80 | 282.95 | 139.04 | 111.23 | 69.52 |
| Echinodermata | Echinoidea | *Echinus esculentus* | 1 | 10 | 38.00 | -1.02 | 89.640 | 8.840 | 0.117 | 34.38 | 27.14 | 300.29 | 223.35 | 178.68 | 111.67 |
| Echinodermata | Echinoidea | *Paracentrotus lividus* | 1 | 5 | 37.24 | 13.68 | 89.400 | 8.530 | 0.113 | 34.93 | 29.38 | 302.53 | 243.07 | 194.46 | 121.54 |
| Echinodermata | Echinoidea | *Clypeaster testudinarius* | 1 | 20 | 33.40 | 134.60 | 91.290 | 8.410 | 0.109 | 37.98 | 17.54 | 290.69 | 246.65 | 197.32 | 123.32 |
| Echinodermata | Echinoidea | *Prionocidaris baculosa* | 1 | 15 | 28.02 | 34.97 | 89.330 | 10.670 | 0.142 | 32.94 | 8.46 | 281.61 | 141.05 | 112.84 | 70.52 |
| Echinodermata | Echinoidea | *Tetrocidaris affinis* | 1 | 10 | 26.90 | -82.80 | 89.350 | 9.300 | 0.124 | 36.08 | 26.28 | 299.43 | 251.16 | 200.93 | 125.58 |
| Echinodermata | Echinoidea | *Mellita sexiesperforatus* | 1 | 30 | 18.04 | -67.96 | 85.020 | 11.910 | 0.166 | 31.96 | 9.77 | 282.92 | 156.89 | 125.51 | 78.45 |
| Echinodermata | Echinoidea | *Tetrapygus niger* | 1 | 20 | -9.40 | -78.50 | 90.520 | 6.270 | 0.082 | 36.19 | 25.42 | 298.57 | 258.80 | 207.04 | 129.40 |
| Echinodermata | Echinoidea | *Heterocentrotus mammillatus* | 1 | 20 | -27.64 | -144.33 | 86.420 | 12.260 | 0.168 | 40.40 | 23.37 | 296.52 | 282.07 | 225.66 | 141.04 |
| Echinodermata | Echinoidea | *Lytechinus albus* | 1 | 10 | -43.60 | -74.00 | 91.730 | 7.380 | 0.096 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 1 | 10 | 34.80 | -120.60 | n/a | 2.83 | n/a | 34.51 | 20.33 | 293.48 | 201.59 | 161.28 | 100.80 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 1 | 10 | 37.80 | -122.10 | n/a | 6.44 | n/a | 34.20 | 21.07 | 294.22 | 196.02 | 156.81 | 98.01 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 237 | -60.62 | -46.96 | n/a | 2.89 | n/a | 34.63 | 1.92 | 275.07 | 77.98 | 62.39 | 38.99 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 602 | -74.66 | -29.52 | n/a | 2.28 | n/a | 34.46 | 2.46 | 275.61 | 76.21 | 60.97 | 38.11 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 810 | -75.54 | -29.88 | n/a | 2.02 | n/a | 34.72 | 1.07 | 274.22 | 79.93 | 63.94 | 39.96 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 1480 | -73.48 | -22.66 | n/a | 1.93 | n/a | 34.73 | 2.00 | 275.15 | 81.23 | 64.99 | 40.62 |
| Echinodermata | Echinoidea | *Eucidaris tribuloides* | 1 | 5 | 24.65 | -81.25 | n/a | 4.86 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 1 | 5 | 24.65 | -81.25 | n/a | 4.83 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 1 | 5 | 24.65 | -81.25 | n/a | 10.57 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Echinoidea | *Lytechinus varieqatus* | 1 | 5 | 24.79 | -80.82 | n/a | 5.73 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Ophiuroidea | *Astrophyton* sp. | 1 | 60 | 56.00 | 2.90 | 89.670 | 9.110 | 0.121 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Echinodermata | Ophiuroidea | *Ophiopholis aculeata japonica* | 1 | 10 | 53.91 | -166.50 | 91.160 | 8.010 | 0.104 | 34.51 | 23.85 | 297.00 | 246.10 | 196.88 | 123.05 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus arcticus* | 1 | 10 | 41.50 | -70.30 | 86.600 | 9.530 | 0.131 | 32.57 | 9.62 | 282.77 | 143.70 | 114.96 | 71.85 |
| Echinodermata | Ophiuroidea | *Ophioglypha sarsii* | 1 | 100 | 39.54 | -72.35 | 87.650 | 9.840 | 0.133 | 34.51 | 23.85 | 297.00 | 246.10 | 196.88 | 123.05 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus eucnemis* | 1 | 50 | 38.30 | 139.00 | 88.440 | 8.390 | 0.113 | 35.24 | 10.50 | 283.65 | 167.52 | 134.02 | 83.76 |
| Echinodermata | Ophiuroidea | *Ophionereis eurybrachiplax* | 1 | 50 | 38.30 | 139.00 | 85.530 | 13.380 | 0.186 | 34.20 | 23.49 | 296.64 | 213.34 | 170.67 | 106.67 |
| Echinodermata | Ophiuroidea | *Ophioglypha lütkeni* | 1 | 200 | 35.20 | -121.30 | 86.340 | 10.190 | 0.140 | 34.52 | 18.51 | 291.66 | 175.82 | 140.66 | 87.91 |
| Echinodermata | Ophiuroidea | *Ophiothrix angulata* | 1 | 200 | 21.40 | -76.70 | 87.240 | 11.680 | 0.159 | 32.86 | 14.31 | 287.46 | 147.12 | 117.69 | 73.56 |
| Echinodermata | Ophiuroidea | *Ophiocamax fasciculata* | 1 | 100 | 21.40 | -76.70 | 91.300 | 7.620 | 0.099 | 36.82 | 23.81 | 296.96 | 267.33 | 213.86 | 133.66 |
| Echinodermata | Ophiuroidea | *Ophiocoma erinaceus* | 1 | 20 | 20.10 | -155.30 | 86.830 | 12.050 | 0.165 | 36.82 | 23.81 | 296.96 | 267.33 | 213.86 | 133.66 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 1 | 5 | 25.01 | -80.46 | n/a | 13.62 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 1 | 5 | 24.65 | -81.25 | n/a | 13.71 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Echinodermata | Ophiuroidea | *Ophioderma cinerum* | 1 | 30 | 18.50 | -66.60 | 85.090 | 14.080 | 0.196 | 36.82 | 23.81 | 296.96 | 267.33 | 213.86 | 133.66 |
| Echinodermata | Ophiuroidea | *Ophiocoma aethiops* | 1 | 25 | 18.04 | -67.96 | 92.120 | 7.040 | 0.091 | 36.82 | 23.81 | 296.96 | 267.33 | 213.86 | 133.66 |
| Echinodermata | Ophiuroidea | *Ophiomixa flaccida* | 1 | 120 | 18.04 | -67.96 | 81.020 | 14.560 | 0.213 | 34.16 | 27.86 | 301.01 | 237.55 | 190.04 | 118.78 |
| Echinodermata | Ophiuroidea | *Ophiocoma pumila* | 1 | 120 | 18.04 | -67.96 | 84.440 | 12.970 | 0.182 | 36.53 | 24.79 | 297.94 | 257.40 | 205.92 | 128.70 |
| Echinodermata | Ophiuroidea | *Ophiomusium lymani* | 1 | 200 | -1.00 | -91.01 | 92.700 | 6.610 | 0.085 | 33.48 | 6.24 | 279.39 | 166.29 | 133.04 | 83.15 |
| Echinodermata | Ophiuroidea | *Ophioglypha lymani* | 1 | 30 | -35.70 | -72.80 | 89.500 | 8.240 | 0.109 | 36.53 | 24.79 | 297.94 | 257.40 | 205.92 | 128.70 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Coralline algae | - | *Lithothamnium* sp. | 1 | 10 | 78.00 | 20.00 | 84.830 | 8.670 | 0.121 | 35.09 | 8.07 | 281.22 | 179.42 | 143.54 | 89.71 |
| Coralline algae | - | *Lithothamnium soriferum* | 1 | 10 | 75.00 | 20.00 | 80.900 | 9.560 | 0.140 | 34.38 | 3.83 | 276.98 | 164.72 | 131.78 | 82.36 |
| Coralline algae | - | *Lithothamnium glaciale* | 1 | 10 | 75.00 | 20.00 | 83.100 | 13.190 | 0.188 | 36.66 | 22.27 | 295.42 | 247.54 | 198.03 | 123.77 |
| Coralline algae | - | *Lithothamnium fornicatum* | 1 | 10 | 72.00 | 20.00 | 88.610 | 10.090 | 0.135 | 35.09 | 8.07 | 281.22 | 179.42 | 143.54 | 89.71 |
| Coralline algae | - | *Lithothamnium polymorphum* | 1 | 10 | 57.00 | 12.00 | 74.220 | 9.100 | 0.146 | 32.92 | 8.45 | 281.60 | 178.18 | 142.54 | 89.09 |
| Coralline algae | - | *Corallina squamata -* 29-Nov | 1 | 5 | 50.60 | -2.30 | 71.680 | 10.530 | 0.174 | 35.60 | 14.57 | 287.72 | 194.74 | 155.79 | 97.37 |
| Coralline algae | - | *Corallina squamata -* 29-Jan | 1 | 5 | 50.60 | -2.30 | 72.420 | 9.650 | 0.158 | 35.64 | 14.40 | 287.55 | 192.09 | 153.67 | 96.04 |
| Coralline algae | - | *Corallina squamata -* 26-Mar | 1 | 5 | 50.60 | -2.30 | 70.400 | 9.260 | 0.156 | 35.63 | 14.55 | 287.70 | 210.98 | 168.78 | 105.49 |
| Coralline algae | - | *Corallina squamata -* 28-May | 1 | 5 | 50.60 | -2.30 | 71.050 | 8.670 | 0.145 | 31.79 | 13.16 | 286.31 | 172.11 | 137.69 | 86.06 |
| Coralline algae | - | *Corallina squamata -* 01-Jul | 1 | 5 | 50.60 | -2.30 | 72.340 | 9.340 | 0.153 | 37.98 | 17.54 | 290.69 | 246.65 | 197.32 | 123.32 |
| Coralline algae | - | *Corallina squamata -* 13-Aug | 1 | 5 | 50.60 | -2.30 | 71.290 | 9.790 | 0.163 | 32.86 | 14.31 | 287.46 | 167.12 | 133.69 | 83.56 |
| Coralline algae | - | *Corallina squamata -* 12-Sep | 1 | 5 | 50.60 | -2.30 | 71.370 | 10.340 | 0.172 | 34.70 | 30.15 | 303.30 | 257.24 | 205.79 | 128.62 |
| Coralline algae | - | *Corallina squamata -* 10-Oct | 1 | 5 | 50.60 | -2.30 | 72.460 | 10.190 | 0.167 | 34.70 | 30.15 | 303.30 | 258.24 | 206.59 | 129.12 |
| Coralline algae | - | *Corallina officinalis* | 1 | 5 | 49.60 | -1.20 | 86.680 | 12.060 | 0.165 | 34.70 | 30.15 | 303.30 | 259.24 | 207.39 | 129.62 |
| Coralline algae | - | *Lithothamnium calcareum* | 1 | 10 | 48.08 | -4.00 | 84.600 | 12.040 | 0.169 | 34.70 | 30.15 | 303.30 | 260.24 | 208.19 | 130.12 |
| Coralline algae | - | *Lithophyllum incrustans* | 1 | 10 | 48.00 | -3.00 | 87.100 | 11.140 | 0.152 | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Phymatolithon compactum* | 1 | 10 | 48.00 | -55.00 | 87.210 | 10.930 | 0.149 | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Lithophyllum tortuosum* | 1 | 20 | 44.00 | 9.00 | 77.580 | 9.830 | 0.150 | 34.67 | 28.50 | 301.65 | 259.46 | 207.56 | 129.73 |
| Coralline algae | - | *Lithophyllum proboscideum* | 1 | 15 | 37.00 | -122.00 | 72.000 | 8.150 | 0.134 | 35.40 | 26.65 | 299.80 | 262.09 | 209.67 | 131.05 |
| Coralline algae | - | *Goniolithon strictum -* old | 1 | 30 | 25.00 | -75.00 | 74.850 | 24.000 | 0.381 | 29.37 | 34.79 | 307.94 | 260.70 | 208.56 | 130.35 |
| Coralline algae | - | *Goniolithon strictum -* old | 1 | 30 | 25.00 | -75.00 | 74.290 | 23.740 | 0.379 | 34.73 | 30.10 | 303.25 | 256.96 | 205.57 | 128.48 |
| Coralline algae | - | *Goniolithon strictum -* young | 1 | 30 | 25.00 | -75.00 | 75.420 | 22.980 | 0.362 | 34.58 | 28.29 | 301.44 | 235.47 | 188.38 | 117.74 |
| Coralline algae | - | *Lithophyllum pachydermum* | 1 | 30 | 25.00 | -75.00 | 83.060 | 15.430 | 0.221 | 34.23 | 29.17 | 302.32 | 238.10 | 190.48 | 119.05 |
| Coralline algae | - | *Goniolithon acropectum* | 1 | 20 | 18.00 | -68.00 | 79.050 | 19.240 | 0.289 | 34.60 | 28.66 | 301.81 | 234.24 | 187.39 | 117.12 |
| Coralline algae | - | *Amphiroa fragilissima* | 1 | 10 | 18.00 | -68.00 | 76.230 | 17.470 | 0.272 | 34.60 | 27.33 | 300.48 | 208.18 | 166.54 | 104.09 |
| Coralline algae | - | *Lithothamnium nodosum* | 1 | 5 | 0.00 | -90.00 | 91.040 | 6.060 | 0.079 | 35.55 | 15.58 | 288.73 | 193.68 | 154.95 | 96.84 |
| Coralline algae | - | *Lithophyllum oncodes* | 1 | 30 | -7.00 | 56.00 | 80.930 | 18.170 | 0.267 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Goniolithon orthoblastum* | 1 | 10 | -10.00 | 145.00 | 86.220 | 13.660 | 0.188 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 17.373 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 17.548 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 14.843 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 15.890 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 18.595 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 19.641 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 19.729 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | n/a | 19.031 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | n/a | 14.582 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | n/a | 16.763 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | n/a | 16.239 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | n/a | 14.756 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | n/a | 13.099 | n/a | 36.61 | 24.55 | 297.70 | 258.94 | 207.15 | 129.47 |
| Coralline algae | - | *Lithothamnium erubescens* | 1 | 10 | -10.00 | 123.00 | 81.590 | 16.960 | 0.247 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Archaeolithothamium episporum* | 1 | 10 | -10.00 | 80.00 | 83.470 | 13.090 | 0.186 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Lithothamnium kaiseri* | 1 | 10 | -15.00 | -172.00 | 72.800 | 16.150 | 0.263 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Porolithon craspedium* | 1 | 10 | -15.00 | -172.00 | 75.390 | 16.800 | 0.265 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
| Coralline algae | - | *Porolithon oncodes* | 1 | 10 | -15.00 | -172.00 | 78.200 | 13.750 | 0.209 | 35.55 | 15.58 | 288.73 | 193.69 | 154.95 | 96.85 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Foraminifera | - | *Pulvinulina menardii -* pelagic | 1 | 20 | 40.56 | -66.15 | 77.020 | 3.670 | 0.057 | 34.46 | 23.63 | 296.78 | 219.31 | 175.45 | 109.66 |
| Foraminifera | - | *Polytrema mineaccum -* benthic | 1 | 100 | 25.00 | -77.00 | 90.110 | 9.330 | 0.123 | 34.23 | 30.01 | 303.16 | 248.76 | 199.01 | 124.38 |
| Foraminifera | - | *Orbitolites marginatis -* benthic | 1 | 50 | 24.60 | -81.96 | 89.010 | 10.550 | 0.141 | 34.38 | 29.29 | 302.44 | 278.83 | 223.07 | 139.42 |
| Foraminifera | - | *Amphistegina lessonii* - pelagic | 1 | 20 | 16.10 | -22.95 | 92.850 | 4.900 | 0.063 | 34.68 | 25.82 | 298.97 | 251.31 | 201.04 | 125.65 |
| Foraminifera | - | *Sphaeroidina dehiscens -* pelagic | 1 | 20 | 12.40 | 121.60 | 84.380 | 1.790 | 0.025 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Foraminifera | - | *Orbitolites complanata -* benthic | 1 | 30 | -17.30 | 177.47 | 86.460 | 12.520 | 0.172 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | n/a | 13.099 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | n/a | 11.528 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | n/a | 11.877 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | n/a | 12.575 | n/a | 36.72 | 23.73 | 296.88 | 252.33 | 201.86 | 126.16 |
| Foraminifera | - | *Globigerinoides ruber* | 1 | 5 | 11.84 | -86.68 | n/a | 0.353 | n/a | 35.95 | 27.83 | 300.98 | 270.53 | 216.42 | 135.27 |
| Foraminifera | - | *Globigerinoides ruber* | 1 | 5 | 11.95 | -86.68 | n/a | 0.441 | n/a | 35.95 | 27.83 | 300.98 | 270.53 | 216.42 | 135.27 |
| Foraminifera | - | *Globigerinoides sacculifer* | 1 | 5 | 11.95 | -86.68 | n/a | 0.275 | n/a | 35.95 | 27.83 | 300.98 | 270.53 | 216.42 | 135.27 |
| Foraminifera | - | *Globorotalia menardii* | 1 | 5 | 25.03 | -77.83 | n/a | 0.318 | n/a | 36.52 | 28.76 | 301.91 | 256.08 | 204.87 | 128.04 |
| Foraminifera | - | *Hastigeria pelagica* | 1 | 5 | 11.95 | -86.68 | n/a | 0.423 | n/a | 35.95 | 27.83 | 300.98 | 270.53 | 216.42 | 135.27 |
| Foraminifera | - | *Orbulina universa* | 1 | 5 | 11.95 | -86.68 | n/a | 0.493 | n/a | 35.95 | 27.83 | 300.98 | 270.53 | 216.42 | 135.27 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hydrocorallia | - | *Millepora alcicornis* | 1 | 10 | 24.60 | -81.96 | 98.220 | 0.950 | 0.011 | 36.17 | 25.83 | 298.98 | 251.71 | 201.37 | 125.86 |
| Hydrocorallia | - | *Distichopora nitida* | 1 | 20 | 7.40 | 151.50 | 98.220 | 0.240 | 0.003 | 36.81 | 26.46 | 299.61 | 261.14 | 208.91 | 130.57 |
| Hydrocorallia | - | *Millepora braziliensis* | 1 | 30 | -12.20 | -36.80 | 96.770 | 1.280 | 0.016 | 33.91 | 29.09 | 302.24 | 249.15 | 199.32 | 124.57 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Hexacorallia | - | *Madracis decactis* | 1 | 20 | 32.40 | -64.90 | 99.060 | 0.760 | 0.009 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Hexacorallia | - | *Siderastrea radians* | 1 | 20 | 32.40 | -64.90 | 99.270 | 0.480 | 0.006 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Hexacorallia | - | *Flabellum alabastrum* | 1 | 10 | 26.00 | -77.20 | 99.420 | 0.370 | 0.004 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Hexacorallia | - | *Acropora cervicornis* | 1 | 15 | 26.00 | -77.20 | 99.490 | 0.450 | 0.005 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Hexacorallia | - | *Favia fragum* | 1 | 20 | 24.60 | -81.96 | 99.200 | 0.390 | 0.005 | 36.10 | 26.49 | 299.64 | 256.56 | 205.25 | 128.28 |
| Hexacorallia | - | *Dasmosmilia lymani* | 1 | 10 | 24.60 | -81.96 | 98.710 | 0.630 | 0.008 | 36.63 | 21.35 | 294.50 | 256.94 | 205.55 | 128.47 |
| Hexacorallia | - | *Balanophyllia floridana* | 1 | 10 | 24.54 | -81.80 | 98.050 | 1.110 | 0.013 | 35.36 | 26.32 | 299.47 | 257.85 | 206.28 | 128.93 |
| Hexacorallia | - | *Paracyathus defilipii* | 1 | 10 | 24.54 | -81.80 | 98.320 | 0.870 | 0.011 | 36.77 | 23.72 | 296.87 | 262.37 | 209.90 | 131.19 |
| Hexacorallia | - | *Porites lutea* | 1 | 2 | 24.55 | 124.33 | n/a | 4.070 | n/a | 35.36 | 28.13 | 301.28 | 246.82 | 197.46 | 123.41 |
| Hexacorallia | - | *Porites sp.* | 1 | 2 | -18.28 | 147.38 | n/a | 3.302 | n/a | 34.68 | 25.82 | 298.97 | 251.31 | 201.04 | 125.65 |
| Hexacorallia | - | *Deltocyathus italicus* | 1 | 20 | 18.50 | -63.51 | 98.980 | 0.540 | 0.006 | 36.63 | 21.35 | 294.50 | 256.94 | 205.55 | 128.47 |
| Hexacorallia | - | *Desmophyllum ingens* | 1 | 15 | -36.55 | -73.00 | 99.210 | 0.590 | 0.007 | 33.80 | 9.92 | 273.15 | 141.30 | 113.04 | 70.65 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Octocorallia | - | *Gorgonia* sp. | 1 | 30 | 54.60 | 154.40 | 88.830 | 9.290 | 0.124 | 33.58 | 29.38 | 302.53 | 242.51 | 194.01 | 121.25 |
| Octocorallia | - | *Alcyonium carneum* | 1 | 50 | 45.18 | -55.85 | 84.500 | 6.660 | 0.094 | 34.13 | 29.00 | 302.15 | 239.41 | 191.52 | 119.70 |
| Octocorallia | - | *Paramuricea borealis* | 1 | 50 | 45.18 | -55.85 | 85.110 | 8.030 | 0.112 | 34.75 | 23.78 | 296.93 | 233.86 | 187.09 | 116.93 |
| Octocorallia | - | *Alcyonium carneum* | 1 | 50 | 45.18 | -55.85 | - | 6.660 |  | 32.54 | 2.23 | 275.38 | 106.34 | 85.07 | 53.17 |
| Octocorallia | - | *Pennatula aculeata* | 1 | 50 | 44.45 | -58.51 | 85.620 | 7.710 | 0.107 | 34.25 | 29.62 | 302.77 | 254.57 | 203.66 | 127.29 |
| Octocorallia | - | *Paragorgia arborea* | 1 | 50 | 44.36 | -63.75 | 88.040 | 9.050 | 0.122 | 36.77 | 23.72 | 296.87 | 262.37 | 209.90 | 131.19 |
| Octocorallia | - | *Paragorgia arborea* | 1 | 50 | 43.00 | -62.00 | - | 9.050 |  | 32.88 | 13.39 | 286.54 | 179.79 | 143.83 | 89.89 |
| Octocorallia | - | *Corallium elatior* | 1 | 40 | 42.25 | 130.91 | 86.570 | 11.560 | 0.159 | 33.64 | 8.23 | 281.38 | 159.71 | 127.77 | 79.86 |
| Octocorallia | - | *Primnoa resedaeformis* | 1 | 30 | 42.25 | 130.91 | - | 9.290 |  | 35.56 | 20.25 | 293.40 | 214.53 | 171.63 | 107.27 |
| Octocorallia | - | *Primnoa reseda* | 1 | 40 | 42.25 | -63.25 | - | 6.180 |  | 35.48 | 23.06 | 296.21 | 240.96 | 192.77 | 120.48 |
| Octocorallia | - | *Rhipidogorgia flabellum* | 1 | 20 | 32.40 | -64.90 | 83.380 | 12.640 | 0.180 | 35.48 | 23.06 | 296.21 | 240.96 | 192.77 | 120.48 |
| Octocorallia | - | *Pleurocorallium johnsoni* | 1 | 30 | 25.75 | -20.20 | 93.870 | 6.030 | 0.076 | 35.48 | 23.06 | 296.21 | 240.96 | 192.77 | 120.48 |
| Octocorallia | - | *Gorgonia acerosa* | 1 | 50 | 24.60 | -81.96 | 85.760 | 13.390 | 0.185 | 35.48 | 23.06 | 296.21 | 240.96 | 192.77 | 120.48 |
| Octocorallia | - | *Leptogorgia pulchra* | 1 | 80 | 24.60 | -108.25 | - | 13.710 |  | 36.68 | 27.77 | 300.92 | 269.08 | 215.27 | 134.54 |
| Octocorallia | - | *Xiphigorgia anceps* | 1 | 20 | 24.47 | -81.55 | 80.960 | 13.040 | 0.191 | 34.61 | 24.17 | 297.32 | 221.42 | 177.13 | 110.71 |
| Octocorallia | - | *Eunicella singularis* | 1 | 20 | 42.58 | 8.75 | n/a | 1.70 | n/a | 34.97 | 16.74 | 289.89 | 147.18 | 117.75 | 73.59 |
| Octocorallia | - | *Eunicella cavolini* | 1 | 20 | 42.58 | 8.75 | n/a | 2.00 | n/a | 34.97 | 16.74 | 289.89 | 147.18 | 117.75 | 73.59 |
| Octocorallia | - | *Paramuricea clavata* | 1 | 20 | 42.58 | 8.75 | n/a | 2.00 | n/a | 34.97 | 16.74 | 289.89 | 147.18 | 117.75 | 73.59 |
| Octocorallia | - | *Corallium rubrum* | 1 | 60 | 42.41 | 8.75 | n/a | 2.90 | n/a | 34.97 | 16.74 | 289.89 | 147.18 | 117.75 | 73.59 |
| Octocorallia | - | *E. Barbadensis* | 1 | 10 | 11.32 | -60.7 | n/a | 4.99 | n/a | 33.81 | 29.52 | 302.67 | 216.37 | 173.10 | 108.19 |
| Octocorallia | - | *Lepidisis spp.* | 1 | 3945 | -45.37 | 144.57 | n/a | 7.60 | n/a | 34.71 | 1.00 | 274.15 | 81.86 | 65.49 | 40.93 |
| Octocorallia | - | *Tubipora musica* | 1 | 5 | 14.21 | 122.06 | n/a | 13.45 | n/a | 34.63 | 27.22 | 300.37 | 265.60 | 212.48 | 132.80 |
| Octocorallia | - | *Tubipora musica* | 1 | 5 | 14.21 | 122.06 | n/a | 11.96 | n/a | 34.63 | 27.22 | 300.37 | 265.60 | 212.48 | 132.80 |
| Octocorallia | - | *Tubipora musica* | 1 | 5 | 14.21 | 122.06 | n/a | 11.18 | n/a | 34.63 | 27.22 | 300.37 | 265.60 | 212.48 | 132.80 |
| Octocorallia | - | *Plexaurella grisea* | 1 | 10 | 11.32 | -60.59 | n/a | 15.63 | n/a | 34.01 | 29.57 | 302.72 | 229.15 | 183.32 | 114.58 |
| Octocorallia | - | *Ellisella barbadensis* | 1 | 10 | 11.32 | -60.59 | n/a | 12.58 | n/a | 34.01 | 29.57 | 302.72 | 229.15 | 183.32 | 114.58 |
| Octocorallia | - | *Muricea echinata* | 1 | 10 | 22.86 | -106.10 | 83.790 | 12.280 | 0.174 | 32.17 | 13.67 | 286.82 | 149.26 | 119.41 | 74.63 |
| Octocorallia | - | *Leptogorgia rigida* | 1 | 150 | 22.86 | -109.79 | - | 14.130 |  | 33.09 | 10.98 | 284.13 | 137.16 | 109.73 | 68.58 |
| Octocorallia | - | *Heliopora cerulea* | 1 | 20 | 12.40 | 121.60 | 98.930 | 0.350 | 0.004 | 36.53 | 24.69 | 297.84 | 257.40 | 205.92 | 128.70 |
| Octocorallia | - | *Tubipora purpurea* | 1 | 10 | 1.33 | 103.83 | 84.610 | 12.230 | 0.172 | 34.20 | 23.49 | 296.64 | 213.34 | 170.67 | 106.67 |
| Octocorallia | - | *Phyllogorgia quercifolia* | 1 | 10 | -3.83 | -32.41 | - | 15.730 |  | 32.57 | 6.50 | 279.65 | 116.43 | 93.14 | 58.22 |
| Octocorallia | - | *Ctenocella pectinata* | 1 | 20 | -10.00 | 142.20 | - | 15.650 |  | 34.38 | 27.65 | 300.80 | 233.89 | 187.11 | 116.94 |
| Octocorallia | - | *Muricea humilis* | 1 | 30 | -12.20 | -36.80 | 84.470 | 12.640 | 0.178 | 34.52 | 17.58 | 290.73 | 198.69 | 158.95 | 99.34 |
| Octocorallia | - | *Gorgonia subfruticosa* | 1 | 45 | -18.00 | -178.00 | 79.840 | 13.430 | 0.200 | 34.52 | 17.58 | 290.73 | 198.69 | 158.95 | 99.34 |
| Octocorallia | - | *Plexaurella grandiflora* | 1 | 20 | -28.40 | 155.67 | 85.610 | 13.790 | 0.191 | 34.52 | 17.58 | 290.73 | 198.69 | 158.95 | 99.34 |
| Octocorallia | - | *Eunicella papillose* | 1 | 30 | -34.21 | 18.35 | 62.050 | 5.720 | 0.109 | 34.13 | 17.12 | 290.27 | 121.66 | 97.33 | 60.83 |
| Octocorallia | - | *Eunicella alba* | 1 | 30 | -34.22 | 18.48 | 68.700 | 7.050 | 0.122 | 34.17 | 13.17 | 286.32 | 137.43 | 109.95 | 68.72 |
| Octocorallia | - | *Eunicella tricoronata* | 1 | 30 | -34.22 | 18.48 | 70.750 | 7.310 | 0.123 | 34.70 | 30.15 | 303.30 | 257.24 | 205.79 | 128.62 |
| Octocorallia | - | *Lophogorgia flamea* | 1 | 30 | -34.22 | 18.48 | 75.510 | 7.990 | 0.126 | 35.51 | 14.55 | 287.70 | 128.14 | 102.51 | 64.07 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bryozoa | - | *Flustra membranacea* | 1 | 50 | 59.17 | -151.60 | 87.920 | 6.940 | 0.094 | 31.68 | 1.60 | 274.75 | 153.84 | 123.07 | 76.92 |
| Bryozoa | - | *Cellepora incrassata* | 1 | 50 | 44.69 | -62.69 | 91.770 | 6.070 | 0.079 | 35.56 | 20.25 | 293.40 | 214.53 | 171.63 | 107.27 |
| Bryozoa | - | *Schizoporella unicornis* | 1 | 10 | 41.35 | -70.79 | 95.970 | 0.630 | 0.008 | 31.68 | 1.60 | 274.75 | 153.84 | 123.07 | 76.92 |
| Bryozoa | - | *Bugula turrita* | 1 | 40 | 41.23 | -70.07 | 64.510 | 10.190 | 0.188 | 32.67 | 3.72 | 276.87 | 94.96 | 75.97 | 47.48 |
| Bryozoa | - | *Lepralia sp.* | 1 | 20 | 40.80 | 14.20 | 90.820 | 5.020 | 0.066 | 37.99 | 18.54 | 291.69 | 246.65 | 197.32 | 123.32 |
| Bryozoa | - | *Amathia spiralis* | 1 | 20 | 35.22 | -75.60 | 90.430 | 9.570 | 0.126 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Bryozoa | - | *Holoporella albirostris* | 1 | 20 | 24.47 | -81.55 | 95.280 | 2.590 | 0.032 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Bryozoa | - | *Bugula neritina* | 1 | 20 | 24.47 | -81.55 | 63.290 | 11.080 | 0.208 | 31.68 | 1.60 | 274.75 | 153.84 | 123.07 | 76.92 |
| Bryozoa | - | *Microporella grisea* | 1 | 20 | -28.40 | 155.67 | 96.900 | 1.110 | 0.014 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Bryozoa | - | *Adeonellopsis sp.* | 1 | 12 | -45.3 | 166.91 | n/a | 8.793 | n/a | 35.32 | 16.39 | 289.54 | 200.53 | 160.43 | 100.27 |
| Bryozoa | - | *Bugula neritina* | 1 | 5 | 26.71 | -79.99 | n/a | 8.327 | n/a | 35.27 | 26.39 | 299.54 | 243.25 | 194.60 | 121.62 |
| Bryozoa | - | *Bugula neritina* | 1 | 5 | 26.88 | -79.99 | n/a | 10.045 | n/a | 35.27 | 26.39 | 299.54 | 243.25 | 194.60 | 121.62 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Brachiopoda | - | *Terebratulina septentrionalis* | 1 | 30 | 44.87 | -66.91 | 96.780 | 1.370 | 0.017 | 34.46 | 23.63 | 296.78 | 219.31 | 175.45 | 109.66 |
| Brachiopoda | - | *Laqueus californicus* | 1 | 80 | 24.60 | -108.25 | 98.300 | 0.680 | 0.008 | 34.79 | 18.07 | 291.22 | 201.94 | 161.55 | 100.97 |
| Brachiopoda | - | *Krassina rubra* | 1 | 5 | -34.25 | 18.35 | n/a | 0.641193405 | n/a | 35.08 | 14.17 | 287.32 | 163.63 | 147.26 | 130.90 |
| Brachiopoda | - | *Megerlea truncata* | 1 | 5 | 37.28 | 13.07 | n/a | 2.394661083 | n/a | 35.99 | 25.80 | 298.95 | 214.87 | 193.39 | 171.90 |
| Brachiopoda | - | *Notosaris sp.* | 1 | 5 | -42.94 | 168.69 | n/a | 2.089330891 | n/a | 35.09 | 18.21 | 291.36 | 203.81 | 183.43 | 163.05 |
| Brachiopoda | - | *Terebratella cruenta* | 1 | 5 | -42.84 | 168.69 | n/a | 0.492890168 | n/a | 35.09 | 18.21 | 291.36 | 203.81 | 183.43 | 163.05 |
| Brachiopoda | - | *Stethothyris sp.* | 1 | 5 | -64.03 | -61.82 | n/a | 0.44054785 | n/a | 33.84 | 1.80 | 274.95 | 108.92 | 98.02 | 87.13 |
| Brachiopoda | - | *Thecidellina sp.* | 1 | 5 | 12.31 | -68.97 | n/a | 7.62016924 | n/a | 36.44 | 25.29 | 298.44 | 213.74 | 192.37 | 170.99 |
| Brachiopoda | - | *Thecidellina sp.* | 1 | 5 | 12.21 | -68.97 | n/a | 8.012736631 | n/a | 36.44 | 25.29 | 298.44 | 213.74 | 192.37 | 170.99 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mollusca | Polyplacophora | *Mopalia muscosa* | 1 | 120 | 34.39 | -119.70 | 98.370 | 0.450 | 0.005 | 33.58 | 39.38 | 312.53 | 242.51 | 194.01 | 121.25 |
| Mollusca | Bivalvia | *Astarte borealis* | 1 | 50 | 74.16 | 54.40 | 98.700 | 0.620 | 0.007 | 35.56 | 17.46 | 290.61 | 195.19 | 156.15 | 97.60 |
| Mollusca | Bivalvia | *Tellina calcarea* | 1 | 40 | 74.16 | 54.33 | 98.840 | 0.710 | 0.009 | 33.52 | 29.26 | 302.41 | 237.13 | 189.71 | 118.57 |
| Mollusca | Bivalvia | *Pecten groenlandicus* | 1 | 20 | 73.50 | 68.83 | 90.000 | 0.800 | 0.011 | 36.66 | 22.69 | 295.84 | 248.58 | 198.86 | 124.29 |
| Mollusca | Bivalvia | *Pecten islandicus* | 1 | 40 | 71.50 | 47.00 | 97.600 | 1.280 | 0.016 | 34.57 | 25.51 | 298.66 | 222.38 | 177.91 | 111.19 |
| Mollusca | Bivalvia | *Pecten dislocatus* | 1 | 10 | 26.81 | -82.29 | 98.000 | 1.000 | 0.012 | 35.02 | 8.36 | 281.51 | 178.97 | 143.18 | 89.49 |
| Mollusca | Bivalvia | *Pecten ventricosus* | 1 | 10 | 22.86 | -106.10 | 98.980 | 0.730 | 0.009 | 35.09 | 8.07 | 281.22 | 105.33 | 84.26 | 52.67 |
| Mollusca | Bivalvia | *Placuna orbicularis* | 1 | 10 | 16.83 | 120.26 | 99.220 | 0.700 | 0.008 | 32.93 | 5.10 | 278.25 | 105.33 | 84.26 | 52.67 |
| Mollusca | Cephalopoda | *Nautilus pompilius* | 1 | 100 | 8.53 | 123.03 | 99.500 | 0.160 | 0.002 | 33.80 | 29.76 | 302.91 | 239.93 | 191.94 | 119.97 |
| Mollusca | Cephalopoda | *Sepia officinalis* | 1 | 10 | 5.84 | 118.27 | 98.320 | 1.620 | 0.020 | 33.50 | 0.00 | 273.15 | 150.49 | 120.39 | 75.24 |
| Mollusca | Cephalopoda | *Argonauta argo* | 1 | 50 | -35.82 | 175.39 | 93.760 | 6.020 | 0.076 | 33.91 | 10.93 | 284.08 | 131.88 | 105.50 | 65.94 |
| Mollusca | Gastropoda | *Neptunea despecta* | 1 | 20 | 69.63 | 57.35 | 98.520 | 1.170 | 0.014 | 34.40 | 8.45 | 281.60 | 203.08 | 162.46 | 101.54 |
| Mollusca | Gastropoda | *Natica clausa* | 1 | 20 | 60.50 | -46.91 | 98.540 | 0.840 | 0.010 | 34.20 | 23.49 | 296.64 | 213.34 | 170.67 | 106.67 |
| Mollusca | Gastropoda | *Tachyrhynchus erosa* | 1 | 30 | 52.90 | 158.76 | 97.000 | 1.020 | 0.012 | 34.20 | 23.49 | 296.64 | 213.34 | 170.67 | 106.67 |
| Mollusca | Gastropoda | *Nassa tegula* | 1 | 20 | 36.62 | -121.91 | 99.220 | 0.370 | 0.004 | 36.69 | 23.84 | 296.99 | 251.09 | 200.87 | 125.54 |
| Mollusca | Gastropoda | *Odontocymbiola magellanica* | 1 | 15 | -42.71 | -65.02 | n/a | 13.45 | n/a | 34.36 | 8.45 | 281.60 | 147.34 | 117.87 | 73.67 |
| Mollusca | Gastropoda | *Nassa isculpta* | 1 | 50 | 32.34 | -118.43 | 97.080 | 1.780 | 0.022 | 34.61 | 24.08 | 297.23 | 217.84 | 174.27 | 108.92 |
| Mollusca | Scaphopoda | *Dentalium solidum* | 1 | 30 | 41.23 | -70.07 | 99.130 | 0.200 | 0.002 | 32.85 | 10.77 | 283.92 | 146.62 | 117.30 | 73.31 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Crustacea | Cirripedia | *Scalpellum regium* | 1 | 5 | 52.92 | -132.29 | 97.020 | 2.230 | 0.027 | 34.20 | 23.49 | 296.64 | 213.34 | 170.67 | 106.67 |
| Crustacea | Cirripedia | *Balanus hameri* | 1 | 20 | 41.23 | -70.07 | 99.070 | 0.750 | 0.009 | 33.65 | 17.00 | 290.15 | 177.33 | 141.86 | 88.66 |
| Crustacea | Cirripedia | *Balanus amphitrite* | 1 | 5 | 38.92 | -74.91 | 95.630 | 1.630 | 0.020 | 32.86 | 14.31 | 287.46 | 167.12 | 133.69 | 83.56 |
| Crustacea | Cirripedia | *Lepas anatifera* | 1 | 10 | 24.47 | -81.55 | 97.270 | 2.490 | 0.030 | 32.76 | 10.07 | 283.22 | 133.16 | 106.53 | 66.58 |
| Crustacea | Cirripedia | *Mitella polymerus* | 1 | 10 | 22.86 | -106.10 | 97.470 | 2.110 | 0.026 | 33.49 | 1.30 | 274.45 | 165.83 | 132.66 | 82.92 |
| Crustacea | Amphipoda | *Tryphosa pinguis* | 1 | 30 | 41.52 | -70.67 | 74.640 | 4.840 | 0.077 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Crustacea | Isopoda | *Pentidotea wosnesenkii* | 1 | 2 | 48.75 | -125.23 | n/a | 5.841 | n/a | 35.26 | 13.97 | 287.12 | 163.77 | 131.02 | 81.89 |
| Crustacea | Isopoda | *Sphaeroma serratum* | 1 | 2 | 45.18 | 13.68 | n/a | 4.759 | n/a | 35.45 | 12.35 | 285.50 | 144.06 | 115.25 | 72.03 |
| Crustacea | Isopoda | *Gnovimosphaeroma oregonensis* | 1 | 2 | 48.75 | -125.23 | n/a | 4.689 | n/a | 35.26 | 13.97 | 287.12 | 163.77 | 131.02 | 81.89 |
| Crustacea | Decapoda | *Crago dalli* | 1 | 40 | 59.17 | -151.60 | 54.830 | 10.050 | 0.218 | 33.75 | 4.84 | 277.99 | 64.67 | 51.74 | 32.34 |
| Crustacea | Decapoda | *Pagurus rathbuni* | 1 | 210 | 58.46 | -175.22 | 78.030 | 5.800 | 0.088 | 36.69 | 23.84 | 296.99 | 251.09 | 200.87 | 125.54 |
| Crustacea | Decapoda | *Homarus americanus -* small | 1 | 30 | 43.84 | -69.64 | 78.980 | 7.740 | 0.116 | 32.54 | 9.23 | 282.38 | 118.47 | 94.78 | 59.24 |
| Crustacea | Decapoda | *Homarus americanus -* medium | 1 | 30 | 43.84 | -69.64 | 70.580 | 8.120 | 0.137 | 33.09 | 17.60 | 290.75 | 163.99 | 131.19 | 81.99 |
| Crustacea | Decapoda | *Homarus americanus -* large | 1 | 30 | 43.84 | -69.64 | 65.140 | 8.770 | 0.160 | 34.77 | 25.68 | 298.83 | 233.55 | 186.84 | 116.77 |
| Crustacea | Decapoda | *Homarus americanus* | 1 | 50 | 41.35 | -70.79 | 79.500 | 8.020 | 0.120 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Crustacea | Decapoda | *Libinia emarginata* | 1 | 20 | 41.35 | -70.79 | 76.440 | 8.650 | 0.134 | 35.72 | 13.61 | 286.76 | 186.56 | 149.25 | 93.28 |
| Crustacea | Decapoda | *Munida iris* | 1 | 20 | 37.62 | -76.26 | 82.640 | 8.710 | 0.125 | 32.17 | 13.67 | 286.82 | 149.26 | 119.41 | 74.63 |
| Crustacea | Decapoda | *Pandalus platyceros* | 1 | 50 | 36.62 | -121.91 | 60.940 | 8.090 | 0.158 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Crustacea | Decapoda | *Palinurus argus* | 1 | 60 | 21.84 | -71.33 | 76.870 | 12.580 | 0.194 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Crustacea | Decapoda | *Grapsus grapsus* | 1 | 60 | -9.36 | 46.40 | 72.770 | 6.180 | 0.101 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |
| Crustacea | Stomatopoda | *Chloridella empusa* | 1 | 20 | 24.47 | -81.55 | 28.560 | 15.990 | 0.665 | 35.20 | 11.27 | 284.42 | 174.45 | 139.56 | 87.23 |

a Literature data were measured via X-Ray difraction (see original ciation in Table S3 for methods) and the new data via inducted coupled plasma spectroscopy (ICP) (see text for the different procedures).

b See text for NEAR 3D analysis procedure to recover in situ field data.

c Scenarios of future [CO32-] taken assuming a 20 and 50 % reduction in the ion concentration with the other variables remaining constant.

**Table S2.** Details of data used in Ω*i* calculations. Included are activity coefficients [γT(*i*)] used, calculated from in situ temperature.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Organisms** | | | **Field data** | | | | **Activity coefficients - γT(*i*)**  (T-corrected) b | | |
| Taxa | Class | Species | Depth  (m) | Lat. | Long. | mol % MgCO3 | CO32- | Mg2+ | Ca2+ |
| Echinodermata | Asteroidea | *Labidiaster annulatus* | 175 | -61.21 | -56.01 | 11.506 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Macroptychaster accrescens* | 180 | -63.53 | -62.75 | 11.460 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Paralophaster godfroyi* | 180 | -63.53 | -62.75 | 11.185 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Paralophaster* sp. | 180 | -63.53 | -62.75 | 10.830 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Perknaster* sp. | 180 | -63.53 | -62.75 | 10.497 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Acodontaster hodgsoni* | 160 | -64.15 | -62.74 | 11.483 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Kampylaster incurvatus* | 160 | -64.15 | -62.74 | 10.830 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Odontaster penicillatus* | 160 | -64.15 | -62.74 | 11.552 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Porania antarctica* | 160 | -64.15 | -62.74 | 11.883 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Diplasterias brandti* | 30 | -64.77 | -64.05 | 11.105 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Granaster nutrix* | 30 | -64.77 | -64.05 | 9.692 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Neosmilaster georgianus* | 30 | -64.77 | -64.05 | 10.933 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Odontaster meridionalis* | 30 | -64.77 | -64.04 | 11.082 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Perknaster aurorae* | 30 | -64.78 | -63.99 | 9.945 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Acodontaster conspicuus* | 30 | -65.07 | -63.97 | 10.956 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Perknaster fuscus antracticus* | 30 | -65.07 | -63.97 | 11.563 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Henricia* sp. | 155 | -65.67 | -67.40 | 11.449 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Asteroidea | *Diplopteraster verrucosus* | 900 | -66.29 | -66.60 | 9.496 | 0.0514 | 0.2211 | 0.2068 |
| Echinodermata | Echinoidea | *Diadema setosum* | 0.5 | -18.85 | 159.75 | 14.036 | 0.0451 | 0.2043 | 0.1984 |
| Echinodermata | Echinoidea | *Evechinus chloroticus* | 5 | -45.30 | 166.97 | 4.714 | 0.0497 | 0.2164 | 0.2045 |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 8 | -45.41 | 167.10 | 6.545 | 0.0497 | 0.2164 | 0.2045 |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 8 | -45.41 | 167.10 | 4.363 | 0.0516 | 0.2215 | 0.2070 |
| Echinodermata | Echinoidea | *Amphineustes similis* | 685 | -64.75 | -65.47 | 8.793 | 0.0516 | 0.2215 | 0.2070 |
| Echinodermata | Echinoidea | *Amphineustes similis* | 685 | -64.75 | -65.47 | 4.492 | 0.0516 | 0.2215 | 0.2070 |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 685 | -64.75 | -65.47 | 8.908 | 0.0516 | 0.2215 | 0.2070 |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 685 | -64.75 | -65.47 | 4.117 | 0.0515 | 0.2212 | 0.2069 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 30 | -65.07 | -63.97 | 7.091 | 0.0510 | 0.2199 | 0.2062 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 30 | -65.07 | -63.97 | 5.333 | 0.0507 | 0.2191 | 0.2058 |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 30 | -65.07 | -63.97 | 3.272 | 0.0510 | 0.2199 | 0.2062 |
| Echinodermata | Ophiuroidea | *Ophionotus victoriae* | 30 | -64.77 | -64.05 | 8.562 | 0.0459 | 0.2062 | 0.1993 |
| Echinodermata | Ophiuroidea | *Ophiosparte gigas* | 30 | -64.77 | -64.05 | 9.081 | 0.0466 | 0.2083 | 0.2004 |
|  |  |  |  |  |  |  |  |  |  |
| Echinodermata | Asteroidea | *Asterias linckii* | 20 | 65.81 | 39.73 | 11.197 | 0.0466 | 0.2082 | 0.2004 |
| Echinodermata | Asteroidea | *Orthasterias tanneri* | 30 | 61.68 | 3.31 | 11.036 | 0.0495 | 0.2158 | 0.2042 |
| Echinodermata | Asteroidea | *Ctenodiscus crispatus* | 80 | 46.90 | -59.10 | 10.256 | 0.0522 | 0.2230 | 0.2077 |
| Echinodermata | Asteroidea | *Pisaster giganteus* | 10 | 34.39 | -119.68 | 16.850 | 0.0430 | 0.2030 | 0.1995 |
| Echinodermata | Asteroidea | *Unidentified* | 5 | 24.89 | -80.99 | 10.412 | 0.0438 | 0.2048 | 0.2005 |
| Echinodermata | Asteroidea | *Asterias vulgaris* | 10 | 44.79 | -66.92 | 12.237 | 0.0491 | 0.2149 | 0.2037 |
| Echinodermata | Asteroidea | *Asterias acervata borealis* | 40 | 43.58 | -65.17 | 12.443 | 0.0495 | 0.2158 | 0.2042 |
| Echinodermata | Asteroidea | *Asterias forbesi* | 10 | 41.42 | -70.80 | 9.635 | 0.0485 | 0.2133 | 0.2029 |
| Echinodermata | Asteroidea | *Odontaster hispidus* | 40 | 41.30 | -70.80 | 13.070 | 0.0466 | 0.2082 | 0.2004 |
| Echinodermata | Asteroidea | *Plutonaster agassizii* | 10 | 41.30 | -70.80 | 13.991 | 0.0455 | 0.2052 | 0.1988 |
| Echinodermata | Asteroidea | *Pontaster tenuispinus* | 40 | 41.30 | -70.80 | 11.963 | 0.0466 | 0.2082 | 0.2004 |
| Echinodermata | Asteroidea | *Leptasterias compta* | 100 | 40.28 | -69.85 | 12.979 | 0.0463 | 0.2075 | 0.2000 |
| Echinodermata | Asteroidea | *Benthopecten spinosus* | 100 | 39.25 | -68.13 | 12.317 | 0.0478 | 0.2114 | 0.2020 |
| Echinodermata | Asteroidea | *Astropecten articulatus* | 200 | 35.71 | -73.50 | 10.612 | 0.0478 | 0.2114 | 0.2020 |
| Echinodermata | Asteroidea | *Urasterias linckii* | 200 | 35.71 | -73.50 | 10.348 | 0.0478 | 0.2114 | 0.2020 |
| Echinodermata | Asteroidea | *Asterias tanneri* | 200 | 35.71 | -73.50 | 15.090 | 0.0478 | 0.2114 | 0.2020 |
| Echinodermata | Asteroidea | *Asterina miniata* | 10 | 35.20 | -121.30 | 12.135 | 0.0478 | 0.2114 | 0.2020 |
| Echinodermata | Asteroidea | *Astropecten americanus* | 10 | 26.90 | -82.80 | 11.975 | 0.0448 | 0.2033 | 0.1979 |
| Echinodermata | Asteroidea | *Asterina minuta* | 15 | 18.04 | -67.96 | 9.692 | 0.0468 | 0.2087 | 0.2006 |
| Echinodermata | Asteroidea | *Linckia guildingii* | 30 | 18.04 | -67.96 | 11.780 | 0.0453 | 0.2047 | 0.1986 |
| Echinodermata | Asteroidea | *Acanthaster planci* | 25 | 5.86 | -162.08 | 15.441 | 0.0432 | 0.1992 | 0.1958 |
| Echinodermata | Asteroidea | *Ctenodiscus procurator* | 30 | -35.70 | -72.80 | 16.547 | 0.0437 | 0.2004 | 0.1965 |
| Echinodermata | Crinoidea | *Heliometra glacialis* | 20 | 68.20 | 39.20 | 11.082 | 0.0499 | 0.2169 | 0.2047 |
| Echinodermata | Crinoidea | *Ptilocrinus pinnatus* | 10 | 53.10 | -130.00 | 9.254 | 0.0498 | 0.2166 | 0.2045 |
| Echinodermata | Crinoidea | *Florometra asperrima* | 12 | 47.10 | -124.20 | 11.013 | 0.0479 | 0.2116 | 0.2020 |
| Echinodermata | Crinoidea | *Bythocrinus robustus* | 40 | 42.30 | -70.77 | 10.922 | 0.0455 | 0.2052 | 0.1988 |
| Echinodermata | Crinoidea | *Psathyrometra fragilis* | 20 | 35.07 | 139.70 | 11.826 | 0.0436 | 0.2002 | 0.1963 |
| Echinodermata | Crinoidea | *Pentametrocrinus japonicus* | 20 | 34.90 | 138.50 | 11.758 | 0.0455 | 0.2052 | 0.1988 |
| Echinodermata | Crinoidea | *Crinometra concinna* | 40 | 28.05 | -96.02 | 12.945 | 0.0460 | 0.2065 | 0.1995 |
| Echinodermata | Crinoidea | *Isocrinus decorus* | 50 | 21.40 | -76.70 | 13.582 | 0.0468 | 0.2086 | 0.2006 |
| Echinodermata | Crinoidea | *Endoxocrinus parra* | 60 | 21.40 | -76.70 | 14.717 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Tropiometra picta* | 30 | 21.40 | -76.70 | 14.161 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Promachocrinus kerguelensis* | 20 | 11.17 | -60.68 | 13.571 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Capillaster multiradiata* | 30 | 7.85 | 116.90 | 11.838 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Pachylometra patula* | 30 | 7.85 | 116.90 | 12.888 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Catoptometra ophiura* | 30 | 7.85 | 116.90 | 14.320 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Crinoidea | *Hypalocrinus naresianus* | 30 | 7.85 | 116.90 | 13.582 | 0.0442 | 0.2016 | 0.1971 |
| Echinodermata | Crinoidea | *Parametra granulata* | 30 | 7.85 | 116.90 | 13.502 | 0.0442 | 0.2016 | 0.1971 |
| Echinodermata | Crinoidea | *Craspedometra anceps* | 30 | 7.85 | 116.90 | 13.673 | 0.0442 | 0.2016 | 0.1971 |
| Echinodermata | Crinoidea | *Zygometra microdiscus* | 40 | -5.99 | 134.10 | 15.904 | 0.0449 | 0.2036 | 0.1980 |
| Echinodermata | Crinoidea | *Tropiometra carinata* | 15 | -22.98 | -43.20 | 9.197 | 0.0437 | 0.2005 | 0.1965 |
| Echinodermata | Crinoidea | *Pilometra mülleri* | 20 | -33.85 | 151.26 | 15.486 | 0.0432 | 0.1990 | 0.1957 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 3100 | 8.70 | -55.80 | 0.0515 | 0.2210 | 0.2075 | 0.0515 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 3100 | 8.70 | -55.80 | 0.0515 | 0.2210 | 0.2075 | 0.0515 |
| Echinodermata | Echinoidea | *Strongylocentrotus droebachiensis* | 40 | 64.00 | -38.00 | 7.033 | 0.0498 | 0.2166 | 0.2046 |
| Echinodermata | Echinoidea | *Echinarachnius parma* | 32 | 59.20 | -165.80 | 7.195 | 0.0494 | 0.2155 | 0.2040 |
| Echinodermata | Echinoidea | *Arbacia pustulosa* | 15 | 40.76 | 14.35 | 8.643 | 0.0490 | 0.2145 | 0.2035 |
| Echinodermata | Echinoidea | *Echinus esculentus* | 10 | 38.00 | -1.02 | 7.358 | 0.0438 | 0.2006 | 0.1965 |
| Echinodermata | Echinoidea | *Paracentrotus lividus* | 5 | 37.24 | 13.68 | 9.830 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Echinoidea | *Clypeaster testudinarius* | 20 | 33.40 | 134.60 | 9.968 | 0.0466 | 0.2083 | 0.2004 |
| Echinodermata | Echinoidea | *Prionocidaris baculosa* | 15 | 28.02 | 34.97 | 10.325 | 0.0494 | 0.2155 | 0.2040 |
| Echinodermata | Echinoidea | *Tetrocidaris affinis* | 10 | 26.90 | -82.80 | 10.853 | 0.0440 | 0.2013 | 0.1969 |
| Echinodermata | Echinoidea | *Mellita sexiesperforatus* | 30 | 18.04 | -67.96 | 12.089 | 0.0490 | 0.2145 | 0.2035 |
| Echinodermata | Echinoidea | *Tetrapygus niger* | 20 | -9.40 | -78.50 | 14.229 | 0.0443 | 0.2020 | 0.1972 |
| Echinodermata | Echinoidea | *Heterocentrotus mammillatus* | 20 | -27.64 | -144.33 | 12.420 | 0.0449 | 0.2036 | 0.1981 |
| Echinodermata | Echinoidea | *Lytechinus albus* | 10 | -43.60 | -74.00 | 13.832 | 0.0431 | 0.1988 | 0.1956 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 10 | 34.80 | -120.60 | 2.829 | 0.0443 | 0.2060 | 0.2013 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 10 | 37.80 | -122.10 | 6.438 | 0.0441 | 0.2054 | 0.2009 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 237 | -60.62 | -46.96 | 2.892 | 0.0513 | 0.2208 | 0.2074 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 602 | -74.66 | -29.52 | 2.281 | 0.0511 | 0.2203 | 0.2073 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 810 | -75.54 | -29.88 | 2.020 | 0.0517 | 0.2214 | 0.2076 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1480 | -73.48 | -22.66 | 1.932 | 0.0513 | 0.2207 | 0.2074 |
| Echinodermata | Echinoidea | *Eucidaris tribuloides* | 5 | 24.65 | -81.25 | 4.863 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 5 | 24.65 | -81.25 | 4.829 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 5 | 24.65 | -81.25 | 10.569 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Echinoidea | *Lytechinus varieqatus* | 5 | 24.79 | -80.82 | 5.727 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Ophiuroidea | *Astrophyton* sp. | 60 | 56.00 | 2.90 | 11.116 | 0.0485 | 0.2133 | 0.2029 |
| Echinodermata | Ophiuroidea | *Ophiopholis aculeata japonica* | 10 | 53.91 | -166.50 | 9.807 | 0.0447 | 0.2032 | 0.1979 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus arcticus* | 10 | 41.50 | -70.30 | 9.370 | 0.0490 | 0.2146 | 0.2036 |
| Echinodermata | Ophiuroidea | *Ophioglypha sarsii* | 100 | 39.54 | -72.35 | 15.498 | 0.0447 | 0.2032 | 0.1979 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus eucnemis* | 50 | 38.30 | 139.00 | 10.635 | 0.0488 | 0.2139 | 0.2032 |
| Echinodermata | Ophiuroidea | *Ophionereis eurybrachiplax* | 50 | 38.30 | 139.00 | 11.471 | 0.0449 | 0.2035 | 0.1980 |
| Echinodermata | Ophiuroidea | *Ophioglypha lütkeni* | 200 | 35.20 | -121.30 | 9.635 | 0.0463 | 0.2075 | 0.2000 |
| Echinodermata | Ophiuroidea | *Ophiothrix angulata* | 200 | 21.40 | -76.70 | 11.872 | 0.0476 | 0.2109 | 0.2017 |
| Echinodermata | Ophiuroidea | *Ophiocamax fasciculata* | 100 | 21.40 | -76.70 | 8.250 | 0.0448 | 0.2033 | 0.1979 |
| Echinodermata | Ophiuroidea | *Ophiocoma erinaceus* | 20 | 20.10 | -155.30 | 16.287 | 0.0448 | 0.2033 | 0.1979 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 5 | 25.01 | -80.46 | 13.622 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 5 | 24.65 | -81.25 | 13.709 | 0.0431 | 0.2033 | 0.1997 |
| Echinodermata | Ophiuroidea | *Ophioderma cinerum* | 30 | 18.50 | -66.60 | 16.828 | 0.0448 | 0.2033 | 0.1979 |
| Echinodermata | Ophiuroidea | *Ophiocoma aethiops* | 25 | 18.04 | -67.96 | 15.034 | 0.0448 | 0.2033 | 0.1979 |
| Echinodermata | Ophiuroidea | *Ophiomixa flaccida* | 120 | 18.04 | -67.96 | 13.991 | 0.0435 | 0.2000 | 0.1963 |
| Echinodermata | Ophiuroidea | *Ophiocoma pumila* | 120 | 18.04 | -67.96 | 13.571 | 0.0445 | 0.2025 | 0.1975 |
| Echinodermata | Ophiuroidea | *Ophiomusium lymani* | 200 | -1.00 | -91.01 | 7.752 | 0.0500 | 0.2173 | 0.2049 |
| Echinodermata | Ophiuroidea | *Ophioglypha lymani* | 30 | -35.70 | -72.80 | 8.920 | 0.0445 | 0.2025 | 0.1975 |
|  |  |  |  |  |  |  |  |  |  |
| Coralline algae | - | *Lithothamnium* sp. | 10 | 78.00 | 20.00 | 10.129 | 0.0495 | 0.2158 | 0.2042 |
| Coralline algae | - | *Lithothamnium soriferum* | 10 | 75.00 | 20.00 | 11.151 | 0.0508 | 0.2192 | 0.2059 |
| Coralline algae | - | *Lithothamnium glaciale* | 10 | 75.00 | 20.00 | 15.283 | 0.0452 | 0.2045 | 0.1985 |
| Coralline algae | - | *Lithothamnium fornicatum* | 10 | 72.00 | 20.00 | 11.758 | 0.0495 | 0.2158 | 0.2042 |
| Coralline algae | - | *Lithothamnium polymorphum* | 10 | 57.00 | 12.00 | 10.623 | 0.0494 | 0.2155 | 0.2040 |
| Coralline algae | - | *Corallina squamata -* 29-Nov | 5 | 50.60 | -2.30 | 14.002 | 0.0475 | 0.2106 | 0.2016 |
| Coralline algae | - | *Corallina squamata -* 29-Jan | 5 | 50.60 | -2.30 | 13.980 | 0.0476 | 0.2108 | 0.2016 |
| Coralline algae | - | *Corallina squamata -* 26-Mar | 5 | 50.60 | -2.30 | 12.956 | 0.0475 | 0.2107 | 0.2016 |
| Coralline algae | - | *Corallina squamata -* 28-May | 5 | 50.60 | -2.30 | 12.717 | 0.0480 | 0.2118 | 0.2021 |
| Coralline algae | - | *Corallina squamata -* 01-Jul | 5 | 50.60 | -2.30 | 11.460 | 0.0466 | 0.2083 | 0.2004 |
| Coralline algae | - | *Corallina squamata -* 13-Aug | 5 | 50.60 | -2.30 | 9.531 | 0.0476 | 0.2109 | 0.2017 |
| Coralline algae | - | *Corallina squamata -* 12-Sep | 5 | 50.60 | -2.30 | 27.269 | 0.0429 | 0.1982 | 0.1953 |
| Coralline algae | - | *Corallina squamata -* 10-Oct | 5 | 50.60 | -2.30 | 26.986 | 0.0429 | 0.1982 | 0.1953 |
| Coralline algae | - | *Corallina officinalis* | 5 | 49.60 | -1.20 | 26.158 | 0.0429 | 0.1982 | 0.1953 |
| Coralline algae | - | *Lithothamnium calcareum* | 10 | 48.08 | -4.00 | 17.805 | 0.0429 | 0.1982 | 0.1953 |
| Coralline algae | - | *Lithophyllum incrustans* | 10 | 48.00 | -3.00 | 22.049 | 0.0445 | 0.2027 | 0.1976 |
| Coralline algae | - | *Phymatolithon compactum* | 10 | 48.00 | -55.00 | 20.085 | 0.0445 | 0.2027 | 0.1976 |
| Coralline algae | - | *Lithophyllum tortuosum* | 20 | 44.00 | 9.00 | 18.612 | 0.0433 | 0.1995 | 0.1960 |
| Coralline algae | - | *Lithophyllum proboscideum* | 15 | 37.00 | -122.00 | 19.338 | 0.0439 | 0.2010 | 0.1967 |
| Coralline algae | - | *Goniolithon strictum -* old | 30 | 25.00 | -75.00 | 15.915 | 0.0415 | 0.1945 | 0.1935 |
| Coralline algae | - | *Goniolithon strictum -* old | 30 | 25.00 | -75.00 | 15.814 | 0.0429 | 0.1982 | 0.1954 |
| Coralline algae | - | *Goniolithon strictum -* young | 30 | 25.00 | -75.00 | 19.516 | 0.0434 | 0.1997 | 0.1961 |
| Coralline algae | - | *Lithophyllum pachydermum* | 30 | 25.00 | -75.00 | 15.170 | 0.0431 | 0.1990 | 0.1957 |
| Coralline algae | - | *Goniolithon acropectum* | 20 | 18.00 | -68.00 | 20.863 | 0.0433 | 0.1994 | 0.1959 |
| Coralline algae | - | *Amphiroa fragilissima* | 10 | 18.00 | -68.00 | 7.114 | 0.0437 | 0.2004 | 0.1965 |
| Coralline algae | - | *Lithothamnium nodosum* | 5 | 0.00 | -90.00 | 12.260 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Lithophyllum oncodes* | 30 | -7.00 | 56.00 | 11.254 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Goniolithon orthoblastum* | 10 | -10.00 | 145.00 | 10.807 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 20.10 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 20.30 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 17.20 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 18.40 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 21.50 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 22.70 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 22.80 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Amphiroa rigida* | 5 | 24.89 | -80.99 | 22.00 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Neogoniolithon sp.* | 5 | 24.89 | -80.99 | 16.90 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Neogoniolithon sp.* | 5 | 24.89 | -80.99 | 19.40 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Neogoniolithon sp.* | 5 | 24.89 | -80.99 | 18.80 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Neogoniolithon sp.* | 5 | 24.89 | -80.99 | 17.10 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Neogoniolithon sp.* | 5 | 24.89 | -80.99 | 15.20 | 0.0428 | 0.2027 | 0.1993 |
| Coralline algae | - | *Lithothamnium erubescens* | 10 | -10.00 | 123.00 | 10.129 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Archaeolithothamium episporum* | 10 | -10.00 | 80.00 | 10.899 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Lithothamnium kaiseri* | 10 | -15.00 | -172.00 | 11.414 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Porolithon craspedium* | 10 | -15.00 | -172.00 | 12.043 | 0.0472 | 0.2098 | 0.2012 |
| Coralline algae | - | *Porolithon oncodes* | 10 | -15.00 | -172.00 | 11.872 | 0.0472 | 0.2098 | 0.2012 |
|  |  |  |  |  |  |  |  |  |  |
| Foraminifera | - | *Pulvinulina menardii -* pelagic | 20 | 40.56 | -66.15 | 4.328 | 0.0448 | 0.2034 | 0.1979 |
| Foraminifera | - | *Polytrema mineaccum -* benthic | 100 | 25.00 | -77.00 | 2.118 | 0.0429 | 0.1983 | 0.1954 |
| Foraminifera | - | *Orbitolites marginatis -* benthic | 50 | 24.60 | -81.96 | 5.765 | 0.0431 | 0.1989 | 0.1957 |
| Foraminifera | - | *Amphistegina lessonii* - pelagic | 20 | 16.10 | -22.95 | 14.524 | 0.0442 | 0.2016 | 0.1971 |
| Foraminifera | - | *Sphaeroidina dehiscens -* pelagic | 20 | 12.40 | 121.60 | 12.283 | 0.0440 | 0.2011 | 0.1968 |
| Foraminifera | - | *Orbitolites complanata -* benthic | 30 | -17.30 | 177.47 | 10.887 | 0.0440 | 0.2011 | 0.1968 |
| Foraminifera | - | *Archais sp.* | 5 | 24.59 | -81.54 | 15.20 | 0.0431 | 0.2033 | 0.1997 |
| Foraminifera | - | *Archais sp.* | 5 | 24.59 | -81.54 | 13.40 | 0.0431 | 0.2033 | 0.1997 |
| Foraminifera | - | *Archais sp.* | 5 | 24.59 | -81.54 | 13.80 | 0.0431 | 0.2033 | 0.1997 |
| Foraminifera | - | *Archais sp.* | 5 | 24.59 | -81.54 | 14.60 | 0.0431 | 0.2033 | 0.1997 |
| Foraminifera | - | *Globigerinoides ruber* | 5 | 11.84 | -86.68 | 0.59 | 0.0417 | 0.2000 | 0.1976 |
| Foraminifera | - | *Globigerinoides ruber* | 5 | 11.95 | -86.68 | 0.69 | 0.0417 | 0.2000 | 0.1976 |
| Foraminifera | - | *Globigerinoides sacculifer* | 5 | 11.95 | -86.68 | 0.50 | 0.0417 | 0.2000 | 0.1976 |
| Foraminifera | - | *Globorotalia menardii* | 5 | 25.03 | -77.83 | 0.55 | 0.0413 | 0.1993 | 0.1971 |
| Foraminifera | - | *Hastigeria pelagica* | 5 | 11.95 | -86.68 | 0.67 | 0.0417 | 0.2000 | 0.1976 |
| Foraminifera | - | *Orbulina universa* | 5 | 11.95 | -86.68 | 0.75 | 0.0417 | 0.2000 | 0.1976 |
|  |  |  |  |  |  |  |  |  |  |
| Hydrocorallia | - | *Millepora alcicornis* | 10 | 24.60 | -81.96 | 1.126 | 0.0442 | 0.2016 | 0.1971 |
| Hydrocorallia | - | *Distichopora nitida* | 20 | 7.40 | 151.50 | 1.516 | 0.0440 | 0.2011 | 0.1968 |
| Hydrocorallia | - | *Millepora braziliensis* | 30 | -12.20 | -36.80 | 0.285 | 0.0432 | 0.1990 | 0.1958 |
|  |  |  |  |  |  |  |  |  |  |
| Hexacorallia | - | *Madracis decactis* | 20 | 32.40 | -64.90 | 1.315 | 0.0440 | 0.2011 | 0.1968 |
| Hexacorallia | - | *Siderastrea radians* | 20 | 32.40 | -64.90 | 1.031 | 0.0440 | 0.2011 | 0.1968 |
| Hexacorallia | - | *Flabellum alabastrum* | 10 | 26.00 | -77.20 | 0.463 | 0.0440 | 0.2011 | 0.1968 |
| Hexacorallia | - | *Acropora cervicornis* | 15 | 26.00 | -77.20 | 0.747 | 0.0440 | 0.2011 | 0.1968 |
| Hexacorallia | - | *Favia fragum* | 20 | 24.60 | -81.96 | 0.439 | 0.0440 | 0.2011 | 0.1968 |
| Hexacorallia | - | *Dasmosmilia lymani* | 10 | 24.60 | -81.96 | 0.901 | 0.0455 | 0.2052 | 0.1989 |
| Hexacorallia | - | *Balanophyllia floridana* | 10 | 24.54 | -81.80 | 0.640 | 0.0440 | 0.2012 | 0.1969 |
| Hexacorallia | - | *Paracyathus defilipii* | 10 | 24.54 | -81.80 | 0.534 | 0.0448 | 0.2033 | 0.1979 |
| Hexacorallia | - | *Porites lutea* | 2 | 24.55 | 124.33 | 4.85 | 0.0416 | 0.1998 | 0.1974 |
| Hexacorallia | - | *Porites sp.* | 2 | -18.28 | 147.38 | 3.97 | 0.0424 | 0.2016 | 0.1986 |
| Hexacorallia | - | *Deltocyathus italicus* | 20 | 18.50 | -63.51 | 0.569 | 0.0455 | 0.2052 | 0.1989 |
| Hexacorallia | - | *Desmophyllum ingens* | 15 | -36.55 | -73.00 | 0.700 | 0.0519 | 0.2223 | 0.2074 |
|  |  |  |  |  |  |  |  |  |  |
| Octocorallia | - | *Gorgonia* sp. | 30 | 54.60 | 154.40 | 0.415 | 0.0431 | 0.1988 | 0.1956 |
| Octocorallia | - | *Alcyonium carneum* | 50 | 45.18 | -55.85 | 14.195 | 0.0432 | 0.1991 | 0.1958 |
| Octocorallia | - | *Paramuricea borealis* | 50 | 45.18 | -55.85 | 13.434 | 0.0448 | 0.2033 | 0.1979 |
| Octocorallia | - | *Alcyonium carneum* | 50 | 45.18 | -55.85 | 9.024 | 0.0512 | 0.2205 | 0.2065 |
| Octocorallia | - | *Pennatula aculeata* | 50 | 44.45 | -58.51 | 15.554 | 0.0430 | 0.1986 | 0.1956 |
| Octocorallia | - | *Paragorgia arborea* | 50 | 44.36 | -63.75 | 15.509 | 0.0448 | 0.2033 | 0.1979 |
| Octocorallia | - | *Paragorgia arborea* | 50 | 43.00 | -62.00 | 10.841 | 0.0479 | 0.2116 | 0.2020 |
| Octocorallia | - | *Corallium elatior* | 40 | 42.25 | 130.91 | 7.810 | 0.0494 | 0.2157 | 0.2041 |
| Octocorallia | - | *Primnoa resedaeformis* | 30 | 42.25 | 130.91 | 15.960 | 0.0458 | 0.2061 | 0.1993 |
| Octocorallia | - | *Primnoa reseda* | 40 | 42.25 | -63.25 | 6.719 | 0.0450 | 0.2038 | 0.1982 |
| Octocorallia | - | *Rhipidogorgia flabellum* | 20 | 32.40 | -64.90 | 8.261 | 0.0450 | 0.2038 | 0.1982 |
| Octocorallia | - | *Pleurocorallium johnsoni* | 30 | 25.75 | -20.20 | 8.562 | 0.0450 | 0.2038 | 0.1982 |
| Octocorallia | - | *Gorgonia acerosa* | 50 | 24.60 | -81.96 | 9.347 | 0.0450 | 0.2038 | 0.1982 |
| Octocorallia | - | *Leptogorgia pulchra* | 80 | 24.60 | -108.25 | 14.660 | 0.0436 | 0.2001 | 0.1963 |
| Octocorallia | - | *Xiphigorgia anceps* | 20 | 24.47 | -81.55 | 14.252 | 0.0446 | 0.2030 | 0.1977 |
| Octocorallia | - | *Eunicella singularis* | 20 | 42.58 | 8.75 | 2.11 | 0.0457 | 0.2089 | 0.2028 |
| Octocorallia | - | *Eunicella cavolini* | 20 | 42.58 | 8.75 | 2.45 | 0.0457 | 0.2089 | 0.2028 |
| Octocorallia | - | *Paramuricea clavata* | 20 | 42.58 | 8.75 | 2.45 | 0.0457 | 0.2089 | 0.2028 |
| Octocorallia | - | *Corallium rubrum* | 60 | 42.41 | 8.75 | 3.49 | 0.0457 | 0.2089 | 0.2028 |
| Octocorallia | - | *E. Barbadensis* | 10 | 11.32 | -60.7 | 5.90 | 0.0411 | 0.1987 | 0.1967 |
| Octocorallia | - | *Lepidisis spp.* | 3945 | -45.37 | 144.57 | 8.90 | 0.0517 | 0.2215 | 0.2076 |
| Octocorallia | - | *Tubipora musica* | 5 | 14.21 | 122.06 | 15.60 | 0.0419 | 0.2005 | 0.1979 |
| Octocorallia | - | *Tubipora musica* | 5 | 14.21 | 122.06 | 13.90 | 0.0419 | 0.2005 | 0.1979 |
| Octocorallia | - | *Tubipora musica* | 5 | 14.21 | 122.06 | 13.00 | 0.0419 | 0.2005 | 0.1979 |
| Octocorallia | - | *Plexaurella grisea* | 10 | 11.32 | -60.59 | 18.10 | 0.0411 | 0.1986 | 0.1966 |
| Octocorallia | - | *Ellisella barbadensis* | 10 | 11.32 | -60.59 | 14.60 | 0.0411 | 0.1986 | 0.1966 |
| Octocorallia | - | *Muricea echinata* | 10 | 22.86 | -106.10 | 9.393 | 0.0478 | 0.2114 | 0.2019 |
| Octocorallia | - | *Leptogorgia rigida* | 150 | 22.86 | -109.79 | 10.566 | 0.0486 | 0.2135 | 0.2030 |
| Octocorallia | - | *Heliopora cerulea* | 20 | 12.40 | 121.60 | 15.113 | 0.0445 | 0.2026 | 0.1975 |
| Octocorallia | - | *Tubipora purpurea* | 10 | 1.33 | 103.83 | 14.660 | 0.0449 | 0.2035 | 0.1980 |
| Octocorallia | - | *Phyllogorgia quercifolia* | 10 | -3.83 | -32.41 | 7.079 | 0.0500 | 0.2171 | 0.2048 |
| Octocorallia | - | *Ctenocella pectinata* | 20 | -10.00 | 142.20 | 10.841 | 0.0436 | 0.2002 | 0.1963 |
| Octocorallia | - | *Muricea humilis* | 30 | -12.20 | -36.80 | 7.253 | 0.0466 | 0.2082 | 0.2004 |
| Octocorallia | - | *Gorgonia subfruticosa* | 45 | -18.00 | -178.00 | 7.810 | 0.0466 | 0.2082 | 0.2004 |
| Octocorallia | - | *Plexaurella grandiflora* | 20 | -28.40 | 155.67 | 10.566 | 0.0466 | 0.2082 | 0.2004 |
| Octocorallia | - | *Eunicella papillose* | 30 | -34.21 | 18.35 | 15.870 | 0.0468 | 0.2086 | 0.2006 |
| Octocorallia | - | *Eunicella alba* | 30 | -34.22 | 18.48 | 16.344 | 0.0479 | 0.2118 | 0.2021 |
| Octocorallia | - | *Eunicella tricoronata* | 30 | -34.22 | 18.48 | 18.052 | 0.0429 | 0.1982 | 0.1953 |
| Octocorallia | - | *Lophogorgia flamea* | 30 | -34.22 | 18.48 | 18.142 | 0.0475 | 0.2107 | 0.2016 |
|  |  |  |  |  |  |  |  |  |  |
| Bryozoa | - | *Flustra membranacea* | 50 | 59.17 | -151.60 | 0.747 | 0.0514 | 0.2210 | 0.2068 |
| Bryozoa | - | *Cellepora incrassata* | 50 | 44.69 | -62.69 | 1.315 | 0.0458 | 0.2061 | 0.1993 |
| Bryozoa | - | *Schizoporella unicornis* | 10 | 41.35 | -70.79 | 7.126 | 0.0514 | 0.2210 | 0.2068 |
| Bryozoa | - | *Bugula turrita* | 40 | 41.23 | -70.07 | 8.134 | 0.0508 | 0.2193 | 0.2059 |
| Bryozoa | - | *Lepralia* sp. | 20 | 40.80 | 14.20 | 5.905 | 0.0463 | 0.2075 | 0.2000 |
| Bryozoa | - | *Amathia spiralis* | 20 | 35.22 | -75.60 | 3.060 | 0.0478 | 0.2114 | 0.2020 |
| Bryozoa | - | *Holoporella albirostris* | 20 | 24.47 | -81.55 | 11.162 | 0.0478 | 0.2114 | 0.2020 |
| Bryozoa | - | *Bugula neritina* | 20 | 24.47 | -81.55 | 11.872 | 0.0514 | 0.2210 | 0.2068 |
| Bryozoa | - | *Microporella grisea* | 20 | -28.40 | 155.67 | 12.888 | 0.0478 | 0.2114 | 0.2020 |
| Bryozoa | - | *Adeonellopsis sp.* | 12 | -45.3 | 166.91 | 10.265 | 0.0458 | 0.2092 | 0.2029 |
| Bryozoa | - | *Bugula neritina* | 5 | 26.71 | -79.99 | 9.730 | 0.0422 | 0.2012 | 0.1983 |
| Bryozoa | - | *Bugula neritina* | 5 | 26.88 | -79.99 | 11.700 | 0.0422 | 0.2012 | 0.1983 |
|  |  |  |  |  |  |  |  |  |  |
| Brachiopoda | - | *Terebratulina septentrionalis* | 30 | 44.87 | -66.91 | 1.622 | 0.0448 | 0.2034 | 0.1979 |
| Brachiopoda | - | *Laqueus californicus* | 80 | 24.60 | -108.25 | 0.806 | 0.0465 | 0.2078 | 0.2002 |
| Brachiopoda | - | *Krassina rubra* | 5 | -34.25 | 18.35 | 0.920 | 0.0466 | 0.2110 | 0.2038 |
| Brachiopoda | - | *Megerlea truncata* | 5 | 37.28 | 13.07 | 2.930 | 0.0424 | 0.2017 | 0.1986 |
| Brachiopoda | - | *Notosaris sp.* | 5 | -42.94 | 168.69 | 2.580 | 0.0451 | 0.2077 | 0.2022 |
| Brachiopoda | - | *Terebratella cruenta* | 5 | -42.84 | 168.69 | 0.750 | 0.0451 | 0.2077 | 0.2022 |
| Brachiopoda | - | *Stethothyris sp.* | 5 | -64.03 | -61.82 | 0.690 | 0.0514 | 0.2209 | 0.2074 |
| Brachiopoda | - | *Thecidellina sp.* | 5 | 12.31 | -68.97 | 8.920 | 0.0426 | 0.2021 | 0.1989 |
| Brachiopoda | - | *Thecidellina sp.* | 5 | 12.21 | -68.97 | 9.370 | 0.0426 | 0.2021 | 0.1989 |
|  |  |  |  |  |  |  |  |  |  |
| Mollusca | Amphineura | *Mopalia muscosa* | 120 | 34.39 | -119.70 | 0.190 | 0.0401 | 0.1908 | 0.1916 |
| Mollusca | Bivalvia | *Astarte borealis* | 50 | 74.16 | 54.40 | 7.068 | 0.0467 | 0.2083 | 0.2004 |
| Mollusca | Bivalvia | *Tellina calcarea* | 40 | 74.16 | 54.33 | 1.918 | 0.0431 | 0.1989 | 0.1957 |
| Mollusca | Bivalvia | *Pecten groenlandicus* | 20 | 73.50 | 68.83 | 1.185 | 0.0451 | 0.2041 | 0.1983 |
| Mollusca | Bivalvia | *Pecten islandicus* | 40 | 71.50 | 47.00 | 0.866 | 0.0442 | 0.2019 | 0.1972 |
| Mollusca | Bivalvia | *Pecten dislocatus* | 10 | 26.81 | -82.29 | 1.516 | 0.0494 | 0.2156 | 0.2041 |
| Mollusca | Bivalvia | *Pecten ventricosus* | 10 | 22.86 | -106.10 | 0.948 | 0.0495 | 0.2158 | 0.2042 |
| Mollusca | Bivalvia | *Placuna orbicularis* | 10 | 16.83 | 120.26 | 0.735 | 0.0504 | 0.2182 | 0.2054 |
| Mollusca | Cephalopoda | *Nautilus pompilius* | 100 | 8.53 | 123.03 | 0.830 | 0.0430 | 0.1985 | 0.1955 |
| Mollusca | Cephalopoda | *Sepia officinalis* | 10 | 5.84 | 118.27 | 0.842 | 0.0519 | 0.2223 | 0.2074 |
| Mollusca | Cephalopoda | *Argonauta argo* | 50 | -35.82 | 175.39 | 0.534 | 0.0486 | 0.2136 | 0.2030 |
| Mollusca | Gastropoda | *Neptunea despecta* | 20 | 69.63 | 57.35 | 0.996 | 0.0494 | 0.2155 | 0.2040 |
| Mollusca | Gastropoda | *Natica clausa* | 20 | 60.50 | -46.91 | 0.889 | 0.0449 | 0.2035 | 0.1980 |
| Mollusca | Gastropoda | *Tachyrhynchus erosa* | 30 | 52.90 | 158.76 | 1.929 | 0.0449 | 0.2035 | 0.1980 |
| Mollusca | Gastropoda | *Nassa tegula* | 20 | 36.62 | -121.91 | 2.943 | 0.0447 | 0.2032 | 0.1979 |
| Mollusca | Gastropoda | *Odontocymbiola magellanica* | 15 | -42.71 | -65.02 | 15.608 | 0.0488 | 0.2155 | 0.2057 |
| Mollusca | Gastropoda | *Nassa isculpta* | 50 | 32.34 | -118.43 | 2.495 | 0.0447 | 0.2030 | 0.1978 |
| Mollusca | Scaphopoda | *Dentalium solidum* | 30 | 41.23 | -70.07 | 2.637 | 0.0487 | 0.2137 | 0.2031 |
|  |  |  |  |  |  |  |  |  |  |
| Crustacea | Cirripedia | *Scalpellum regium* | 5 | 52.92 | -132.29 | 0.237 | 0.0449 | 0.2035 | 0.1980 |
| Crustacea | Cirripedia | *Balanus hameri* | 20 | 41.23 | -70.07 | 0.439 | 0.0468 | 0.2087 | 0.2006 |
| Crustacea | Cirripedia | *Balanus amphitrite* | 5 | 38.92 | -74.91 | 2.106 | 0.0476 | 0.2109 | 0.2017 |
| Crustacea | Cirripedia | *Lepas anatifera* | 10 | 24.47 | -81.55 | 1.209 | 0.0489 | 0.2142 | 0.2034 |
| Crustacea | Cirripedia | *Mitella polymerus* | 10 | 22.86 | -106.10 | 1.386 | 0.0515 | 0.2213 | 0.2069 |
| Crustacea | Amphipoda | *Tryphosa pinguis* | 30 | 41.52 | -70.67 | 9.381 | 0.0485 | 0.2133 | 0.2029 |
| Crustacea | Isopoda | *Pentidotea wosnesenkii* | 2 | 48.75 | -125.23 | 6.880 | 0.0467 | 0.2111 | 0.2038 |
| Crustacea | Isopoda | *Sphaeroma serratum* | 2 | 45.18 | 13.68 | 5.640 | 0.0473 | 0.2124 | 0.2044 |
| Crustacea | Isopoda | *Gnovimosphaeroma oregonensis* | 2 | 48.75 | -125.23 | 5.560 | 0.0467 | 0.2111 | 0.2038 |
| Crustacea | Decapoda | *Crago dalli* | 40 | 59.17 | -151.60 | 6.812 | 0.0504 | 0.2184 | 0.2055 |
| Crustacea | Decapoda | *Pagurus rathbuni* | 210 | 58.46 | -175.22 | 14.592 | 0.0447 | 0.2032 | 0.1979 |
| Crustacea | Decapoda | *Homarus americanus -* small | 30 | 43.84 | -69.64 | 11.712 | 0.0491 | 0.2149 | 0.2037 |
| Crustacea | Decapoda | *Homarus americanus -* medium | 30 | 43.84 | -69.64 | 9.462 | 0.0466 | 0.2082 | 0.2004 |
| Crustacea | Decapoda | *Homarus americanus -* large | 30 | 43.84 | -69.64 | 7.253 | 0.0442 | 0.2018 | 0.1971 |
| Crustacea | Decapoda | *Homarus americanus* | 50 | 41.35 | -70.79 | 10.106 | 0.0485 | 0.2133 | 0.2029 |
| Crustacea | Decapoda | *Libinia emarginata* | 20 | 41.35 | -70.79 | 10.175 | 0.0478 | 0.2114 | 0.2020 |
| Crustacea | Decapoda | *Munida iris* | 20 | 37.62 | -76.26 | 9.058 | 0.0478 | 0.2114 | 0.2019 |
| Crustacea | Decapoda | *Pandalus platyceros* | 50 | 36.62 | -121.91 | 9.496 | 0.0485 | 0.2133 | 0.2029 |
| Crustacea | Decapoda | *Palinurus argus* | 60 | 21.84 | -71.33 | 10.244 | 0.0485 | 0.2133 | 0.2029 |
| Crustacea | Decapoda | *Grapsus grapsus* | 60 | -9.36 | 46.40 | 18.433 | 0.0485 | 0.2133 | 0.2029 |
| Crustacea | Stomatopoda | *Chloridella empusa* | 20 | 24.47 | -81.55 | 5.695 | 0.0485 | 0.2133 | 0.2029 |

a Corrections used from the CO2SYS Matlab script equations. For Mg-calcite, corrections applied from pure calcite. See text for details.

b Calculations.done using correlation equations. See text for details.

c Solubility -log IAP*i* divided as "cleaned" and "minimally prepared" curves.

**Table S3.** Details of sample collection and skeletal material used.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Taxa** | **Class** | **Species** | ***n*** | **Depth**  **(m)** | **Lat.** | **Long.** | **Location** | **Material** | **Collection** | **Reference** |
|
| Echinodermata | Asteroidea | *Labidiaster annulatus* | 9 | 175 | -61.21 | -56.01 | Elephant Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Macroptychaster accrescens* | 3 | 180 | -63.53 | -62.75 | Low Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Paralophaster godfroyi* | 1 | 180 | -63.53 | -62.75 | Low Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Paralophaster* sp. | 3 | 180 | -63.53 | -62.75 | Low Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Perknaster* sp. | 2 | 180 | -63.53 | -62.75 | Low Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Acodontaster hodgsoni* | 3 | 160 | -64.15 | -62.74 | Dallmann Bay (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Kampylaster incurvatus* | 4 | 160 | -64.15 | -62.74 | Dallmann Bay (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Odontaster penicillatus* | 1 | 160 | -64.15 | -62.74 | Dallmann Bay (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Porania antarctica* | 3 | 160 | -64.15 | -62.74 | Dallmann Bay (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Diplasterias brandti* | 3 | 30 | -64.77 | -64.05 | Arthur Harbor (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Granaster nutrix* | 5 | 30 | -64.77 | -64.05 | Arthur Harbor (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Neosmilaster georgianus* | 3 | 30 | -64.77 | -64.05 | Arthur Harbor (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Odontaster meridionalis* | 3 | 30 | -64.77 | -64.04 | SE Boneparte Pt. (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Perknaster aurorae* | 3 | 30 | -64.78 | -63.99 | Stepping Stones (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Acodontaster conspicuus* | 1 | 30 | -65.07 | -63.97 | Lemaire Channel (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Perknaster fuscus antracticus* | 1 | 30 | -65.07 | -63.97 | Lemaire Channel (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Asteroidea | *Henricia* sp. | 2 | 155 | -65.67 | -67.40 | Renaud Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Asteroidea | *Diplopteraster verrucosus* | 2 | 900 | -66.29 | -66.60 | Banana Trench (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Echinoidea | *Diadema setosum* | 3 | 0.5 | -18.85 | 159.75 | Aitukai Island (Pacific Ocean) | Spines | Manual | NEW |
| Echinodermata | Echinoidea | *Evechinus chloroticus* | 3 | 5 | -45.30 | 166.97 | Doubtful Sound (Pacific Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 2 | 8 | -45.41 | 167.10 | Doubtful Sound (Pacific Ocean) | Spines | Scuba diving | NEW |
| Echinodermata | Echinoidea | *Pseudechinus huttoni* | 3 | 8 | -45.41 | 167.10 | Doubtful Sound (Pacific Ocean) | Plates | Trawling | NEW |
| Echinodermata | Echinoidea | *Amphineustes similis* | 2 | 685 | -64.75 | -65.47 | Hugo Island (Southern Ocean) | Spines | Trawling | NEW |
| Echinodermata | Echinoidea | *Amphineustes similis* | 4 | 685 | -64.75 | -65.47 | Hugo Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 3 | 685 | -64.75 | -65.47 | Hugo Island (Southern Ocean) | Spines | Trawling | NEW |
| Echinodermata | Echinoidea | *Ctenocidaris perrieri* | 3 | 685 | -64.75 | -65.47 | Hugo Island (Southern Ocean) | Plates | Trawling | NEW |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 3 | 30 | -65.07 | -63.97 | Lemaire Channel (Southern Ocean) | Spines | Scuba diving | NEW |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 6 | 30 | -65.07 | -63.97 | Lemaire Channel (Southern Ocean) | Plates | Scuba diving | NEW |
| Echinodermata | Echinoidea | *Sterechinus neumayeri* | 3 | 30 | -65.07 | -63.97 | Lemaire Channel (Southern Ocean) | Spines | Scuba diving | NEW |
| Echinodermata | Ophiuroidea | *Ophionotus victoriae* | 3 | 30 | -64.77 | -64.05 | Arthur Harbor (Southern Ocean) | Plates | Manual | NEW |
| Echinodermata | Ophiuroidea | *Ophiosparte gigas* | 1 | 30 | -64.77 | -64.05 | Arthur Harbor (Southern Ocean) | Plates | Benthic trawl | NEW |
|  |  |  |  |  |  |  |  |  |  |  |
| Echinodermata | Asteroidea | *Asterias linckii* | 1 | 20 | 65.81 | 39.73 | White Sea (Arctic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Orthasterias tanneri* | 1 | 30 | 61.68 | 3.31 | Norwegian Sea (Atlantic Ocean) | Plates | see original reference | Samoilov & Terentieva, 1925 |
| Echinodermata | Asteroidea | *Ctenodiscus crispatus* | 1 | 80 | 46.90 | -59.10 | Newfoundland (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Pisaster giganteus* | 1 | 10 | 34.39 | -119.68 | Eastern Pacific | Plates | see original reference | Gayathri et al., 2007 |
| Echinodermata | Asteroidea | *Unidentified* | 1 | 5 | 24.89 | -80.99 | Florida Keys | Plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Asteroidea | *Asterias vulgaris* | 1 | 10 | 44.79 | -66.92 | Eastport Maine (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Asterias acervata borealis* | 1 | 40 | 43.58 | -65.17 | Nova Scotia (Atlantic Ocean) | Plates | see original reference | Schmelck, 1901 |
| Echinodermata | Asteroidea | *Asterias forbesi* | 1 | 10 | 41.42 | -70.80 | Vineyard Sound (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Odontaster hispidus* | 1 | 40 | 41.30 | -70.80 | Martha’s Vineyard (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Plutonaster agassizii* | 1 | 10 | 41.30 | -70.80 | Martha’s Vineyard (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Pontaster tenuispinus* | 1 | 40 | 41.30 | -70.80 | Martha’s Vineyard (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Leptasterias compta* | 1 | 100 | 40.28 | -69.85 | Cape Cod (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Benthopecten spinosus* | 1 | 100 | 39.25 | -68.13 | Cape Cod (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Astropecten articulatus* | 1 | 200 | 35.71 | -73.50 | Cape Hatteras (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Urasterias linckii* | 1 | 200 | 35.71 | -73.50 | Cape Hatteras (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Asterias tanneri* | 1 | 200 | 35.71 | -73.50 | Cape Hatteras (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Asterina miniata* | 1 | 10 | 35.20 | -121.30 | California (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Astropecten americanus* | 1 | 10 | 26.90 | -82.80 | West Florida (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Asterina minuta* | 1 | 15 | 18.04 | -67.96 | British West Indies (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Linckia guildingii* | 1 | 30 | 18.04 | -67.96 | British West Indies (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Acanthaster planci* | 1 | 25 | 5.86 | -162.08 | Palmyra Island (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Asteroidea | *Ctenodiscus procurator* | 1 | 30 | -35.70 | -72.80 | Chile (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Heliometra glacialis* | 1 | 20 | 68.20 | 39.20 | Kola Peninsula (Barents Sea) | Plates | see original reference | Terentieva, 1932 |
| Echinodermata | Crinoidea | *Ptilocrinus pinnatus* | 1 | 10 | 53.10 | -130.00 | British Columbia (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Florometra asperrima* | 1 | 12 | 47.10 | -124.20 | Washington (Pacific ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Bythocrinus robustus* | 1 | 40 | 42.30 | -70.77 | Massachussets (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Psathyrometra fragilis* | 1 | 20 | 35.07 | 139.70 | Japan Sea (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Pentametrocrinus japonicus* | 1 | 20 | 34.90 | 138.50 | Japan Sea (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Crinometra concinna* | 1 | 40 | 28.05 | -96.02 | Gulf of Mexico (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Isocrinus decorus* | 1 | 50 | 21.40 | -76.70 | Cuba (Caribbean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Endoxocrinus parra* | 1 | 60 | 21.40 | -76.70 | Cuba (Caribbean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Tropiometra picta* | 1 | 30 | 21.40 | -76.70 | Cuba (Caribbean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Promachocrinus kerguelensis* | 1 | 20 | 11.17 | -60.68 | Tobago (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Capillaster multiradiata* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Pachylometra patula* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Catoptometra ophiura* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Hypalocrinus naresianus* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Parametra granulata* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Craspedometra anceps* | 1 | 30 | 7.85 | 116.90 | Philippines (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Zygometra microdiscus* | 1 | 40 | -5.99 | 134.10 | New Guinea (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Tropiometra carinata* | 1 | 15 | -22.98 | -43.20 | Rio de Janeiro (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Pilometra mülleri* | 1 | 20 | -33.85 | 151.26 | Sydney Harbor (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 1 | 3100 | 8.70 | -55.80 | Demerara Plateau (Atlantic Ocean) | Plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Crinoidea | *Bathycrinus sp.* | 1 | 3100 | 8.70 | -55.80 | Demerara Plateau (Atlantic Ocean) | Plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Echinoidea | *Strongylocentrotus droebachiensis* | 1 | 40 | 64.00 | -38.00 | Greenland Sea (Atllantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Echinarachnius parma* | 1 | 32 | 59.20 | -165.80 | Bering Sea (Arctic Ocean) | Plates | see original reference | Terentieva, 1932 |
| Echinodermata | Echinoidea | *Arbacia pustulosa* | 1 | 15 | 40.76 | 14.35 | Bay of Naples (Mediterranean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Echinus esculentus* | 1 | 10 | 38.00 | -1.02 | Mediterranean Sea | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Paracentrotus lividus* | 1 | 5 | 37.24 | 13.68 | Sicily (Mediterranean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Clypeaster testudinarius* | 1 | 20 | 33.40 | 134.60 | South Japan Sea (Pacific Ocean) | Plates | see original reference | Terentieva, 1932 |
| Echinodermata | Echinoidea | *Prionocidaris baculosa* | 1 | 15 | 28.02 | 34.97 | Red Sea | Plates | see original reference | Bütschli, 1908 |
| Echinodermata | Echinoidea | *Tetrocidaris affinis* | 1 | 10 | 26.90 | -82.80 | Florida (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Mellita sexiesperforatus* | 1 | 30 | 18.04 | -67.96 | British West Indies (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Tetrapygus niger* | 1 | 20 | -9.40 | -78.50 | Peru (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Heterocentrotus mammillatus* | 1 | 20 | -27.64 | -144.33 | Tuamotu (Pacific Ocean) | Plates | see original reference | Terentieva, 1932 |
| Echinodermata | Echinoidea | *Lytechinus albus* | 1 | 10 | -43.60 | -74.00 | Patagonia (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 1 | 10 | 34.80 | -120.60 | California (Pacific Ocean) | Test/plates | see original reference | LaVigne *et al.,* 2013 |
| Echinodermata | Echinoidea | *Strongylocentrotus purpuratus* | 1 | 10 | 37.80 | -122.10 | California (Pacific Ocean) | Test/Plates | see original reference | LaVigne *et al.,* 2013 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 237 | -60.62 | -46.96 | Antarctica | Plates | see original reference | Catarino *et al.,* 2013 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 602 | -74.66 | -29.52 | Antarctica | Plates | see original reference | Catarino *et al.,* 2013 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 810 | -75.54 | -29.88 | Antarctica | Plates | see original reference | Catarino *et al.,* 2013 |
| Echinodermata | Echinoidea | *Ctenocidaris speciosa* | 1 | 1480 | -73.48 | -22.66 | Antarctica | Plates | see original reference | Catarino *et al.,* 2013 |
| Echinodermata | Echinoidea | *Eucidaris tribuloides* | 1 | 5 | 24.65 | -81.25 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 1 | 5 | 24.65 | -81.25 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Echinoidea | *unidentified Echinoid* | 1 | 5 | 24.65 | -81.25 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Echinoidea | *Lytechinus varieqatus* | 1 | 5 | 24.79 | -80.82 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Ophiuroidea | *Astrophyton* sp*.* | 1 | 60 | 56.00 | 2.90 | North Sea | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiopholis aculeata japonica* | 1 | 10 | 53.91 | -166.50 | Unalaska (Arctic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus arcticus* | 1 | 10 | 41.50 | -70.30 | Cape Cod (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophioglypha sarsii* | 1 | 100 | 39.54 | -72.35 | New England slope (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Gorgonocephalus eucnemis* | 1 | 50 | 38.30 | 139.00 | Japan Sea (Pacific Ocean) | Plates | see original reference | Schmelck, 1901 |
| Echinodermata | Ophiuroidea | *Ophionereis eurybrachiplax* | 1 | 50 | 38.30 | 139.00 | Japan Sea (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophioglypha lütkeni* | 1 | 200 | 35.20 | -121.30 | California (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiothrix angulata* | 1 | 200 | 21.40 | -76.70 | Cuba (Caribbean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiocamax fasciculata* | 1 | 100 | 21.40 | -76.70 | Caribbean Sea | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiocoma erinaceus* | 1 | 20 | 20.10 | -155.30 | Hawaii (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 1 | 5 | 25.01 | -80.46 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Ophiuroidea | *Unidentified Ophiuroid* | 1 | 5 | 24.65 | -81.25 | Florida (Atlantic Ocean) | Test/plates | see original reference | Carpenter & Lohmann, 1992 |
| Echinodermata | Ophiuroidea | *Ophioderma cinerum* | 1 | 30 | 18.50 | -66.60 | Puerto Rico (Caribbean Sea) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiocoma aethiops* | 1 | 25 | 18.04 | -67.96 | Gulf of California (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiomixa flaccida* | 1 | 120 | 18.04 | -67.96 | British West Indies (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiocoma pumila* | 1 | 120 | 18.04 | -67.96 | British West Indies (Atlantic Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophiomusium lymani* | 1 | 200 | -1.00 | -91.01 | Galapagos (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
| Echinodermata | Ophiuroidea | *Ophioglypha lymani* | 1 | 30 | -35.70 | -72.80 | Chile (Pacific Ocean) | Plates | see original reference | Clarke & Wheeler, 1922 |
|  |  |  |  |  |  |  |  |  |  |  |
| Coralline algae | - | *Lithothamnium* sp. | 1 | 10 | 78.00 | 20.00 | Spitzbergen (Barents Sea) | Skeletal | see original reference | Högbom, 1894 |
| Coralline algae | - | *Lithothamnium soriferum* | 1 | 10 | 75.00 | 20.00 | Spitzbergen (Barents Sea) | Skeletal | see original reference | Högbom, 1894 |
| Coralline algae | - | *Lithothamnium glaciale* | 1 | 10 | 75.00 | 20.00 | Spitzbergen (Barents Sea) | Skeletal | see original reference | Högbom, 1894 |
| Coralline algae | - | *Lithothamnium fornicatum* | 1 | 10 | 72.00 | 20.00 | Norwegian Sea | Skeletal | see original reference | Lemoine, 1910 |
| Coralline algae | - | *Lithothamnium polymorphum* | 1 | 10 | 57.00 | 12.00 | North Sea | Skeletal | see original reference | Högbom, 1894 |
| Coralline algae | - | *Corallina squamata -* 29-Nov | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 29-Jan | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 26-Mar | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 28-May | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 01-Jul | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 13-Aug | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 12-Sep | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina squamata -* 10-Oct | 1 | 5 | 50.60 | -2.30 | Dorset (Atlantic Ocean) | Skeletal | see original reference | Haas *et al.,* 1935 |
| Coralline algae | - | *Corallina officinalis* | 1 | 5 | 49.60 | -1.20 | Normandy (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Lithothamnium calcareum* | 1 | 10 | 48.08 | -4.00 | Atlantic Ocean | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Lithophyllum incrustans* | 1 | 10 | 48.00 | -3.00 | English Channel (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Phymatolithon compactum* | 1 | 10 | 48.00 | -55.00 | Newfoundland (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Lithophyllum tortuosum* | 1 | 20 | 44.00 | 9.00 | Genocean acidification (Mediterranean Sea) | Skeletal | see original reference | Lipman & Shelley, 1924 |
| Coralline algae | - | *Lithophyllum proboscideum* | 1 | 15 | 37.00 | -122.00 | Monterey Bay (Pacific Ocean) | Skeletal | see original reference | Lipman & Shelley, 1924 |
| Coralline algae | - | *Goniolithon strictum -* old | 1 | 30 | 25.00 | -75.00 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Lipman & Shelley, 1924 |
| Coralline algae | - | *Goniolithon strictum -* old | 1 | 30 | 25.00 | -75.00 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Vaughan, 1918 |
| Coralline algae | - | *Goniolithon strictum -* young | 1 | 30 | 25.00 | -75.00 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Lithophyllum pachydermum* | 1 | 30 | 25.00 | -75.00 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Goniolithon acropectum* | 1 | 20 | 18.00 | -68.00 | Puerto Rico (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Amphiroa fragilissima* | 1 | 10 | 18.00 | -68.00 | Puerto Rico (Atlantic Ocean) | Skeletal | see original reference | Högbom, 1894 |
| Coralline algae | - | *Lithothamnium nodosum* | 1 | 5 | 0.00 | -90.00 | Galapagos Islands (Pacific Ocean) | Skeletal | see original reference | Vinogradov, 1953 |
| Coralline algae | - | *Lithophyllum oncodes* | 1 | 30 | -7.00 | 56.00 | Madagascar (Indian Ocean) | Skeletal | see original reference | Lemoine, 1910 |
| Coralline algae | - | *Goniolithon orthoblastum* | 1 | 10 | -10.00 | 145.00 | Murray Isle (Pacific Ocean) | Skeletal | see original reference | Lemoine, 1910 |
| Coralline algae | - | *Lithothamnium erubescens* | 1 | 10 | -10.00 | 123.00 | Timor (Indian Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Archaeolithothamium episporum* | 1 | 10 | -10.00 | 80.00 | Panama (Pacific Ocean) | Skeletal | see original reference | Lemoine, 1910 |
| Coralline algae | - | *Lithothamnium kaiseri* | 1 | 10 | -15.00 | -172.00 | Samocean acidification (Pacific Ocean) | Skeletal | see original reference | Lipman & Shelley, 1924 |
| Coralline algae | - | *Porolithon craspedium* | 1 | 10 | -15.00 | -172.00 | Rose Atoll (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Porolithon oncodes* | 1 | 10 | -15.00 | -172.00 | Samocean acidification (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Amphiroa rigida* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Coralline algae | - | *Neogoniolithon sp.* | 1 | 5 | 24.89 | -80.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Pulvinulina menardii -* pelagic | 1 | 20 | 40.56 | -66.15 | Atlantic Ocean | Shell | see original reference | Clarke & Wheeler, 1922 |
| Foraminifera | - | *Polytrema mineaccum -* benthic | 1 | 100 | 25.00 | -77.00 | Bahamas (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Foraminifera | - | *Orbitolites marginatis -* benthic | 1 | 50 | 24.60 | -81.96 | Florida (Atlantic Ocean) | Shell | see original reference | Brady, 1884 |
| Foraminifera | - | *Amphistegina lessonii* - pelagic | 1 | 20 | 16.10 | -22.95 | Cape Verde (Atlantic Ocean) | Shell | see original reference | Brady, 1884 |
| Foraminifera | - | *Sphaeroidina dehiscens -* pelagic | 1 | 20 | 12.40 | 121.60 | Philippines (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Foraminifera | - | *Orbitolites complanata -* benthic | 1 | 30 | -17.30 | 177.47 | Fiji (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | Florida (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | Florida (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | Florida (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Archais sp.* | 1 | 5 | 24.59 | -81.54 | Florida (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Globigerinoides ruber* | 1 | 5 | 11.84 | -86.68 | Nicaragua (Pacific Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Globigerinoides ruber* | 1 | 5 | 11.95 | -86.68 | Nicaragua (Pacific Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Globigerinoides sacculifer* | 1 | 5 | 11.95 | -86.68 | Nicaragua (Pacific Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Foraminifera | - | *Globorotalia menardii* | 1 | 5 | 25.03 | -77.83 | Bahamas (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
|  |  |  |  |  |  |  |  |  |  |  |
| Hydrocorallia | - | *Millepora alcicornis* | 1 | 10 | 24.60 | -81.96 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hydrocorallia | - | *Distichopora nitida* | 1 | 20 | 7.40 | 151.50 | Micronesia (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hydrocorallia | - | *Millepora braziliensis* | 1 | 30 | -12.20 | -36.80 | Brazil (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
|  |  |  |  |  |  |  |  |  |  |  |
| Hexacorallia | - | *Madracis decactis* | 1 | 20 | 32.40 | -64.90 | Bermuda (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Siderastrea radians* | 1 | 20 | 32.40 | -64.90 | Bermuda (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Flabellum alabastrum* | 1 | 10 | 26.00 | -77.20 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Acropora cervicornis* | 1 | 15 | 26.00 | -77.20 | Bahamas (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Favia fragum* | 1 | 20 | 24.60 | -81.96 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Dasmosmilia lymani* | 1 | 10 | 24.60 | -81.96 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Balanophyllia floridana* | 1 | 10 | 24.54 | -81.80 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Paracyathus defilipii* | 1 | 10 | 24.54 | -81.80 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Porites lutea* | 1 | 2 | 24.55 | 124.33 | Off Taiwan ( Pacific Ocean) | Skeletal | see original reference | Mitsuguchi *et al.,* 2001 |
| Hexacorallia | - | *Porites sp.* | 1 | 2 | -18.28 | 147.38 | East Australia (Pacific Ocean) | Skeletal | see original reference | Mitsuguchi *et al.,* 2001 |
| Hexacorallia | - | *Deltocyathus italicus* | 1 | 20 | 18.50 | -63.51 | Caribbean (Atlantic Ocean) |  | see original reference | Clarke & Wheeler, 1922 |
| Hexacorallia | - | *Desmophyllum ingens* | 1 | 15 | -36.55 | -73.00 | Chile (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
|  |  |  |  |  |  |  |  |  |  |  |
| Octocorallia | - | *Gorgonia sp.* | 1 | 30 | 54.60 | 154.40 | Sea of Okhotsk (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Alcyonium carneum* | 1 | 50 | 45.18 | -55.85 | Newfoundland (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Paramuricea borealis* | 1 | 50 | 45.18 | -55.85 | Grand Banks (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Alcyonium carneum* | 1 | 50 | 45.18 | -55.85 | Newfoundland (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Pennatula aculeata* | 1 | 50 | 44.45 | -58.51 | Banquereau (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Paragorgia arborea* | 1 | 50 | 44.36 | -63.75 | Nova Scotia (Atlantic Ocean) | Skeletal | see original reference | Phillips, 1922 |
| Octocorallia | - | *Paragorgia arborea* | 1 | 50 | 43.00 | -62.00 | Nova Scotia (Atlantic Ocean) | Skeletal | see original reference | Vinogradov, 1953 |
| Octocorallia | - | *Corallium elatior* | 1 | 40 | 42.25 | 130.91 | Japan Sea (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Primnoa resedaeformis* | 1 | 30 | 42.25 | 130.91 | Japan Sea (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Primnoa reseda* | 1 | 40 | 42.25 | -63.25 | Nova Scotia (Atlantic Ocean) | Skeletal | see original reference | Velimirov & Böhm, 1976 |
| Octocorallia | - | *Rhipidogorgia flabellum* | 1 | 20 | 32.40 | -64.90 | Bermuda (Atlantic Ocean) | Skeletal | see original reference | Velimirov & Böhm, 1976 |
| Octocorallia | - | *Pleurocorallium johnsoni* | 1 | 30 | 25.75 | -20.20 | Canary Islands (Atlantic Ocean) | Skeletal | see original reference | Velimirov & Böhm, 1976 |
| Octocorallia | - | *Gorgonia acerosa* | 1 | 50 | 24.60 | -81.96 | Florida (Atlantic Ocean) | Skeletal | see original reference | Velimirov & Böhm, 1976 |
| Octocorallia | - | *Leptogorgia pulchra* | 1 | 80 | 24.60 | -108.25 | California (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Xiphigorgia anceps* | 1 | 20 | 24.47 | -81.55 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Eunicella singularis* | 20 | 20 | 42.58 | 8.75 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Eunicella cavolini* | 20 | 20 | 42.58 | 8.75 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Paramuricea clavata* | 20 | 20 | 42.58 | 8.75 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Corallium rubrum* | 60 | 60 | 42.41 | 8.75 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *E. Barbadensis* | 10 | 10 | 11.32 | -60.7 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Lepidisis spp.* | 3945 | 3945 | -45.37 | 144.57 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Tubipora musica* | 5 | 5 | 14.21 | 122.06 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Tubipora musica* | 5 | 5 | 14.21 | 122.06 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Tubipora musica* | 5 | 5 | 14.21 | 122.06 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Plexaurella grisea* | 10 | 10 | 11.32 | -60.59 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Ellisella barbadensis* | 10 | 10 | 11.32 | -60.59 | Tobago (Atlantic Ocean) | Skeletal | see original reference | Esford & Lewis, 1990 |
| Octocorallia | - | *Muricea echinata* | 1 | 10 | 22.86 | -106.10 | California (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Leptogorgia rigida* | 1 | 150 | 22.86 | -109.79 | California (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Heliopora cerulea* | 1 | 20 | 12.40 | 121.60 | Philippines (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Tubipora purpurea* | 1 | 10 | 1.33 | 103.83 | Singapore (Indian Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Phyllogorgia quercifolia* | 1 | 10 | -3.83 | -32.41 | Brazil (Atlantic Ocean) | Skeletal | see original reference | Murray & Renard, 1891 |
| Octocorallia | - | *Ctenocella pectinata* | 1 | 20 | -10.00 | 142.20 | Torres Strait (Pacific Ocean) | Skeletal | see original reference | Vinogradov, 1953 |
| Octocorallia | - | *Muricea humilis* | 1 | 30 | -12.20 | -36.80 | Brazil (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Gorgonia subfruticosa* | 1 | 45 | -18.00 | -178.00 | Fiji (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Plexaurella grandiflora* | 1 | 20 | -28.40 | 155.67 | Australia (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Eunicella papillose* | 1 | 30 | -34.21 | 18.35 | Cape Town (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Eunicella alba* | 1 | 30 | -34.22 | 18.48 | False Bay (Indian Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Eunicella tricoronata* | 1 | 30 | -34.22 | 18.48 | False Bay (Indian Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Octocorallia | - | *Lophogorgia flamea* | 1 | 30 | -34.22 | 18.48 | False Bay (Indian Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
|  |  |  |  |  |  |  |  |  |  |  |
| Bryozoa | - | *Flustra membranacea* | 1 | 50 | 59.17 | -151.60 | Alaska (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Cellepora incrassata* | 1 | 50 | 44.69 | -62.69 | Grand Banks (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Schizoporella unicornis* | 1 | 10 | 41.35 | -70.79 | Vineyard Sound (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Bugula turrita* | 1 | 40 | 41.23 | -70.07 | Georges Bank (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Lepralia* sp. | 1 | 20 | 40.80 | 14.20 | Naples (Mediterranean Sea) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Amathia spiralis* | 1 | 20 | 35.22 | -75.60 | Cape Hatteras (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Holoporella albirostris* | 1 | 20 | 24.47 | -81.55 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Bugula neritina* | 1 | 20 | 24.47 | -81.55 | Florida (Atlantic Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Microporella grisea* | 1 | 20 | -28.40 | 155.67 | Australia (Pacific Ocean) | Skeletal | see original reference | Clarke & Wheeler, 1922 |
| Bryozoa | - | *Adeonellopsis sp.* | 1 | 12 | -45.3 | 166.91 | New Zealand (Pacific Ocean) | Skeletal | see original reference | Wejnert &Smith, 2008 |
| Bryozoa | - | *Bugula neritina* | 1 | 5 | 26.71 | -79.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
| Bryozoa | - | *Bugula neritina* | 1 | 5 | 26.88 | -79.99 | Florida (Atlantic Ocean) | Skeletal | see original reference | Carpenter & Lohmann, 1992 |
|  |  |  |  |  |  |  |  |  |  |  |
| Brachiopoda | - | *Terebratulina septentrionalis* | 1 | 30 | 44.87 | -66.91 | Eastport (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Brachiopoda | - | *Laqueus californicus* | 1 | 80 | 24.60 | -108.25 | California (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Brachiopoda | - | *Krassina rubra* | 1 | 5 | -34.25 | 18.35 | Cape of Good Hope (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Megerlea truncata* | 1 | 5 | 37.28 | 13.07 | Sicily (Mediterranean Sea) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Notosaris sp.* | 1 | 5 | -42.94 | 168.69 | New Zealand (Pacific Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Terebratella cruenta* | 1 | 5 | -42.84 | 168.69 | New Zealand (Pacific Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Stethothyris sp.* | 1 | 5 | -64.03 | -61.82 | Antarctica | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Thecidellina sp.* | 1 | 5 | 12.31 | -68.97 | Curacao (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
| Brachiopoda | - | *Thecidellina sp.* | 1 | 5 | 12.21 | -68.97 | Curacao (Atlantic Ocean) | Shell | see original reference | Carpenter & Lohmann, 1992 |
|  |  |  |  |  |  |  |  |  |  |  |
| Mollusca | Amphineura | *Mopalia muscosa* | 1 | 120 | 34.39 | -119.70 | Santa Barbara (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Bivalvia | *Astarte borealis* | 1 | 50 | 74.16 | 54.40 | Novaia Zemlya (White Sea) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Bivalvia | *Tellina calcarea* | 1 | 40 | 74.16 | 54.33 | Novaia Zemlya (White Sea) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Bivalvia | *Pecten groenlandicus* | 1 | 20 | 73.50 | 68.83 | Barents Sea (Arctic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Bivalvia | *Pecten islandicus* | 1 | 40 | 71.50 | 47.00 | Barents Sea (Arctic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Bivalvia | *Pecten dislocatus* | 1 | 10 | 26.81 | -82.29 | Charlotte Harbor (Atlantic Ocean) | Shell | see original reference | Samoilov & Terentieva, 1925 |
| Mollusca | Bivalvia | *Pecten ventricosus* | 1 | 10 | 22.86 | -106.10 | California (Pacific Ocean) | Shell | see original reference | Samoilov & Terentieva, 1925 |
| Mollusca | Bivalvia | *Placuna orbicularis* | 1 | 10 | 16.83 | 120.26 | Philippines (Pacific Ocean) | Shell | see original reference | Samoilov & Terentieva, 1925 |
| Mollusca | Cephalopoda | *Nautilus pompilius* | 1 | 100 | 8.53 | 123.03 | Mindanao (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Cephalopoda | *Sepia officinalis* | 1 | 10 | 5.84 | 118.27 | Philippines (Pacific Ocean) | Shell | see original reference | Terentieva, 1932 |
| Mollusca | Cephalopoda | *Argonauta argo* | 1 | 50 | -35.82 | 175.39 | Pacific Ocean | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Gastropoda | *Neptunea despecta* | 1 | 20 | 69.63 | 57.35 | Barents Sea | Shell | see original reference | Samoilov & Terentieva, 1925 |
| Mollusca | Gastropoda | *Natica clausa* | 1 | 20 | 60.50 | -46.91 | Barents Sea | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Gastropoda | *Tachyrhynchus erosa* | 1 | 30 | 52.90 | 158.76 | Kamchatka (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Gastropoda | *Nassa tegula* | 1 | 20 | 36.62 | -121.91 | Monterey Bay (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Gastropoda | *Odontocymbiola magellanica* | 1 | 15 | -42.71 | -65.02 | Chile (Pacific Ocean) | Shell | see original reference | Bigatti *et al.,* 2010 |
| Mollusca | Gastropoda | *Nassa isculpta* | 1 | 50 | 32.34 | -118.43 | Cortez Bank (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Mollusca | Scaphopoda | *Dentalium solidum* | 1 | 30 | 41.23 | -70.07 | Georges Bank (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
|  |  |  |  |  |  |  |  |  |  |  |
| Crustacea | Cirripedia | *Scalpellum regium* | 1 | 5 | 52.92 | -132.29 | Queen Charlotte I (Pacific Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Cirripedia | *Balanus hameri* | 1 | 20 | 41.23 | -70.07 | Georges Bank (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Cirripedia | *Balanus amphitrite* | 1 | 5 | 38.92 | -74.91 | Cape May (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Cirripedia | *Lepas anatifera* | 1 | 10 | 24.47 | -81.55 | Florida (Atlantic Ocean) | Shell | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Cirripedia | *Mitella polymerus* | 1 | 10 | 22.86 | -106.10 | California (Pacific Ocean) | Shell | see original reference | Samoilov & Terentieva, 1925 |
| Crustacea | Amphipoda | *Tryphosa pinguis* | 1 | 30 | 41.52 | -70.67 | Woods Hole (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Isopoda | *Pentidotea wosnesenkii* | 1 | 2 | 48.75 | -125.23 | Barnfield (Pacific Ocean) | Carapace | see original reference | Neues *et al.,* 2007 |
| Crustacea | Isopoda | *Sphaeroma serratum* | 1 | 2 | 45.18 | 13.68 | Slovenia (Mediterranean Sea) | Carapace | see original reference | Neues *et al.,* 2007 |
| Crustacea | Isopoda | *Gnovimosphaeroma oregonensis* | 1 | 2 | 48.75 | -125.23 | Barnfield (Pacific Ocean) | Carapace | see original reference | Neues *et al.,* 2007 |
| Crustacea | Decapoda | *Crago dalli* | 1 | 40 | 59.17 | -151.60 | Alaska (Pacific Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Pagurus rathbuni* | 1 | 210 | 58.46 | -175.22 | Bering Sea (Arctic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Homarus americanus -* small | 1 | 30 | 43.84 | -69.64 | Boothbay Harbor (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Homarus americanus -* medium | 1 | 30 | 43.84 | -69.64 | Boothbay Harbor (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Homarus americanus -* large | 1 | 30 | 43.84 | -69.64 | Boothbay Harbor (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Homarus americanus* | 1 | 50 | 41.35 | -70.79 | Vineyard Sounds (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Libinia emarginata* | 1 | 20 | 41.35 | -70.79 | Vineyard Sounds (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Munida iris* | 1 | 20 | 37.62 | -76.26 | Chesapeake Bay (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Pandalus platyceros* | 1 | 50 | 36.62 | -121.91 | Monterey Bay (Pacific Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Palinurus argus* | 1 | 60 | 21.84 | -71.33 | West Indies (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Decapoda | *Grapsus grapsus* | 1 | 60 | -9.36 | 46.40 | Aldabra Island (Indian Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |
| Crustacea | Stomatopoda | *Chloridella empusa* | 1 | 20 | 24.47 | -81.55 | Florida (Atlantic Ocean) | Carapace | see original reference | Clarke & Wheeler, 1922 |

**Table S4.** Quality control data for the main elements analyzed via ICP-MS, including Mg and Ca.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Analyte Symbol** | Li | Be | B | Na | Mg | Al | K | Bi | Ca |
| **Unit Symbol** | ppm | ppm | ppm | % | % | % | % | ppm | % |
| **Detection Limit** | 0.1 | 0.1 | 1 | 0.001 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 |
| **Analysis Method** | AR-MS | AR-MS | AR-MS | AR-MS | AR-MS | AR-MS | AR-MS | AR-MS | AR-MS |
| GXR-1 Meas | 5.9 | 1.2 | 16 | 0.045 | 0.14 | 0.32 | 0.04 | 1450 | 0.79 |
| GXR-1 Cert | 8.2 | 1.22 | 15 | 0.052 | 0.217 | 3.52 | 0.05 | 1380 | 0.96 |
| GXR-4 Meas | 11.9 | 2 | 5 | 0.131 | 1.67 | 2.71 | 2.06 | 19.8 | 0.84 |
| GXR-4 Cert | 11.1 | 1.9 | 4.5 | 0.564 | 1.66 | 7.2 | 4.01 | 19 | 1.01 |
| GXR-2 Meas | 52 | 1.4 | 19 | 0.124 | 0.41 | 2.8 | 0.73 | 0.27 | 0.65 |
| GXR-2 Cert | 54 | 1.7 | 42 | 0.556 | 0.85 | 16.5 | 1.37 | 0.69 | 0.93 |
| GXR-6 Meas | 25.1 | 0.9 | 4 | 0.075 | 0.34 | 5.93 | 1.14 | 0.16 | 0.18 |
| GXR-6 Cert | 32 | 1.4 | 9.8 | 0.104 | 0.609 | 17.7 | 1.87 | 0.29 | 0.18 |
| OREAS 13P Meas |  |  |  |  |  |  |  |  |  |
| OREAS 13P Cert |  |  |  |  |  |  |  |  |  |
| Method Blank Method Blank | < 0.1 | < 0.1 | < 1 | < 0.001 | < 0.01 | < 0.01 | < 0.01 | < 0.02 | < 0.01 |

**Table S5.** Details of the field photos and metadata used in Fig. 3. Grey cells indicate in situ data recovered in the field survey and not from the NEAR3D analysis. TO CHANGE IN MANUSCRIPT CITATION

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Metadata** | | | | | | | | | | | | | | | | | | | |
| Photo Tag | Class | Species | Depth (m) | Lat. | Long. | Ocean | Collection | | Source | |  | | |  | |  | | |  | |
| # Ophi. 4 | Echinodermata | Ophiuroidea | *Ophiothrix fragilis* | 40.000 | 60.534 | 1.232 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Ophi. 10 | Echinodermata | Ophiuroidea | *Ophiosparta* sp. | 732.000 | -66.914 | -72.574 | Southern | | Towed camera | | |  | |  | |  | | |  | |
| # Ophi. 16 | Echinodermata | Ophiuroidea | Indetermined white-yellow ophiuroid | 2580.000 | -9.380 | 40.720 | Indian | | Commercial ROV | | |  | |  | |  | | |  | |
| # Ophi. 15 | Echinodermata | Ophiuroidea | Indetermined white-pink ophiuroid | 4100.000 | 34.830 | -123.000 | Pacific | | Sled camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Ast. 14 | Echinodermata | Asteroidea | *Asterias rubens* | 184.000 | 60.187 | -3.839 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Ast. 9 | Echinodermata | Asteroidea | Indetermined red asteroid | 722.000 | -66.914 | -72.574 | Southern | | Towed camera | | |  | |  | |  | | |  | |
| # Ast. 3 | Echinodermata | Asteroidea | *Hyphalaster inermis* | 5440.000 | 31.283 | -25.400 | Atlantic | | Bathysnap camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Echi. 2 | Echinodermata | Echinoidea | *Diadema* sp. | 106.800 | 5.028 | 4.466 | Atlantic | | ROV video | | |  | |  | |  | | |  | |
| # Echi. 4 | Echinodermata | Echinoidea | *Phormosoma* sp. | 772.100 | 5.001 | -4.532 | Atlantic | | ROV video | | |  | |  | |  | | |  | |
| # Echi. 8 | Echinodermata | Echinoidea | Indetermined pink regular echinoid | 2264.000 | -66.872 | -72.678 | Southern | | Towed camera | | |  | |  | |  | | |  | |
| # Echi. 12 | Echinodermata | Echinoidea | Indetermined pink regular echinoid | 4100.000 | 34.830 | -123.000 | Pacific | | Sled camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Holoth. 8 | Echinodermata | Holothuroidea | *Stichopus tremulus* | 357.000 | 72.100 | 22.770 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Holoth. 2 | Echinodermata | Holothuroidea | *Pelopatides mammillatus* | 3305.000 | 23.504 | 59.498 | Indian | | Towed camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Crin. 6 | Echinodermata | Crinoidea | Indetermined white crinoid | 184.000 | 60.280 | -4.830 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Crin. 4 | Echinodermata | Crinoidea | *Poliometra prolixa* | 1080.000 | 60.562 | -4.456 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Crin. 1 | Echinodermata | Crinoidea | *Anachalypsicrinus nefertiti* | 2619.000 | 48.735 | -28.655 | Atlantic | | ISIS ROV | | |  | |  | |  | | |  | |
| # Crin. 5 | Echinodermata | Crinoidea | Indetermined white-yellow crinoid | 4100.000 | 34.830 | -123.000 | Pacific | | Sled camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Crust. 2 | Crustacea | Decapoda | *Galathea* sp. | 330.100 | 5.032 | 4.468 | Atlantic | | ROV video | | |  | |  | |  | | |  | |
| # Crust. 1 | Crustacea | Decapoda | Majidae | 615.600 | 5.001 | -4.532 | Atlantic | | ROV video | | |  | |  | |  | | |  | |
| # Crust. 11 | Crustacea | Decapoda | *Parapagurus pilosimanus* | 1159.000 | -10.620 | 40.840 | Indian | | Commercial ROV | | |  | |  | |  | | |  | |
| # Crust. 8 | Crustacea | Cirripedia | *Alcockianum alcockianum* | 2580.000 | -9.380 | 40.720 | Indian | | Commercial ROV | | |  | |  | |  | | |  | |
| # Crust. 4 | Crustacea | Decapoda | *Lithodidae* sp. | 2619.000 | 48.735 | -28.655 | Atlantic | | ISIS ROV | | |  | |  | |  | | |  | |
| # Crust. 9 | Crustacea | Decapoda | *Geryon trespinosus* | 3000.000 | 20.200 | 68.810 | Indian | | Commercial ROV | | |  | |  | |  | | |  | |
| # Crust. 6 | Crustacea | Cirripedia | Indetermined white cirriped | 4100.000 | 34.830 | -123.000 | Pacific | | Sled camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
| # Cnida. 1 | Cnidaria | Anthozocean acidification | *Gersemia* sp | 1080.000 | 60.562 | -4.456 | Atlantic | | Commercial ROV | | |  | |  | |  | | |  | |
| # Cnida. 2 | Cnidaria | Anthozocean acidification | Octocorallia | 4100.000 | 34.830 | -123.000 | Pacific | | Sled camera | | |  | |  | |  | | |  | |
|  |  |  |  |  |  |  |  | |  | | |  | |  | |  | | |  | |
|  | **NEAR3D analysis** | | | | | **Mg-calcite** | | | | **Calculations** | | | | | | | |
| Photo Tag | T | S | CO32- | pHtotal | pCO2 | mol MgCO3% | Mg/Ca | Original Mg-calcite | | Ω*Cal.* | | | Ω*Arag.* | | ΩMg-x  (cleaned) | | Ω*Mg-x*  (min. prep) |
| # Ophi. 4 | 8.804 | 35.122 | 135.948 | 8.066 | 375.113 | 13.571 | 0.159 | *Ophiothrix angulata* | | 3.275 | | | 2.184 | | 2.717 | | 0.954 |
| # Ophi. 10 | 0.980 | 34.718 | 80.456 | 7.892 | 464.770 | 10.738 | 0.120 | *Ophionotus victoriae* | | 1.745 | | | 1.174 | | 1.677 | | 0.891 |
| # Ophi. 16 | 2.100 | 35.100 | 83.390 | 7.858 | 484.891 | 9.577 | 0.138 | *Ophiosium lynami* | | 1.263 | | | 0.869 | | 1.267 | | 0.794 |
| # Ophi. 15 | 1.500 | 34.600 | 74.261 | 7.767 | 514.592 | 9.577 | 0.138 | *Ophiosium lynami* | | 0.831 | | | 0.582 | | 0.835 | | 0.523 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Ast. 14 | 3.053 | 34.469 | 123.188 | 8.127 | 311.254 | 4.807 | 0.134 | *Asterias rubens* | | 2.924 | | | 1.954 | | 3.384 | | 3.568 |
| # Ast. 9 | 0.970 | 34.716 | 80.814 | 7.882 | 458.721 | 11.506 | 0.130 | *Labidiaster annulatus* | | 1.757 | | | 1.181 | | 1.639 | | 0.778 |
| # Ast. 3 | 2.157 | 34.858 | 98.695 | 7.857 | 336.498 | 8.331 | 0.148 | *Zorocean acidificationster fulgens* | | 0.873 | | | 0.622 | | 0.918 | | 0.678 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Echi. 2 | 15.534 | 35.594 | 125.205 | 7.896 | 595.334 | 6.905 | 0.088 | *Cidaris blakei* | | 2.969 | | | 1.982 | | 2.891 | | 2.520 |
| # Echi. 4 | 5.403 | 34.585 | 70.768 | 7.793 | 690.945 | 8.770 | 0.136 | *Tripneustes ventricosus* | | 1.483 | | | 0.998 | | 1.514 | | 1.056 |
| # Echi. 8 | 1.110 | 34.702 | 77.273 | 7.866 | 476.218 | 8.908 | 0.098 | *Ctenocidaris perrieri* | | 1.232 | | | 0.844 | | 1.271 | | 0.871 |
| # Echi. 12 | 1.500 | 34.600 | 74.261 | 7.767 | 514.592 | 6.359 | 0.072 | *Echinus affinis* | | 0.831 | | | 0.582 | | 0.934 | | 0.861 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Holoth. 8 | -0.012 | 34.875 | 108.266 | 8.109 | 312.022 | 8.770 | 0.096 | *Pseudostichopus spiculiferus* | | 2.567 | | | 1.719 | | 2.663 | | 1.858 |
| # Holoth. 2 | 1.822 | 34.741 | 77.047 | 7.787 | 542.985 | 8.770 | 0.096 | *Pseudostichopus spiculiferus* | | 1.006 | | | 0.698 | | 1.041 | | 0.727 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Crin. 6 | 3.053 | 34.469 | 123.188 | 8.127 | 311.254 | 13.582 | 0.157 | *Isocrinus decorus* | | 2.924 | | | 1.954 | | 2.518 | | 0.883 |
| # Crin. 4 | -0.702 | 35.199 | 105.495 | 8.092 | 310.836 | 11.826 | 0.138 | *Pentametrocrinus japonicus* | | 2.183 | | | 1.474 | | 2.014 | | 0.912 |
| # Crin. 1 | 3.300 | 34.950 | 110.396 | 7.982 | 333.362 | 13.502 | 0.157 | *Endoxocrinus parra* | | 1.652 | | | 1.137 | | 1.426 | | 0.505 |
| # Crin. 5 | 1.500 | 34.600 | 67.438 | 7.715 | 583.636 | 13.502 | 0.157 | *Endoxocrinus parra* | | 0.755 | | | 0.528 | | 0.654 | | 0.232 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Crust. 2 | 10.157 | 34.710 | 52.839 | 7.586 | 1222.203 | 9.381 | 0.120 | *Homarus americanus* | | 1.188 | | | 0.795 | | 1.137 | | 0.732 |
| # Crust. 1 | 6.252 | 34.575 | 47.843 | 7.596 | 1134.484 | 9.462 | 0.158 | *Pandalus platyceros* | | 1.030 | | | 0.691 | | 1.018 | | 0.647 |
| # Crust. 11 | 5.179 | 34.757 | 76.312 | 7.813 | 641.975 | 6.812 | 0.088 | *Pagurus rathbuni* | | 1.494 | | | 1.010 | | 1.635 | | 1.439 |
| # Crust. 8 | 2.100 | 35.100 | 83.390 | 7.858 | 484.891 | 2.637 | 0.027 | *Scalpellum regium* | | 1.263 | | | 0.869 | | 1.459 | | 1.733 |
| # Crust. 4 | 3.300 | 34.950 | 110.396 | 7.982 | 333.362 | 10.106 | 0.134 | *Libinia emarginata* | | 1.652 | | | 1.137 | | 1.618 | | 0.941 |
| # Crust. 9 | 1.715 | 34.742 | 76.957 | 7.796 | 541.337 | 7.253 | 0.101 | *Grapsus grapsus* | | 1.065 | | | 0.736 | | 1.164 | | 0.977 |
| # Crust. 6 | 1.500 | 34.600 | 74.261 | 7.767 | 514.592 | 10.175 | 0.125 | *Munida iris* | | 0.856 | | | 0.611 | | 0.820 | | 0.511 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |
| # Cnida. 1 | -0.702 | 35.199 | 107.461 | 7.998 | 391.804 | 10.841 | 0.124 | *Gorgonia sp.* | | 2.224 | | | 1.502 | | 2.129 | | 1.114 |
| # Cnida. 2 | 1.500 | 34.600 | 74.261 | 7.767 | 514.592 | 14.660 | 0.180 | *Rhipidogorgia flabellum* | | 0.831 | | | 0.582 | | 0.692 | | 0.209 |
|  |  |  |  |  |  |  |  |  | |  | | |  | |  | |  |