Strengthening confidence in climate change impact science

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APPENDIX S1: DETAILED METHODS

Development of the Confidence Index

Creation of the confidence index was based on the need to assess the robustness of the evidence for long-term biological change and the confidence we can place in arguments attributing that change to climate change. The confidence index is based on practices generally regarded as robust by the scientific community, and also on the recommendations of Brown et al. (2011)(*1*). The index scores for *a priori* expectations, adequate data, and strong statistical tests separately and weights them equally (maximum score = 6; Table 1).

To score each study, we first gave a score for the expectations parameter based on presence (+2) or absence (0) of a clearly stated *a priori* expectation. Sufficient knowledge and research on the environment and ecology of the organism in question are required to develop *a priori* expectations with which to formulate falsifiable hypotheses that can be tested with observational data. A study received a positive score if an expectation, as defined above, was stated in the abstract, introduction or methods sections of a paper. Expectations and their components were not scored if they were introduced after the results were presented, and conveyed as *post hoc* interpretations. Examples of expectation statements include "Rising temperatures caused by climatic warming may cause poleward range shifts…"(*2*) ("poleward" can be evaluated against data, "range shifts" indicates the biological response, climate change is mentioned), and "…here we test the summer heat death, day length, and winter cold limitation of reproduction hypotheses by examining the changes in the southern geographic limit of the species since 1872 in relation to climate"(*3*).

The following statement is not a prior expectation: "Thus, we combined the unique time series data for phytoplankton and temperature in the German Bight to assess the effect of a potential warming on the patterns of phytoplankton occurrence"(*4*). This statement cannot be evaluated because any outcome of this test will be consistent with the statement. It is not clear whether an effect of temperature is expected, nor how it would be expected to influence phytoplankton communities if it were observed. It is important to note that we relied on the assumption that the English quality of the studies was equal while performing the scoring.

Expectations are strongest when they reference specific evidence independent of the data used for testing. For example, Wethey and Woodin (*3*) reference experimental evidence: "For *Semibalanus*, the summer thermal extreme hypothesis has been elaborated by such authors as Southward (1958) and Foster (1969) who identified heat coma (37 ºC) and thermal death (42 ºC) limits for the species…" Yamano et al. (2011)(*2*) reference historical evidence independent of the study system: "…poleward range shifts and/or expansions may also occur in temperate areas, as suggested by geological records and present-day eyewitnesses in several localities [*Greenstein and Pandolfi*, 2008; *Precht and Aronson*, 2004]." Studies that invoked specific evidence from scientific theory, experiments, historical or paleontological evidence, and/or models received +2 points, and studies that invoked more than one line of evidence received +1 additional point (i.e. 3 total).

Stronger attribution can be achieved if other potential explanations of the observed pattern have been examined and tested or otherwise discounted. We awarded +1 point to studies that *either* stated an expectation (meeting the criteria above for expectations) for an alternative causal factor(s) *or* discounted a confounding factor(s) in the discussion (either verbally or quantitatively). An example of an expectation for an alternative causal factor comes from Bunce et al. 2002 (*5*): “Fisheries-induced changes in the marine environment, either through direct or indirect effects of fisheries activities, may also influence seabird populations.” Wiltshire & Manly 2004 (*4*) provides an example of discounting a confounding factor: “Since the formation of sea ice is rare at Helgoland, a delay of the spring bloom caused by temperatures in the first quarter will only occur in very cold winters, of which there has only been one since 1962.”

The second variable in the scoring system depends on the use of sufficient temporal and spatial data, because it is important to use a broad enough temporal scale to account for natural cyclic changes as well as a broad enough spatial area to discount specific local influences (*1*, *6*–*8*). Studies with longer time series received higher scores (See Table 1 for details); scoring was based on the number of years in the time-series with actual data. For example, two-period studies were considered as only two years of data. An additional point was given for datasets that span long-time periods and have more than 30 yrs of data (Table 1). Spatial coverage was ranked similarly, with increasing spatial coverage receiving higher scores (see Table 1 for details) and multi-site studies receiving +1 point. The spatial resolution was determined by first estimating the study area to the nearest 1,000 (km^2) (*9*), typically based on the published coordinates for study sites. For coastal habitats, we considered the area encompassed by a polygon described by the study sites. For example, Simkanin et al (2005) sampled intertidal sites around the coast of Ireland, and this study was scored as covering an area of 100,000 km^2, rounded up from the area of Ireland (approximately 84,421 km^2).

The third component of the C_{index} score emphasizes the strength of the quantitative analysis presented. Strong statistical tests are necessary to detect a biological change and then to accept or reject hypotheses about climate change and alternate causal factors in order to narrow in on the specific cause of the observed biological change (*1*). We awarded points to studies that tested a trend in a biological variable (+1), tested a trend in a physical climate variable (+1), or tested a relationship between the biological and physical variables (+2). We gave an additional point (+1) if the study also tested an alternative causal factor.

Temporal and spatial autocorrelation arising from non-independence of observations is common in biological time-series studies. For example, in seabird studies, the same individual may be counted in multiple years; in other species, a common management regime or other environmental factor may lead to autocorrelation (*1*). Autocorrelation causes the degrees of freedom in a dataset to be over-estimated, which increases the chances of a Type I error (false rejection of the null hypothesis), thus we gave +1 point to those studies that have considered either temporal or spatial autocorrelation, or both.

Summing the score from each of the three variables gives a numerical value (maximum score = 18) that we use as a representation of confidence in the findings of each study. This method does not provide an absolute measure of confidence, but it does provide an objective and transparent relative ranking of confidence that can strengthen detection and attribution in biological climate change impact studies and be adapted to evaluate confidence in scientific attribution in other disciplines as well.

Assessment of current practices

We applied the C_{index} to a sample of marine climate change impact studies to evaluate overall confidence in the assessment of biological responses to climate change. We used a dataset of 208 studies of marine biological responses to climate change (*9*). Criteria for inclusion in the database were based on other high-profile assessments that rely exclusively on time-series datasets (*10*). To support inferences the impacts of climate change with an anthropogenic forcing component, qualifying studies report biological change over a time period of at least 19 years and had to include at least one observation after 1990 (*9*, *11*). Further, the report had to in some way relate the biological change to climate change. Studies are often composed of multiple observations (time series), which may vary in expected relationship to climate, analyses, and results, so we calculated separate scores for each assessment of biological response (n=1735 observations).

We analysed C_{index} scores at the level of study and observation to assess confidence in attribution of biological change to climate in the literature, to test predictions regarding current practices in climate impact assessment, and to identify strengths and areas that may be improved in future research. In particular, we identified indicators of high scoring assessments, and examined topics and types of studies that scored highly.

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Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Abundance	Arctic Ocean	Plankton	Centre	Temperature	1E+07	NA	1899	105	76	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Beaufort Sea	Vertebrates	Trailing edge	Sea ice / snow	100000	NA	1985	20	18	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Fischbach, A.S., S.C. Amstrup and D.C. Douglas. 2007. Landward and eastward shift of Alaskan polar bear denning associated with recent sea ice changes. Polar Biology 30:1395-1405
Abundance	Bering Sea	Benthic	Trailing edge	Temperature	100000	405	1975	27	27	4	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	11	5	6	Orensanz J., B. Ernst, D.A. Armstrong, P. Stabeno and P. Livingston 2004. Contraction of the geographic range of distribution of snow crab (Chionoecetes opilio) in the eastern Bering Sea: An environmental ratchet? CalCOFI Report 45: 65-79.
Abundance	Bering Sea	Benthic	Trailing edge	Temperature	1000000	405	1982	25	25	3	No	Yes	Yes	Yes	No	4	Consistent	Yes	No	No	Yes	3	10	5	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Abundance	Bering Sea	Plankton	Centre	Temperature	1000000	NA	1960	41	20	4	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	No	2	8	6	2	Sinclair, E.H., L.S. Vlietstra, D.S. Johnson, T.K. Zeppelin, G.V. Byrd, A.M. Springer, R.R. Ream and G.L. Hunt Jr. 2008. Patterns in prey use among fur seals and seabirds in the Pribilof Islands. Deep-Sea Research II 55: 1897-1918
Abundance	Bering Sea	Plankton	Centre	Temperature	100000	356	1975	31	28	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Brodeur, R.D., M.B. Decker, L. Cianelli, J.E. Purcell, N.A. Bond, P.J. Stabeno, E. Acuna and G.L. Hunt. 2008. Rise and fall of jellyfish in the eastern Bering Sea in relation to climate regime shifts. Progress in Oceanography 77: 103-111
Abundance	Bering Sea	Plankton	Centre	Temperature	100000	356	1975	31	28	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Brodeur, R.D., M.B. Decker, L. Cianelli, J.E. Purcell, N.A. Bond, P.J. Stabeno, E. Acuna and G.L. Hunt. 2008. Rise and fall of jellyfish in the eastern Bering Sea in relation to climate regime shifts. Progress in Oceanography 77: 103-111
Abundance	Bering Sea	Vertebrates	Centre	Temperature	1000000	NA	1975	26	10	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	10	5	5	Sinclair, E.H., L.S. Vlietstra, D.S. Johnson, T.K. Zeppelin, G.V. Byrd, A.M. Springer, R.R. Ream and G.L. Hunt Jr. 2008. Patterns in prey use among fur seals and seabirds in the Pribilof Islands. Deep-Sea Research II 55: 1897-1918
Abundance	Bering Sea	Vertebrates	Centre	Temperature	1000000	NA	1960	41	20	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	12	7	5	Sinclair, E.H., L.S. Vlietstra, D.S. Johnson, T.K. Zeppelin, G.V. Byrd, A.M. Springer, R.R. Ream and G.L. Hunt Jr. 2008. Patterns in prey use among fur seals and seabirds in the Pribilof Islands. Deep-Sea Research II 55: 1897-1918
Abundance	Bering Sea	Vertebrates	Centre	Temperature	1000000	NA	1960	41	20	4	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	No	2	8	6	2	Sinclair, E.H., L.S. Vlietstra, D.S. Johnson, T.K. Zeppelin, G.V. Byrd, A.M. Springer, R.R. Ream and G.L. Hunt Jr. 2008. Patterns in prey use among fur seals and seabirds in the Pribilof Islands. Deep-Sea Research II 55: 1897-1918
Abundance	Bering Sea	Vertebrates	Trailing edge	Temperature	1000000	405	1960	41	41	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Overland J.E., P.J. Stabeno. 2004. Is the climate of the Bering Sea warming and affecting the ecosystem? EOS 85: 309_316.
Abundance	Bering Sea	Vertebrates	Trailing edge	Temperature	1000000	405	1975	26	26	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Overland J.E., P.J. Stabeno. 2004. Is the climate of the Bering Sea warming and affecting the ecosystem? EOS 85: 309_316.
Abundance	Bering Sea	Vertebrates	Leading edge	Temperature	1000000	405	1960	41	41	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Overland J.E., P.J. Stabeno. 2004. Is the climate of the Bering Sea warming and affecting the ecosystem? EOS 85: 309_316.
Abundance	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Abundance	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Abundance	California Current	Benthic	Trailing edge	Temperature	100	3	1982	25	8	2	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	6	3	3	Rogers-Bennett, L. 2007. Is climate change contributing to range reductions and localized extinctions in Northern (Haloitis kamtschatkana) and flat (Haloitis walallensis) abalones? Bulletin of Marine Science 81: 283-293
Abundance	California Current	Benthic	Trailing edge	Temperature	100	1	1982	25	8	2	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	6	3	3	Rogers-Bennett, L. 2007. Is climate change contributing to range reductions and localized extinctions in Northern (Haloitis kamtschatkana) and flat (Haloitis walallensis) abalones? Bulletin of Marine Science 81: 283-293
Abundance	California Current	Plankton	Leading edge	Temperature	10000	NA	1740	262	262	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Field, D.B., T.R. Baumgartner, C.D. Charles, V. Ferreira-Bartrina and M.D. Ohman. 2006. Planktonic foraminifera of the Californian current reflect 20th-century warming. Science 311:62-66

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Abundance	California Current	Plankton	Leading edge	Temperature	10000	NA	1740	262	262	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Field, D.B., T.R. Baumgartner, C.D. Charles, V. Ferreira-Bartrina and M.D. Ohman. 2006. Planktonic foraminifera of the Californian current reflect 20th-century warming. Science 311:62-66
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Abundance	California Current	Plankton	Trailing edge	Temperature	10000	NA	1740	262	262	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Field, D.B., T.R. Baumgartner, C.D. Charles, V. Ferreira-Bartrina and M.D. Ohman. 2006. Planktonic foraminifera of the Californian current reflect 20th-century warming. Science 311:62-66
Abundance	California Current	Plankton	Trailing edge	Temperature	10000	NA	1740	262	262	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Field, D.B., T.R. Baumgartner, C.D. Charles, V. Ferreira-Bartrina and M.D. Ohman. 2006. Planktonic foraminifera of the Californian current reflect 20th-century warming. Science 311:62-66
Abundance	California Current	Plankton	Trailing edge	Temperature	10000	NA	1740	262	262	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Field, D.B., T.R. Baumgartner, C.D. Charles, V. Ferreira-Bartrina and M.D. Ohman. 2006. Planktonic foraminifera of the Californian current reflect 20th-century warming. Science 311:62-66
Abundance	California Current	Plankton	Centre	Temperature	100000	1	1951	43	38	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Roemmich, D. and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326
Abundance	California Current	Plankton	Centre	Temperature	100000	1	1951	43	38	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Roemmich, D. and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326
Abundance	California Current	Plankton	Centre	Temperature	100000	NA	1951	47	12	4	No	Yes	No	Yes	No	2	Consistent	No	No	No	Yes	1	7	6	1	Lavaniegos, B.E. and M.D. Ohman. 1998. Hyperiid amphipods as indicators of climate change in the Californian Current. Proceedings of the Fourth International Crustacean Conference
Abundance	California Current	Plankton	Centre	Temperature	100000	NA	1951	47	12	4	No	Yes	No	Yes	No	2	Consistent	No	No	No	Yes	1	7	6	1	Lavaniegos, B.E. and M.D. Ohman. 1998. Hyperiid amphipods as indicators of climate change in the Californian Current. Proceedings of the Fourth International Crustacean Conference
Abundance	California Current	Squid	Leading edge	Temperature	1000000	8	1985	22	22	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Field, J.C., K. Baltz, A.J. Phillips and W.A. Walker. 2007. Range expansion and trophic interactions of the Jumbo Squid Dosidicus gigas, in the Californian Current. Californian Cooperative Oceanic Fisheries Investigations Reports 48:131-146
Abundance	East China Sea	Benthic	Leading edge	Temperature	100000	27	1959	47	3	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	6	4	2	Ma, Z., Z. Xu and J. Zhou. 2009. Effect of global warming on the distribution of Lucifer intermedius and L. hanseni (Decapoda) in the Changjiang estuary. Progress in Natural Science 19: 1389-1395
Abundance	East China Sea	Benthic	Leading edge	Temperature	100000	27	1959	47	3	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	6	4	2	Ma, Z., Z. Xu and J. Zhou. 2009. Effect of global warming on the distribution of Lucifer intermedius and L. hanseni (Decapoda) in the Changjiang estuary. Progress in Natural Science 19: 1389-1395
Abundance	English Channel	Larval bony fish	Leading edge	Temperature	1	1	1924	77	64	4	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	10	5	5	Hawkins, S.J., A.J. Southward and M.J. Genner. 2003. Detection of environmental change in a marine ecosystem-evidence from the western English Channel. The Science of the Total Environment 310:245-256
Abundance	English Channel	Plankton	Leading edge	Temperature	1	1	1924	77	64	4	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	10	5	5	Hawkins, S.J., A.J. Southward and M.J. Genner. 2003. Detection of environmental change in a marine ecosystem-evidence from the western English Channel. The Science of the Total Environment 310:245-256
Abundance	English Channel	Plankton	Trailing edge	Temperature	1	1	1924	77	64	4	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	10	5	5	Hawkins, S.J., A.J. Southward and M.J. Genner. 2003. Detection of environmental change in a marine ecosystem-evidence from the western English Channel. The Science of the Total Environment 310:245-256
Abundance	English Channel	Vertebrates	Centre	Temperature	1000	1	1913	90	23	4	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	No	4	13	6	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
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Abundance	English Channel	Vertebrates	Centre	Temperature	1000	1	1913	90	23	4	No	Yes	Yes	Yes	Yes	5	Opposite to expected	Yes	Yes	No	No	4	13	6	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
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Abundance	English Channel	Vertebrates	Centre	Temperature	1000	NA	1911	97	48	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Genner MJ, Sims DW, Southward AJ, Budd GC, Masterson P, McHugh M, et al. 2010. Body size-dependent responses of a marine fish assemblage to climate change and fishing over a century-long scale. Glob Change Biology 16(2): 517-527.

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Abundance	Equatorial Atlantic	Plankton	Centre	Temperature	1E+07	NA	1911	93	44	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	Equatorial Pacific	Plankton	Centre	Temperature	1E+07	NA	1907	101	77	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	Great Australian Bight	Vertebrates	Centre	Temperature	10	1	1873	125	11	4	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	8	5	3	Bunce, A., F.I. Norman, N. Brothers, and R. Gales. 2002. Long-term trends in the Australasian gannet (Morus serrator) population in Australia: the effect of climate change and commercial fisheries. Marine Biology 141: 263-269.
Abundance	Great Australian Bight	Vertebrates	Centre	Temperature	10	1	1966	35	13	4	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	8	5	3	Bunce, A., F.I. Norman, N. Brothers, and R. Gales. 2002. Long-term trends in the Australasian gannet (Morus serrator) population in Australia: the effect of climate change and commercial fisheries. Marine Biology 141: 263-269.
Abundance	Great Australian Bight	Vertebrates	Centre	Temperature	10	1	1961	37	10	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	7	4	3	Bunce, A., F.I. Norman, N. Brothers, and R. Gales. 2002. Long-term trends in the Australasian gannet (Morus serrator) population in Australia: the effect of climate change and commercial fisheries. Marine Biology 141: 263-269.
Abundance	Great Australian Bight	Vertebrates	Centre	Temperature	10	1	1947	52	9	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	7	4	3	Bunce, A., F.I. Norman, N. Brothers, and R. Gales. 2002. Long-term trends in the Australasian gannet (Morus serrator) population in Australia: the effect of climate change and commercial fisheries. Marine Biology 141: 263-269.
Abundance	Great Australian Bight	Vertebrates	Centre	Temperature	10	1	1939	62	13	4	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	8	5	3	Bunce, A., F.I. Norman, N. Brothers, and R. Gales. 2002. Long-term trends in the Australasian gannet (Morus serrator) population in Australia: the effect of climate change and commercial fisheries. Marine Biology 141: 263-269.
Abundance	Gulf of Alaska	Benthic	Centre	Temperature	10000	1	1972	34	34	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Litzow, M.A. and L. Ciannelli. 2007. Oscillating trophic control induces community reorganization in a marine ecosystem. Ecology Letters 10: 1124-1134
Abundance	Gulf of Alaska	Vertebrates	Centre	Temperature	10000	1	1972	34	34	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Litzow, M.A. and L. Ciannelli. 2007. Oscillating trophic control induces community reorganization in a marine ecosystem. Ecology Letters 10: 1124-1134
Abundance	Gulf of California	Plankton	Centre	pH (CO_2, aragonite or calcite sat states)	100000	57	1951	58	53	5	Yes	Yes	No	Yes	No	3	No change	Yes	Yes	No	Yes	5	13	8	5	Ohman MD, Lavaniegos BE, Townsend AW. 2009. Multi-decadal variations in calcareous holozooplankton in the California Current System: Thecosome pteropods, heteropods, and foraminifera. Geophysical Research Letters. VOL. 36, L18608, doi:10.1029/2009GL039901
Abundance	Gulf of California	Plankton	Centre	pH (CO_2, aragonite or calcite sat states)	100000	57	1951	58	53	5	Yes	Yes	No	Yes	No	3	No change	Yes	Yes	No	Yes	5	13	8	5	Ohman MD, Lavaniegos BE, Townsend AW. 2009. Multi-decadal variations in calcareous holozooplankton in the California Current System: Thecosome pteropods, heteropods, and foraminifera. Geophysical Research Letters. VOL. 36, L18608, doi:10.1029/2009GL039901
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Abundance	Gulf of California	Plankton	Centre	pH (CO_2, aragonite or calcite sat states)	100000	38	1951	58	35	5	Yes	Yes	No	Yes	No	3	No change	Yes	Yes	No	Yes	5	13	8	5	Ohman MD, Lavaniegos BE, Townsend AW. 2009. Multi-decadal variations in calcareous holozooplankton in the California Current System: Thecosome pteropods, heteropods, and foraminifera. Geophysical Research Letters. VOL. 36, L18608, doi:10.1029/2009GL039901

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Abundance	Gulf of California	Plankton	Centre	pH (CO_2, aragonite or calcite sat states)	100000	57	1951	58	53	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Ohman MD, Lavaniegos BE, Townsend AW. 2009. Multi-decadal variations in calcareous holozooplankton in the California Current System: Thecosome pteropods, heteropods, and foraminifera. Geophysical Research Letters. VOL. 36, L18608, doi:10.1029/2009GL039901
Abundance	Gulf of Guinea	Plankton	Centre	Temperature	10	5	1969	24	24	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	8	6	2	Wiafe, G., H.B. Yaqub, M.A. Mensah and C.L.J. Frid. 2008. Impact of climate change on long-term zooplankton biomass in the upwelling region of the Gulf of Guinea. ICES Journal of Marine Science 65: 318-324
Abundance	Gulf of Mexico	Vertebrates	Centre	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Centre	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Centre	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Opposite to expected	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Opposite to expected	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Gulf of Mexico	Vertebrates	Leading edge	Temperature	1000	18	1971	36	11	4	No	Yes	No	Yes	No	2	Opposite to expected	Yes	No	No	Yes	3	9	6	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Abundance	Hudson Bay	Plankton	Centre	Temperature	1	1	1981	22	20	2	Yes	Yes	Yes	No	No	4	No change	No	No	No	No	0	6	4	2	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Abundance	Hudson Bay	Vertebrates	Centre	Sea ice / snow	10000	NA	1981	20	20	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	8	6	2	Ferguson, S.H., I. Stirling and P. McLoughlin. 2005. Climate change and ringed seal (Phoca hispida) recruitment in western Hudson Bay. Marine Mammal Science 21:121-135
Abundance	Hudson Bay	Vertebrates	Leading edge	Sea ice / snow	1E+07	NA	1903	103	37	6	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	16	9	7	Higdon, J.W. and S. H. Ferguson. 2009. Loss of Arctic sea ice causing punctuated change in the sightings of killer whales (Orcinus orca) over the past century. Ecological Applications 19: 1365-1375
Abundance	Hudson Bay	Vertebrates	Leading edge	Temperature	1	1	1981	22	20	2	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	6	4	2	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Hudson Bay	Vertebrates	Leading edge	Temperature	1	1	1980	20	5	1	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	3	3	0	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Hudson Bay	Vertebrates	Leading edge	Temperature	1	1	1981	22	20	2	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	6	4	2	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Hudson Bay	Vertebrates	Trailing edge	Temperature	1	1	1981	22	20	2	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	Yes	1	7	4	3	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Hudson Bay	Vertebrates	Trailing edge	Temperature	1	1	1980	20	5	1	Yes	Yes	No	No	No	2	Consistent	No	No	No	Yes	1	4	3	1	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Hudson Bay	Vertebrates	Leading edge	Temperature	1	1	1980	20	5	1	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	3	3	0	Gaston, A.J., K. Woo and M. Hipfner. 2003. Trends in forage fish populations in Northern Hudson Bay since 1981, as determined from the diet of nestling thick-billed murres Uria lomvia. Arctic 56:227-233
Abundance	Indian Ocean	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Irish Sea	Benthic	Centre	Temperature	1	1	1962	41	7	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	4	4	0	Davies, A. J., M. P. Johnson, and C. A. Maggs. 2007. Limpet grazing and loss of Ascophyllum nodosum canopies on decadal time scales. Marine Ecology-Progress Series 339:131-141
Abundance	Irish Sea	Benthic	Centre	Temperature	1	1	1962	41	7	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	4	4	0	Davies, A. J., M. P. Johnson, and C. A. Maggs. 2007. Limpet grazing and loss of Ascophyllum nodosum canopies on decadal time scales. Marine Ecology-Progress Series 339:131-141
Abundance	Irish Sea	Benthic	Centre	Temperature	1	1	1962	41	7	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	4	4	0	Davies, A. J., M. P. Johnson, and C. A. Maggs. 2007. Limpet grazing and loss of Ascophyllum nodosum canopies on decadal time scales. Marine Ecology-Progress Series 339:131-141
Abundance	Irish Sea	Benthic	Centre	Temperature	1	1	1979	26	3	1	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	3	3	0	Davies, A. J., M. P. Johnson, and C. A. Maggs. 2007. Limpet grazing and loss of Ascophyllum nodosum canopies on decadal time scales. Marine Ecology-Progress Series 339:131-141
Abundance	Irish Sea	Vertebrates	Centre	Temperature	100000	14	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	Kattegat	Plankton	Centre	Temperature	10000	11	1979	28	28	4	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	No	No	Yes	3	13	7	6	Henriksen, P. 2009. Long-term changes in phytoplankton in the Kattegat, the Belt Sea, the Sound and the western Baltic Sea. Journal of Sea Research 61: 114-123
Abundance	Kattegat	Plankton	Trailing edge	Temperature	10000	11	1979	28	28	4	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	9	5	4	Henriksen, P. 2009. Long-term changes in phytoplankton in the Kattegat, the Belt Sea, the Sound and the western Baltic Sea. Journal of Sea Research 61: 114-123
Abundance	Mediterranean Sea	Benthic	Leading edge	Temperature	1	1	1981	19	10	1	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	5	2	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1977	27	22	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Leading edge	Temperature	1	1	1977	27	22	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1962	41	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1980	24	10	1	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	5	2	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1962	40	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1962	38	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1977	24	10	1	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	5	2	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379

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Abundance	Mediterranean Sea	Plankton	Trailing edge	Temperature	1	1	1968	33	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Leading edge	Temperature	1	1	1962	40	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Leading edge	Temperature	1	1	1962	38	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Leading edge	Temperature	1	1	1968	33	10	2	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	6	3	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Leading edge	Temperature	1	1	1977	24	10	1	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	No	3	5	2	3	Chevaldonne, P. and C. Lejeusne 2003. Regional warming-induced species shift in north-west Mediterranean marine caves. Ecology Letters 6:371-379
Abundance	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1929	77	9	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Abundance	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1929	77	9	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Abundance	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Abundance	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Abundance	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100000	NA	1950	54	15	4	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	13	6	7	Sabates, A., P. Martin, J. Lloret and V. Raya. 2006. Sea warming and fish distribution: the case of the small pelagic fish, Sardinella aurita, in the western Mediterranean. Global Change Biology. 12: 2209-2219
Abundance	North Atlantic	Plankton	Centre	Temperature	1E+07	NA	1903	104	76	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	North Atlantic	Vertebrates	Centre	Temperature	1E+08	NA	1976	25	25	4	No	Yes	No	Yes	No	2	Consistent	No	Yes	No	Yes	3	9	6	3	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Abundance	North Indian	Plankton	Centre	Temperature	1E+07	NA	1942	56	44	6	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	North Pacific	Plankton	Centre	Temperature	1E+07	NA	1907	102	86	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Abundance	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	9	4	5	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Abundance	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Abundance	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Abundance	North Sea	Benthic	Centre	Temperature	10	1	1974	34	34	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Campos, J., A. Bio, J.F. Cardoso, R. Dapper, J. I. Witte and H.W. van der Veer. 2010. Fluctuations of brown shrimp Crangon crangon abundance in the western Dutch Wadden Sea. Marine Ecology Progress Series. 405: 203-219
Abundance	North Sea	Benthic	Leading edge	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1949	57	57	5	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	11	7	4	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1957	49	49	5	No	Yes	No	Yes	Yes	3	Consistent	No	No	No	Yes	1	9	7	2	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1949	57	57	5	No	Yes	No	Yes	Yes	3	Consistent	No	No	No	Yes	1	9	7	2	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1949	57	57	5	No	Yes	No	Yes	Yes	3	Consistent	No	No	No	Yes	1	9	7	2	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Abundance	North Sea	Plankton	Centre	Temperature	100	13	1973	29	29	4	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	8	5	3	Philippart, C. J. M., H. M. van Aken, J. J. Beukema, O. G. Bos, G. C. Cadee, and R. Dekker. 2003. Climate-related changes in recruitment of the bivalve Macoma balthica. Limnology and Oceanography 48:2171-2185.

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Abundance	North Sea	Plankton	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	9	4	5	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Leading edge	Temperature	1	1	1974	21	21	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1948	48	48	5	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	8	8	0	Reid, P.C., M. Edwards, H.G. Hunt and A.J. Warner. 1998. Phytoplankton change in the North Atlantic. Nature 391:546
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1946	57	57	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Kirby, R.R., G. Beaugrand, J.A. Lindley, A.J. Richardson, M. Edwards and P.C. Reid. 2007. Climate effects and benthic-pelagic coupling in the North Sea. Marine Ecology Progress Series. 330:31-38.
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Kirby R, G. Beaugrand, J.A. Lindley. 2008. Climate-induced effects on the meroplankton and the benthic-pelagic ecology of the North Sea. Limnology and Oceanography 53: 1805_1815.
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Kirby R, G. Beaugrand, J.A. Lindley. 2008. Climate-induced effects on the meroplankton and the benthic-pelagic ecology of the North Sea. Limnology and Oceanography 53: 1805_1815.
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	Yes	Yes	No	4	No change	No	Yes	No	Yes	3	12	7	5	Kirby R, G. Beaugrand, J.A. Lindley. 2008. Climate-induced effects on the meroplankton and the benthic-pelagic ecology of the North Sea. Limnology and Oceanography 53: 1805_1815.
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	Yes	Yes	No	4	Opposite to expected	No	Yes	No	Yes	3	12	7	5	Kirby R, G. Beaugrand, J.A. Lindley. 2008. Climate-induced effects on the meroplankton and the benthic-pelagic ecology of the North Sea. Limnology and Oceanography 53: 1805_1815.
Abundance	North Sea	Plankton	Leading edge	Temperature	100000	NA	1981	22	22	3	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	10	5	5	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Abundance	North Sea	Plankton	Leading edge	Temperature	100000	NA	1958	45	45	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Abundance	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	No	Yes	Yes	Yes	No	4	No change	No	Yes	No	Yes	3	12	7	5	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Abundance	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	No	Yes	No	Yes	No	2	No change	No	Yes	No	Yes	3	10	7	3	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Abundance	North Sea	Plankton	Centre	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Opposite to expected	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310

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Abundance	North Sea	Plankton	Centre	Temperature	1E+08	NA	1958	48	48	6	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	14	9	5	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Abundance	North Sea	Plankton	Trailing edge	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Abundance	North Sea	Plankton	Leading edge	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Abundance	North Sea	Plankton	Leading edge	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	42	42	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G. Long-term changes in copepod abundance and diversity in the north-east Atlantic in relation to fluctuations in the hydroclimatic environment. 2003. Fisheries Oceanography 12: 270-283
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	42	42	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G. Long-term changes in copepod abundance and diversity in the north-east Atlantic in relation to fluctuations in the hydroclimatic environment. 2003. Fisheries Oceanography 12: 270-283
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	14	7	7	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	14	7	7	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	14	7	7	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	14	7	7	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Vertebrates	Leading edge	Temperature	100000	100	1969	40	40	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	No	No	Yes	3	12	7	5	van Hal, R., K. Smits and A.D. Rijnsdorp 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research 64: 76-84.
Abundance	North Sea	Vertebrates	Leading edge	Temperature	100000	100	1969	40	40	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	No	No	Yes	3	12	7	5	van Hal, R., K. Smits and A.D. Rijnsdorp 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research 64: 76-84.
Abundance	North Sea	Vertebrates	Trailing edge	Temperature	1000000	NA	1963	43	43	5	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	11	7	4	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	1	1952	44	44	5	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	9	6	3	Knights, B. 2003. A review of the possible impacts of long-term oceanic and climate changes and fishing mortality on recruitment of anguillid eels of the Northern Hemisphere. The Science of the Total Environment 310: 237-244
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73

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Abundance	North Sea	Vertebrates	Leading edge	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	120	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Leading edge	Temperature	10000	120	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	120	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
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Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
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Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Leading edge	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73

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Abundance	North Sea	Vertebrates	Trailing edge	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
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Abundance	North Sea	Vertebrates	Trailing edge	Temperature	10000	120	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73

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Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
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Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
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Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	No change	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	65	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	40	1970	37	37	5	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	12	8	4	Tulp, I., Bolle, L.J. and A.D. Rijnsdorp. 2008. Signals from the shallows: In search of common patterns in long-term trends in Dutch estuarine and coastal fish. Journal of Sea Research. 60: 54-73
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	NA	1925	79	79	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	Yes	1	8	7	1	Beare, D.J., F. Burns, E. Jones, K. Peach, E. Portilla, T. Greig, E. McKenzie and D. Reid. 2004. An increase in the abundance of anchovies and sardines in the north-western North Sea since 1995. Global Change Biology 10:1209-1213
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	NA	1925	79	79	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	Yes	1	8	7	1	Beare, D.J., F. Burns, E. Jones, K. Peach, E. Portilla, T. Greig, E. McKenzie and D. Reid. 2004. An increase in the abundance of anchovies and sardines in the north-western North Sea since 1995. Global Change Biology 10:1209-1213
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
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Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
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Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	3	1925	80	70	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Beare, D.J., F. Burns, A. Greig, E.G. Jones, K. Peach, M. Kienzle, E. Mackenzie and D.G. Reid. 2004. Long-term increases in prevalence of North Sea fishes having southern biogeographic affinities. Marine Ecology Progress Series 284: 269-278
Abundance	North Sea	Vertebrates	Leading edge	Temperature	100000	79	1925	79	44	5	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	10	7	3	Beare, D.J. ,F. Burns, E. Jones, K. Peach and D. Reid. 2005. Red mullet migration into the northern North Sea during late winter. Journal of Sea Research 53: 205-212
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	1	1960	46	45	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Bonhommeau, S., E. Chassot, B. Planque, E. Rivot, A.H. Knap and O. Le Pape. 2008. Impact of climate on eel populations of the Northern Hemisphere. Marine Ecology Progress Series 373: 71-80
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	1	1960	40	40	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	1	1960	46	46	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	1	1969	37	37	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44
Abundance	North Sea	Vertebrates	Centre	Temperature	1000	1	1964	42	42	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	7	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	6	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	8	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	North Sea	Vertebrates	Centre	Temperature	10000	5	1986	19	19	3	No	Yes	Yes	No	No	3	Opposite to expected	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	North Sea	Vertebrates	Leading edge	Temperature	1000000	NA	1925	81	81	5	No	Yes	No	No	No	1	Opposite to expected	No	No	No	No	0	6	6	0	Harris, M.P., Beare, D., Toresen, R., Nèttestad, L., Kloppmann, M., D_rner, H., Peach, K., Rushton, D.R., Foster-Smith, J. and S. Wanless. 2006. A major increase in snake pipefish (Entelurus aequoreus) in northern European seas since 2003: potential impli
Abundance	North Sea	Vertebrates	Centre	Temperature	1E+08	NA	1962	44	44	6	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	14	9	5	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	Yes	5	Consistent	No	Yes	No	Yes	3	13	7	6	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	200	1980	20	20	3	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	Yes	3	8	5	3	Hedger, R., E. McKenzie, M. Heath, P. Wright, B. Scott, A. Gallego and J. Andrews. 2004. Analysis of the spatial distributions of mature cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) abundance in the North Sea (1980-1999) using generalised add
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	200	1980	20	20	3	Yes	Yes	No	No	No	2	No change	No	Yes	No	Yes	3	8	5	3	Hedger, R., E. McKenzie, M. Heath, P. Wright, B. Scott, A. Gallego and J. Andrews. 2004. Analysis of the spatial distributions of mature cod (Gadus morhua) and haddock (Melanogrammus aeglefinus) abundance in the North Sea (1980-1999) using generalised add
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Abundance	North Sea	Vertebrates	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
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Abundance	North-east Atlantic	Benthic	Centre	Temperature	100000	63	1958	46	2	3	Yes	Yes	No	No	Yes	3	Consistent	Yes	No	No	Yes	3	9	5	4	Simkanin, C., A. Power, A. Myers, D. McGrath, A. Southward, N. Mieszkowska, R. Leaper, and R. O'Riordan. 2005. Using historical data to detect temporal changes in the abundances of intertidal species on Irish shores. Journal of the Marine Biological Assoc
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Abundance	North-east Atlantic	Benthic	Centre	Temperature	100000	63	1958	46	2	3	Yes	Yes	No	No	Yes	3	No change	Yes	No	No	Yes	3	9	5	4	Simkanin, C., A. Power, A. Myers, D. McGrath, A. Southward, N. Mieszkowska, R. Leaper, and R. O'Riordan. 2005. Using historical data to detect temporal changes in the abundances of intertidal species on Irish shores. Journal of the Marine Biological Assoc
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Abundance	North-east Atlantic	Benthic	Centre	Temperature	100000	63	1958	46	2	3	Yes	Yes	No	No	Yes	3	Opposite to expected	Yes	No	No	Yes	3	9	5	4	Simkanin, C., A. Power, A. Myers, D. McGrath, A. Southward, N. Mieszkowska, R. Leaper, and R. O'Riordan. 2005. Using historical data to detect temporal changes in the abundances of intertidal species on Irish shores. Journal of the Marine Biological Assoc
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Abundance	North-east Atlantic	Benthic	Leading edge	Temperature	10	19	1955	53	2	3	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	Yes	4	8	4	4	O'Riordan, R.M., S. Culloty, J. Davenport and R. McAllen. 2009. Increases in the abundance of the invasive barnacle Austrominius modestus on the Isle of Cumbrae, Scotland. Journal of the Marine Biological Association 2 - Biodiversity Records 2: e91 doi:10

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Abundance	North-east Atlantic	Benthic	Leading edge	Temperature	1000000	118	1967	39	7	3	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	No	4	10	6	4	Edward, D.A., J.E. Blyth, R. McKee and A. Simon Gilburn. 2007. Change in the distribution of a member of the strand line community: the seaweed fly (Diptera: Coelopidae). Ecological Entomology 32: 741_746
Abundance	North-east Atlantic	Benthic	Centre	Temperature	100000	3	1981	25	2	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	No	4	7	3	4	Edward, D.A., J.E. Blyth, R. McKee and A. Simon Gilburn. 2007. Change in the distribution of a member of the strand line community: the seaweed fly (Diptera: Coelopidae). Ecological Entomology 32: 741_746
Abundance	North-east Atlantic	Benthic	Leading edge	Temperature	1	1	1951	40	40	4	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	0	9	6	3	Southward, A. J. 1991. Forty years of changes in species composition and population density of barnacles on a rocky shore near Plymouth. Journal of the Marine Biological Association, UK 71:495-513
Abundance	North-east Atlantic	Benthic	Trailing edge	Temperature	1	1	1951	40	40	4	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	0	9	6	3	Southward, A. J. 1991. Forty years of changes in species composition and population density of barnacles on a rocky shore near Plymouth. Journal of the Marine Biological Association, UK 71:495-513
Abundance	North-east Atlantic	Benthic	Centre	Climate oscillation	100000	NA	1973	23	23	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	8	6	2	Hemery, G., F. D'Amico, I. Castege, B. Dupont, J. D'Elbee, Y. Lalanne and C. Mouches. 2008. Detecting the impact of oceano-climatic changes on marine ecosystems using a multivariate index: The case of the Bay of Biscay (North Atlantic-European Ocean).
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Benthic	Centre	Temperature	1	1	1981	24	25	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	Yes	1	5	4	1	Henderson, P., R. Seaby, and J. Somes. 2006. A 25-year study of climatic and density-dependent population regulation of common shrimp Crangon crangon (Crustacea: Caridea) in the Bristol Channel. Journal of the Marine Biological Association of the UK 86:28
Abundance	North-east Atlantic	BenthicCn	Centre	Temperature	100000	63	1958	46	2	3	Yes	Yes	No	No	Yes	3	No change	Yes	No	No	Yes	3	9	5	4	Simkanin, C., A. Power, A. Myers, D. McGrath, A. Southward, N. Mieszkowska, R. Leaper, and R. O'Riordan. 2005. Using historical data to detect temporal changes in the abundances of intertidal species on Irish shores. Journal of the Marine Biological Assoc
Abundance	North-east Atlantic	Larval bony fish	Leading edge	Temperature	1E+07	NA	1950	56	56	6	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	9	7	2	Lindley, J.A., R.R. Kirby, D.G. Johns and P.C. Reid. 2006. Exceptional abundance of the snake pipefish (Entelurus aequoreus) in the north-eastern Atlantic Ocean. ICES CM 2006/C:06
Abundance	North-east Atlantic	Larval bony fish	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	No	Yes	No	2	Consistent	Yes	Yes	No	Yes	5	12	7	5	Kirby, R.R., D.G. Johns and J.A. Lindley. 2006. Fathers in hot water: rising sea temperatures and a Northeastern Atlantic pipefish baby boom. Biology Letters 2: 597-600
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1E+08	NA	1958	45	45	6	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	10	8	2	Richardson, A.J. and D.S. Schoeman. 2004. Climate impacts on plankton ecosystems in the northeast Atlantic. Science 305:1609-1612
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1948	48	48	5	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	8	8	0	Reid, P.C., M. Edwards, H.G. Hunt and A.J. Warner. 1998. Phytoplankton change in the North Atlantic. Nature 391:546
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1948	48	48	5	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	8	8	0	Reid, P.C., M. Edwards, H.G. Hunt and A.J. Warner. 1998. Phytoplankton change in the North Atlantic. Nature 391:546
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1958	45	45	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Bonnet et al. 2005. An overview of Calanus helgolandicus ecology in European waters. Progress in Oceanography 65: 1-53
Abundance	North-east Atlantic	Plankton	Centre	Temperature	100000	NA	1946	60	60	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	Yes	1	10	7	3	Gibbons M., A.J. Richardson. 2009. Patterns of Jellyfish Abundance in the North Atlantic. Hydrobiologia 616: 51-65.
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1946	60	60	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	11	8	3	Gibbons M., A.J. Richardson. 2009. Patterns of Jellyfish Abundance in the North Atlantic. Hydrobiologia 616: 51-65.
Abundance	North-east Atlantic	Plankton	Centre	Temperature	1E+07	NA	1960	41	41	6	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	No	2	12	8	4	Beaugrand, G. and P.C. Reid. 2003. Long-term changes in phytoplankton, zooplankton and salmon related to climate. Global Change Biology 9:801-817
Abundance	North-east Atlantic	Plankton	Centre	Temperature	10000	NA	1958	45	45	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kamenos, N.A. 2010. North Atlantic summers have warmed more than winters since 1353, and the response of marine zooplankton. Proceedings of the National Academy of Science USA. 107: 22442-22447.
Abundance	North-east Atlantic	Plants	Centre	Temperature	10	1	1932	59	10	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	9	4	5	Glemarec, M., Y. Le Faou and F. Cuq. Long-term changes of seagrass beds in the Glenan Archipelago (South Brittany). Oceanologica Acta 20: 217-227
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000000	79	1987	20	17	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	11	6	5	Hermant, M., J. Lobry, S. Bonhommeau, J. Poulard and O. Le Pape. 2010. Impact of warming on abundance and occurrence of flatfish populations in the Bay of Biscay (France). Journal of Sea Research 64: 45-53
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000000	79	1987	20	17	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	11	6	5	Hermant, M., J. Lobry, S. Bonhommeau, J. Poulard and O. Le Pape. 2010. Impact of warming on abundance and occurrence of flatfish populations in the Bay of Biscay (France). Journal of Sea Research 64: 45-53

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Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000000	79	1987	20	17	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	11	6	5	Hermant, M., J. Lobry, S. Bonhommeau, J. Poulard and O. Le Pape. 2010. Impact of warming on abundance and occurrence of flatfish populations in the Bay of Biscay (France). Journal of Sea Research 64: 45-53
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Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	200	1985	20	20	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	No	2	6	4	2	Bjornsson, H. and O.K. Palsson. 2004. Distribution patterns and dynamics of fish stocks under recent climate change in Icelandic waters. ICES CM2004/K:30
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	200	1985	20	20	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	No	2	6	4	2	Bjornsson, H. and O.K. Palsson. 2004. Distribution patterns and dynamics of fish stocks under recent climate change in Icelandic waters. ICES CM2004/K:30
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Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	200	1985	20	20	3	No	Yes	No	No	No	1	No change	Yes	No	No	No	2	6	4	2	Bjornsson, H. and O.K. Palsson. 2004. Distribution patterns and dynamics of fish stocks under recent climate change in Icelandic waters. ICES CM2004/K:30
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	200	1985	20	20	3	No	Yes	No	No	No	1	Opposite to expected	Yes	No	No	No	2	6	4	2	Bjornsson, H. and O.K. Palsson. 2004. Distribution patterns and dynamics of fish stocks under recent climate change in Icelandic waters. ICES CM2004/K:30
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1973	30	12	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Blanchard, F. and F. Vandermeirsch. 2005 Warming and exponential abundance increase of the subtropical fish Capros aper in the Bay of Biscay (1973-2002). C.R. Biologies 328: 505-509
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000	1	1971	35	35	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000	1	1960	46	46	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	Yes	5	15	7	8	Bonhommeau, S., E. Chassot and E. Rivot. 2008. Fluctuations in European eel (Anguilla anguilla) recruitment resulting from environmental changes in the Sargasso Sea. Fisheries Oceanography 17: 32-44
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	45	1981	21	16	3	Yes	Yes	No	Yes	No	3	Consistent	No	Yes	No	No	2	8	6	2	Desaunay, Y, D. Guerault, O. Le Pape and J. Poulard. 2006. Changes in occurrence and abundance of northern/southern flatfishes over a 20-year period in a coastal nursery area (Bay of Vilaine) and on the eastern continental shelf of the Bay of Biscay. Scie
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	45	1981	21	16	3	Yes	Yes	No	Yes	No	3	Consistent	No	Yes	No	No	2	8	6	2	Desaunay, Y, D. Guerault, O. Le Pape and J. Poulard. 2006. Changes in occurrence and abundance of northern/southern flatfishes over a 20-year period in a coastal nursery area (Bay of Vilaine) and on the eastern continental shelf of the Bay of Biscay. Scie
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	45	1981	21	16	3	Yes	Yes	No	Yes	No	3	Consistent	No	Yes	No	No	2	8	6	2	Desaunay, Y, D. Guerault, O. Le Pape and J. Poulard. 2006. Changes in occurrence and abundance of northern/southern flatfishes over a 20-year period in a coastal nursery area (Bay of Vilaine) and on the eastern continental shelf of the Bay of Biscay. Scie
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000	45	1981	21	16	3	Yes	Yes	No	Yes	No	3	Consistent	No	Yes	No	No	2	8	6	2	Desaunay, Y, D. Guerault, O. Le Pape and J. Poulard. 2006. Changes in occurrence and abundance of northern/southern flatfishes over a 20-year period in a coastal nursery area (Bay of Vilaine) and on the eastern continental shelf of the Bay of Biscay. Scie
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000	1	1947	58	48	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	11	8	3	Friedland, K.D., M.J. Miller and B. Knights. 2007. Oceanic changes in the Sargasso Sea and declines in recruitment of the European eel. ICES Journal of Marine Science 64: 519-530
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	No change	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	No change	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65

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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	No change	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	Opposite to expected	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	22	22	2	No	Yes	Yes	Yes	Yes	5	Opposite to expected	Yes	Yes	No	No	4	11	4	7	Genner, M.J., D.W. Sims, V.J. Wearmouth, E.J. Southall, A.J. Southward, P.A. Henderson and S.J. Hawkins. 2004. Regional climatic warming drives long-term community change of British marine fish. Proceedings of the Royal Society of London Series B. 271: 65
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1906	95	59	4	No	Yes	Yes	No	No	3	No change	No	Yes	No	No	2	9	5	4	Guisande, C. A.R. Vergara, I. Riveiro and J.M. Cabanas. 2004. Climate change and abundance of the Atlantic-Iberian sardine (Sardina pilchardus). Fisheries Oceanography 13: 91-101
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	3	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Abundance	North-east Atlantic	Vertebrates	Centre	Climate oscillation	100000	NA	1976	27	27	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Hemery, G., F. D'Amico, I. Castege, B. Dupont, J. D'Elbee, Y. Lalanne and C. Mouches. 2008. Detecting the impact of oceano-climatic changes on marine ecosystems using a multivariate index: The case of the Bay of Biscay (North Atlantic-European Ocean).
Abundance	North-east Atlantic	Vertebrates	Centre	Climate oscillation	100000	NA	1973	23	23	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	8	6	2	Hemery, G., F. D'Amico, I. Castege, B. Dupont, J. D'Elbee, Y. Lalanne and C. Mouches. 2008. Detecting the impact of oceano-climatic changes on marine ecosystems using a multivariate index: The case of the Bay of Biscay (North Atlantic-European Ocean).
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Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
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Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	28	28	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	28	28	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	10	1960	35	35	5	No	Yes	Yes	Yes	No	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	7	8	Munilla, I., C. Diez and A. Velando. 2007. Are edge bird populations doomed to extinction? A retrospective analysis of the common guillemot collapse in Iberia. Biological Conservation 137:359-371.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1E+07	14	1960	41	41	6	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	No	2	12	8	4	Beaugrand, G. and P.C. Reid. 2003. Long-term changes in phytoplankton, zooplankton and salmon related to climate. Global Change Biology 9:801-817
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
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Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	10000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
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Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.

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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	No change	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Opposite to expected	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
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Abundance	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1970	29	29	4	No	Yes	Yes	Yes	Yes	5	Opposite to expected	No	No	No	Yes	1	10	6	4	Brunel T., Boucher J. 2007. Long-term trends in fish recruitment in the north-east Atlantic related to climate change. Fisheries Oceanography 16: 336-349.
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	10000	NA	1948	56	55	5	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	12	7	5	MacLeod, C.D., S.M. Bannon, G.J. Pierce, C. Schweder, J.A. Learmonth, J.S. Herman and R.J. Reid. 2005. Climate change and the cetacean community of north-west Scotland. Biological Conservation 124: 477:483
Abundance	North-east Atlantic	Vertebrates	Leading edge	Temperature	10000	NA	1948	56	55	5	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	12	7	5	MacLeod, C.D., S.M. Bannon, G.J. Pierce, C. Schweder, J.A. Learmonth, J.S. Herman and R.J. Reid. 2005. Climate change and the cetacean community of north-west Scotland. Biological Conservation 124: 477:483
Abundance	North-east Atlantic	Vertebrates	Trailing edge	Temperature	10000	NA	1948	56	55	5	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	12	7	5	MacLeod, C.D., S.M. Bannon, G.J. Pierce, C. Schweder, J.A. Learmonth, J.S. Herman and R.J. Reid. 2005. Climate change and the cetacean community of north-west Scotland. Biological Conservation 124: 477:483
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Abundance	North-east Pacific	Benthic	Trailing edge	Temperature	1	1	1931	66	7	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
Abundance	North-east Pacific	Benthic	Trailing edge	Temperature	1	1	1931	66	7	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
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Abundance	North-east Pacific	Benthic	Leading edge	Temperature	1	1	1931	66	7	2	Yes	Yes	No	No	Yes	3	Opposite to expected	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
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Abundance	North-east Pacific	BenthicCn	Trailing edge	Temperature	1	1	1931	66	7	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
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Abundance	North-east Pacific	Larval bony fish	Centre	Temperature	1000000	66	1951	52	40	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	6	16	7	9	Hsieh, C. H., C. Reiss, W. Watson, M. J. Allen, J. R. Hunter, R. N. Lea, R. H. Rosenblatt, P. E. Smith and G. Sugihara 2005.A comparison of long-term trends and variability in populations of larvae of exploited and unexploited fishes in the southern Calif
Abundance	North-east Pacific	Larval bony fish	Centre	Temperature	1000000	66	1951	52	40	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	6	16	7	9	Hsieh, C. H., C. Reiss, W. Watson, M. J. Allen, J. R. Hunter, R. N. Lea, R. H. Rosenblatt, P. E. Smith and G. Sugihara 2005.A comparison of long-term trends and variability in populations of larvae of exploited and unexploited fishes in the southern Calif
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Abundance	North-east Pacific	Vertebrates	Centre	Temperature	100	1	1972	23	23	3	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	No	2	7	5	2	Veit, R.R., J.A. McGowan, D.G. Ainley, T.R. Wahl and P. Pyle. 1997. Apex marine predator declines ninety percent in association with changing oceanic climate. Global Change Biology 3:23-28.
Abundance	North-east Pacific	Vertebrates	Centre	Temperature	100000	34	1983	25	25	3	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	6	6	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Abundance	North-west Atlantic	Benthic	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Benthic	Leading edge	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
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Abundance	North-west Atlantic	Benthic	Leading edge	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
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Abundance	North-west Atlantic	Benthic	Leading edge	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Plankton	Centre	Temperature	1000	3	1951	53	11	4	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	6	6	0	Costello, J.H, B.K. Sullivan and D.J. Gifford. 2006. A physical-biological interaction underlying variable phenological responses to climate change by coastal zooplankton. Journal of Plankton Research 28:1099-1105
Abundance	North-west Atlantic	Plankton	Centre	Temperature	1000000	NA	1960	43	32	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Reid, C. 2005. Atlantic wide regime shift? Globec International Newsletter October 2005
Abundance	North-west Atlantic	Plankton	Centre	Temperature	1000000	NA	1961	42	26	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Reid, C. 2005. Atlantic wide regime shift? Globec International Newsletter October 2005
Abundance	North-west Atlantic	Plants	Trailing edge	Temperature	1	1	1985	20	4	1	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	9	3	6	Micheli, F., M. J. Bishop, C. H. Peterson, and J. Rivera. 2008. Alteration of seagrass species composition and function over two decades. Ecological Monographs 78:225-244
Abundance	North-west Atlantic	Plants	Trailing edge	Temperature	1	1	1985	20	4	1	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	9	3	6	Micheli, F., M. J. Bishop, C. H. Peterson, and J. Rivera. 2008. Alteration of seagrass species composition and function over two decades. Ecological Monographs 78:225-244
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Abundance	North-west Atlantic	Plants	Leading edge	Temperature	1	1	1986	19	5	1	Yes	Yes	No	No	Yes	3	No change	Yes	Yes	No	Yes	5	9	3	6	Micheli, F., M. J. Bishop, C. H. Peterson, and J. Rivera. 2008. Alteration of seagrass species composition and function over two decades. Ecological Monographs 78:225-244
Abundance	North-west Atlantic	Squid	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Squid	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	1	1974	28	27	4	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	16	7	9	Bonhommeau, S., E. Chassot, B. Planque, E. Rivot, A.H. Knap and O. Le Pape. 2008. Impact of climate on eel populations of the Northern Hemisphere. Marine Ecology Progress Series 373: 71-80
Abundance	North-west Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1910	88	88	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	Yes	No	3	12	7	5	Friedland, K.D., D.G. Reddin, J.R. McMenemy and K.F. Drinkwater. 2003. Multidecadal trends in North American Atlantic salmon (Salmo salar) stocks and climate trends relevant to juvenile survival. Canadian Journal of Fisheries and Aquatic Sciences 60: 563-
Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
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Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Opposite to expected	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
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Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	1E+08	NA	1963	40	40	6	No	Yes	No	Yes	No	2	Consistent	No	Yes	No	Yes	3	11	8	3	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Abundance	North-west Atlantic	Vertebrates	Centre	Temperature	1E+08	NA	1963	40	40	6	No	Yes	No	Yes	No	2	Consistent	No	Yes	No	Yes	3	11	8	3	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Abundance	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	48	48	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
Abundance	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	48	48	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
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Abundance	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	48	48	5	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
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Abundance	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	48	48	5	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
Abundance	North-west Pacific	Vertebrates	Centre	Temperature	1000000	1	1965	37	36	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Bonhommeau, S., E. Chassot, B. Planque, E. Rivot, A.H. Knap and O. Le Pape. 2008. Impact of climate on eel populations of the Northern Hemisphere. Marine Ecology Progress Series 373: 71-80
Abundance	Pacific Ocean	Vertebrates	Centre	Temperature	1	1	1954	51	51	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	10	7	3	Chaloupka M., N. Kamezaki and C. Limpus. 2008. Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? Journal of Experimental Marine Biology and Ecology 356: 136-143
Abundance	Pacific Ocean	Vertebrates	Centre	Temperature	1	1	1977	28	38	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	9	6	3	Chaloupka M., N. Kamezaki and C. Limpus. 2008. Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? Journal of Experimental Marine Biology and Ecology 356: 136-143
Abundance	Pacific Ocean	Vertebrates	Centre	Temperature	1	1	1967	38	28	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	10	7	3	Chaloupka M., N. Kamezaki and C. Limpus. 2008. Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? Journal of Experimental Marine Biology and Ecology 356: 136-143

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Abundance	Pacific Ocean	Vertebrates	Centre	Temperature	1	2	1985	20	20	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	Yes	1	8	5	3	Chaloupka M., N. Kamezaki and C. Limpus. 2008. Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle? Journal of Experimental Marine Biology and Ecology 356: 136-143
Abundance	South Atlantic	Plankton	Centre	Temperature	1E+07	NA	1911	93	49	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	South Indian	Plankton	Centre	Temperature	1E+07	NA	1936	72	56	6	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	South Pacific	Plankton	Centre	Temperature	1E+07	NA	1956	52	46	6	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	13	9	4	Boyce DG, Lewis MR, Worm B. 2010. Global phytoplankton decline over the past century. Nature 466: 591-596.
Abundance	South west Indian Ocean	Vertebrates	Trailing edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Abundance	South west Indian Ocean	Vertebrates	Trailing edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
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Abundance	South west Indian Ocean	Vertebrates	Trailing edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94

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Abundance	South west Indian Ocean	Vertebrates	Trailing edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Abundance	South west Indian Ocean	Vertebrates	Leading edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Abundance	South west Indian Ocean	Vertebrates	Leading edge	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Abundance	SOUTHERN OCEAN	Plankton	Centre	Sea ice / snow	10000	NA	1976	21	12	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	No	4	10	4	6	Loeb, V., V. Siegel, O. Holm-Hansen, R. Hewitt, W. Fraser, W. Trivelpiece and S. Trivelpiece. 1997. Effects of sea-ice extent and krill or salp dominance on the Antarctic food web. Nature, 387: 897-900.
Abundance	Southern Ocean	Plankton	Centre	Sea ice / snow	10000	NA	1976	20	12	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	No	4	10	4	6	Loeb, V., V. Siegel, O. Holm-Hansen, R. Hewitt, W. Fraser, W. Trivelpiece and S. Trivelpiece. 1997. Effects of sea-ice extent and krill or salp dominance on the Antarctic food web. Nature, 387: 897-900.
Abundance	Southern Ocean	Plankton	Centre	Sea ice / snow	100000	NA	1978	29	18	3	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	Yes	No	5	11	6	5	Montes-Hugo, M., S.C. Doney, H.W. Ducklow, W. Fraser, D. Martinson, S.E. Stammerjohn, and O. Schofield. 2009. Recent changes in phytoplankton communities associated with rapid regional climate change along the western Antarctic Peninsula. Science 323: 147
Abundance	Southern Ocean	Plankton	Centre	Sea ice / snow	100000	NA	1978	29	18	3	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	Yes	No	5	11	6	5	Montes-Hugo, M., S.C. Doney, H.W. Ducklow, W. Fraser, D. Martinson, S.E. Stammerjohn, and O. Schofield. 2009. Recent changes in phytoplankton communities associated with rapid regional climate change along the western Antarctic Peninsula. Science 323: 147
Abundance	Southern Ocean	Plankton	Centre	Sea ice / snow	1000000	NA	1926	78	42	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	13	8	5	Atkinson, A., V. Siegel, E. Pakhomov and P. Rothery. 2004. Long-term decline in krill stock and increase in salps within the Southern Ocean. Nature 432: 100-103
Abundance	Southern Ocean	Plankton	Centre	Sea ice / snow	1000000	NA	1926	78	42	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	13	8	5	Atkinson, A., V. Siegel, E. Pakhomov and P. Rothery. 2004. Long-term decline in krill stock and increase in salps within the Southern Ocean. Nature 432: 100-103
Abundance	Southern Ocean	Plankton	Centre	Temperature	100000	189	1926	80	9	3	No	Yes	No	No	No	1	No change	No	No	No	No	0	4	4	0	Ward, P., M.P. Meredith, M.J. Whitehouse and P. Rothery. 2008. The summertime plankton community at South Georgia (Southern Ocean): Comparing the historical (1926/1927) and modern (post 1995) records. Progress in Oceanography 78: 241-256
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1971	25	5	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1960	40	25	4	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	8	6	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1965	31	7	3	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	7	5	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1972	28	12	3	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	7	5	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1952	48	40	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1964	37	37	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1956	41	33	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1961	39	29	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1976	26	14	3	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	7	5	2	Weimerskirch, H., P. Inchausti, C. Guinet and C. Barbraud. 2003. Trends in bird and seal populations as indicators of a system shift in the Southern Ocean. Antarctic Science 15:249-256.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	208	1978	27	26	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	13	7	6	Forcada, J., P.N. Trathan, K. Reid, E.J. Murphy and J.P. Croxall. 2006. Contrasting population changes in sympatric penguin species in association with climate warming. Global Change Biology 12:411-423
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	10	260	1978	27	26	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	13	7	6	Forcada, J., P.N. Trathan, K. Reid, E.J. Murphy and J.P. Croxall. 2006. Contrasting population changes in sympatric penguin species in association with climate warming. Global Change Biology 12:411-423

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Abundance	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	286	1978	27	26	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	13	7	6	Forcada, J., P.N. Trathan, K. Reid, E.J. Murphy and J.P. Croxall. 2006. Contrasting population changes in sympatric penguin species in association with climate warming. Global Change Biology 12:411-423
Abundance	Southern Ocean	Vertebrates	Leading edge	Sea ice / snow	10	1	1959	39	39	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Croxall, J.P., P.N. Trathan, and E.J. Murphy. 2002. Environmental change and Antarctic seabird populations. Science 297: 1510-1514.
Abundance	Southern Ocean	Vertebrates	Trailing edge	Sea ice / snow	10	1	1978	22	22	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Croxall, J.P., P.N. Trathan, and E.J. Murphy. 2002. Environmental change and Antarctic seabird populations. Science 297: 1510-1514.
Abundance	Southern Ocean	Vertebrates	Trailing edge	Sea ice / snow	10	1	1976	21	14	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Croxall, J.P., P.N. Trathan, and E.J. Murphy. 2002. Environmental change and Antarctic seabird populations. Science 297: 1510-1514.
Abundance	Southern Ocean	Vertebrates	Trailing edge	Sea ice / snow	10	1	1978	22	22	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Croxall, J.P., P.N. Trathan, and E.J. Murphy. 2002. Environmental change and Antarctic seabird populations. Science 297: 1510-1514.
Abundance	Southern Ocean	Vertebrates	Centre	Sea ice / snow	1	1	1984	20	20	2	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	11	4	7	Jenouvrier, S., C. Barbraud and H. Weimerskirch. 2006. Sea ice affects the population dynamics of Adelie penguins in Terre Adelie. Polar Biology 29:413-423.
Abundance	Southern Ocean	Vertebrates	Centre	Sea ice / snow	1	1	1963	40	40	4	No	Yes	Yes	No	No	3	Consistent	No	No	No	No	0	7	5	2	Jenouvrier, S., H. Weimerskirch, C. Barbraud, Y.-H. Park and B. Cazelles. 2005. Evidence of a shift in the cyclicity of Antarctic seabird dynamics linked to climate. Proceedings of the Royal Society B 272:887-895.
Abundance	Southern Ocean	Vertebrates	Centre	Sea ice / snow	1	1	1963	40	40	4	No	Yes	Yes	No	No	3	No change	No	No	No	No	0	7	5	2	Jenouvrier, S., H. Weimerskirch, C. Barbraud, Y.-H. Park and B. Cazelles. 2005. Evidence of a shift in the cyclicity of Antarctic seabird dynamics linked to climate. Proceedings of the Royal Society B 272:887-895.
Abundance	Southern Ocean	Vertebrates	Centre	Sea ice / snow	1	1	1962	40	40	4	No	Yes	Yes	No	No	3	Consistent	No	No	No	No	0	7	5	2	Jenouvrier, S., H. Weimerskirch, C. Barbraud, Y.-H. Park and B. Cazelles. 2005. Evidence of a shift in the cyclicity of Antarctic seabird dynamics linked to climate. Proceedings of the Royal Society B 272:887-895.
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	Yes	5	12	5	7	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189

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Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	No	4	11	5	6	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	Southern Ocean	Vertebrates	Centre	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	12	5	7	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Abundance	South-west Pacific	Vertebrates	Centre	Temperature	10	3	1936	58	27	5	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	Yes	3	12	7	5	Peacock, L., M. Paulin and J. Darby. 2000. Investigations into climate influence on population dynamics of yellow-eyed penguins Megadyptes antipodes. New Zealand Journal of Zoology 27:317-325.
Abundance	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Abundance	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Calcification	Arabian Sea	Plankton	Centre	pH (CO_2, aragonite or calcite sat states)	1	1	1890	106	105	4	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	Yes	Yes	6	12	5	7	de Moel, H., G.M. Ganssen, F.J.C. Peeters, S.J.A. Jung, D. Kroon, G.J.A. Brummer and R.E. Zeebe. 2009. Planktic foraminiferal shell thinning in the Arabian Sea due to anthropogenic ocean acidification? Biogeosciences 6: 1917-1925
Calcification	Caribbean	BenthicCn	Centre	Temperature	1	1	1860	148	54	4	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	No	Yes	5	13	7	6	Carilli J.E., Norris R.D., Black B., Walsh S.M., McField M. 2010. Century-scale records of coral growth rates indicate that local stressors reduce coral thermal tolerance threshold. Global Change Biology 16: 1247-1257.
Calcification	Caribbean	BenthicCn	Centre	Temperature	1	1	1860	148	54	4	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	No	Yes	5	13	7	6	Carilli J.E., Norris R.D., Black B., Walsh S.M., McField M. 2010. Century-scale records of coral growth rates indicate that local stressors reduce coral thermal tolerance threshold. Global Change Biology 16: 1247-1257.
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Calcification	Caribbean	BenthicCn	Centre	Temperature	1E+08	15	1974	32	22	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Edmunds P.J. 2007. Evidence for a decadal-scale decline in the growth rates of juvenile scleractinian corals. Marine Ecology Progress Series 341: 1-13.
Calcification	Indian Ocean	BenthicCn	Centre	Temperature	1000	8	1984	22	6	2	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	No	Yes	5	11	4	7	Tanzil, J.T.I., Brown, B.E., Tudhope, A.W., Dunne, R.P. Decline in skeletal growth of the coral Porites lutea from the Andaman Sea, South Thailand between 1984 and 2005. Coral Reefs 28: 519-528.
Calcification	Indian Ocean	BenthicCn	Centre	Temperature	1000	8	1984	22	6	2	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	No	Yes	5	11	4	7	Tanzil, J.T.I., Brown, B.E., Tudhope, A.W., Dunne, R.P. Decline in skeletal growth of the coral Porites lutea from the Andaman Sea, South Thailand between 1984 and 2005. Coral Reefs 28: 519-528.
Calcification	Indian Ocean	BenthicCn	Centre	Temperature	1000	8	1984	22	6	2	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	No	Yes	5	11	4	7	Tanzil, J.T.I., Brown, B.E., Tudhope, A.W., Dunne, R.P. Decline in skeletal growth of the coral Porites lutea from the Andaman Sea, South Thailand between 1984 and 2005. Coral Reefs 28: 519-528.
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Calcification	North Atlantic	BenthicCn	Leading edge	Temperature	100	7	1937	60	60	5	Yes	Yes	Yes	No	No	4	No change	Yes	Yes	Yes	Yes	6	15	7	8	Helmle, K.P., Dodge, R.E., Swart, P.K., Gledhill, D.K., Eakin, C.M. (2011) Growth rates of Florida corals from 1937 to 1996 and their response to climate change. Nature Communications 2: 215
Calcification	North Atlantic	Plankton	Centre	pH (CO2, aragonite or calcite sat states)	1	1	1789	216	216	4	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	Yes	No	5	13	6	7	Iglesias-Rodriguez, M.D., P.R. Halloran, R.E.M. Rickaby, I.R. Hall, E. Colmenero-Hidalgo, J.R. Gittins, D.R.H. Green, T. Tyrrell, S.J. Gibbs, P. von Dassow, W. Rehm, W.V. Armbrust and K.P. Boessenkool. 2008. Phytoplankton calcification in a high-CO2 world
Calcification	North Atlantic	Plankton	Centre	pH (CO2, aragonite or calcite sat states)	1	1	1789	216	216	4	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	Yes	4	9	5	4	Halloran, P.R., I.R. Hall E. Colmenero-Hidalgo and R.E.M. Rickaby. 2008. Evidence for a multi-species coccolith volume change over the past two centuries: understanding a potential ocean acidification response. Biogeosciences 5:1651-1655
Calcification	North Atlantic	Plankton	Centre	pH (CO2, aragonite or calcite sat states)	1	1	1789	216	216	4	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	Yes	4	9	5	4	Halloran, P.R., I.R. Hall E. Colmenero-Hidalgo and R.E.M. Rickaby. 2008. Evidence for a multi-species coccolith volume change over the past two centuries: understanding a potential ocean acidification response. Biogeosciences 5:1651-1655
Calcification	Pacific Ocean	BenthicCn	Centre	pH (CO2, aragonite or calcite sat states)	10	6	1974	33	33	5	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	Yes	3	10	7	3	Manzello, D.P. 2010. Coral growth with thermal stress and ocean acidification: lessons from the eastern tropical Pacific. Coral Reefs 29:749-758
Calcification	Pacific Ocean	BenthicCn	Centre	pH (CO2, aragonite or calcite sat states)	10	4	1974	33	33	5	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	Yes	3	10	7	3	Manzello, D.P. 2010. Coral growth with thermal stress and ocean acidification: lessons from the eastern tropical Pacific. Coral Reefs 29:749-758
Calcification	Pacific Ocean	BenthicCn	Centre	Temperature	10	5	1979	28	28	4	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	Yes	3	9	6	3	Manzello, D.P. 2010. Coral growth with thermal stress and ocean acidification: lessons from the eastern tropical Pacific. Coral Reefs 29:749-758
Calcification	Pacific Ocean	BenthicCn	Centre	Temperature	10	5	1979	28	28	4	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	Yes	3	9	6	3	Manzello, D.P. 2010. Coral growth with thermal stress and ocean acidification: lessons from the eastern tropical Pacific. Coral Reefs 29:749-758
Calcification	Pacific Ocean	BenthicCn	Centre	Temperature	10	2	1983	24	24	3	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	Yes	3	8	5	3	Manzello, D.P. 2010. Coral growth with thermal stress and ocean acidification: lessons from the eastern tropical Pacific. Coral Reefs 29:749-758
Calcification	Red Sea & Gulf of Aden	BenthicCn	Centre	Temperature	1	1	1930	81	81	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	Yes	Yes	6	15	7	8	Cantin, N.E.,A.L. Cohen, K.B. Karnauskas, A.M. Tarrant and D.C. McCorkle. 2010. Ocean warming slows coral growth in the Red Sea. Science 329: 322-325.
Calcification	Southern Ocean	Plankton	Centre	pH (CO2, aragonite or calcite sat states)	1000000	13	-49000	51005	2	3	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	Yes	Yes	6	12	6	6	Moy, A.D., Howard, W.R., Bray, S.G. and T.W. Trull. 2009. Reduced calcification in modern Southern Ocean planktonic foraminifera. Nature Geoscience 2:276-280.
Calcification	South-west Pacific	BenthicCn	Centre	Temperature	10000	69	1900	106	106	5	Yes	Yes	No	No	No	2	Consistent	No	Yes	Yes	Yes	4	11	7	4	De'ath, G., J. M. Lough and K.E. Fabricius. 2009. Declining coral calcification on the Great Barrier Reef. Science 323: 116-119
Calcification	Tasman Sea	BenthicCn	Centre	Temperature	1	1	1650	343	343	4	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	7	5	2	Thresher, R., S.R. Rintoul J.A. Koslow, C. Weidman, J. Adkins and C. Proctor. 2004. Oceanic evidence of climate change in southern Australia over the last three centuries. Geophysical Research Letters 31 doi:10.1029/2003GL018869
Community change	Arctic Ocean	Benthic	Centre	Temperature	1000	22	1908	100	3	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	7	5	2	Berge J, Renaud PE, Eiane K, Gulliksen B, Cottier FR, Varpe ė, Brattegard T. 2009. Changes in the decapod fauna of an Arctic fjord during the last 100 years (1908_2007). Polar Biology 32:953-961
Community change	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Community change	Gulf of Mexico	Vertebrates	Centre	Temperature	1000	18	1971	36	11	4	Yes	Yes	No	Yes	No	3	Consistent	Yes	No	No	Yes	3	10	7	3	Fodrie, F.J., K.L. Heck, S.P. Powers, W.M. Graham and K.L. Robinson. 2010. Climate-related, decadal-scale assemblage changes of seagrass-associated fishes in the northern Gulf of Mexico. Global Change Biology 16: 48-59
Community change	Gulf of St Lawrence	Vertebrates	Centre	Temperature	100000	NA	1971	35	35	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	No	No	Yes	3	12	6	6	Benoit, H.P. and D.P. Swain. 2008. Impacts of environmental change and direct and indirect harvesting effects on the dynamics of a marine fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 2088-2104
Community change	Irish Sea	Vertebrates	Centre	Temperature	1	1	1981	25	25	2	No	Yes	Yes	No	No	3	Consistent	No	No	No	Yes	1	6	3	3	Henderson, P.A. 2007. Discrete and continuous change in the fish community of the Bristol Channel in response to climate change. Journal of the Marine Biological Association of the United Kingdom 87:589-598
Community change	North Sea	Benthic	Centre	Temperature	1000000	NA	1958	48	48	5	No	Yes	No	Yes	Yes	3	Consistent	No	No	No	Yes	1	9	7	2	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561
Community change	North Sea	Plankton	Centre	Temperature	1000000	NA	1949	57	57	5	No	Yes	No	Yes	Yes	3	Consistent	No	No	No	Yes	1	9	7	2	Kirby, R.R., G. Beaugrand and J.A. Lindley. 2009. Synergistic effects of climate and fishin in a marine ecosystem. Ecosystems 12:548-561

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Community change	North Sea	Plankton	Centre	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310
Community change	North Sea	Plankton	Centre	Temperature	1E+08	NA	1958	48	48	6	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	14	9	5	Beaugrand, G., M. Edwards, K. Brander, C. Luczak and F. Ibanez. 2008. Causes and projections of abrupt climate-driven ecosystem shifts in the North Atlantic. Ecology Letters 11: 1157-1168
Community change	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	42	42	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G. Long-term changes in copepod abundance and diversity in the north-east Atlantic in relation to fluctuations in the hydroclimatic environment. 2003. Fisheries Oceanography 12: 270-283
Community change	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	47	47	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Kirby, R.R. and G. Beaugrand. 2009. Trophic amplification of climate warming. Proceedings of the Royal Society of London Series B: Biological Sciences 276: 4095-4103
Community change	North Sea	Vertebrates	Centre	Temperature	1000000	300	1985	22	22	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	13	6	7	Hiddink, J.G. and R. ter Hofstede. 2008. Climate induced increases in species richness of marine fishes. Global Change Biology 14: 453-460
Community change	North-east Atlantic	Benthic	Centre	Temperature	1	2	-10000	12001	2	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Warwick R.M., S.M. Turk SM. 2002 Predicting climate change, effects on marine biodiversity: comparison of recent and fossil molluscan death assemblages. Journal of the Marine Biological Association of the United Kingdom, 82:847-850.
Community change	North-east Atlantic	Benthic	Centre	Temperature	1	1	1980	27	20	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	9	4	5	Hawkins, S. J., P. J. Moore, M. T. Burrows, E. Poloczanska, N. Mieszkowska, R. J. H. Herbert, S. R. Jenkins, R. C. Thompson, M. J. Genner, and A. J. Southward. 2008. Complex interactions in a rapidly changing world: responses of rocky shore communities to
Community change	North-east Atlantic	Benthic	Centre	Temperature	1	1	1983	24	16	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	9	4	5	Hawkins, S. J., P. J. Moore, M. T. Burrows, E. Poloczanska, N. Mieszkowska, R. J. H. Herbert, S. R. Jenkins, R. C. Thompson, M. J. Genner, and A. J. Southward. 2008. Complex interactions in a rapidly changing world: responses of rocky shore communities to
Community change	North-east Atlantic	Benthic	Centre	Temperature	1	1	1983	24	15	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	No	5	9	4	5	Hawkins, S. J., P. J. Moore, M. T. Burrows, E. Poloczanska, N. Mieszkowska, R. J. H. Herbert, S. R. Jenkins, R. C. Thompson, M. J. Genner, and A. J. Southward. 2008. Complex interactions in a rapidly changing world: responses of rocky shore communities to
Community change	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1981	28	28	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Henderson, P. and D. Bird. 2010. Fish and macro-crustacean communities and their dynamics in the Severn Estuary. Marine Pollution Bulletin 61: 100-114.
Community change	North-east Pacific	Benthic	Leading edge	Temperature	1	1	1970	33	2	2	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	Yes	3	7	4	3	Smith, J. R., P. Fong, and R. F. Ambrose. 2006. Dramatic declines in mussel bed community diversity: Response to climate change? Ecology 87:1153-1161.
Community change	North-east Pacific	Benthic	Trailing edge	Temperature	10000	10	1970	33	2	3	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	Yes	3	8	5	3	Smith, J. R., P. Fong, and R. F. Ambrose. 2006. Dramatic declines in mussel bed community diversity: Response to climate change? Ecology 87:1153-1161.
Community change	North-east Pacific	Benthic	Trailing edge	Temperature	10000	11	1970	33	2	3	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	Yes	3	8	5	3	Smith, J. R., P. Fong, and R. F. Ambrose. 2006. Dramatic declines in mussel bed community diversity: Response to climate change? Ecology 87:1153-1161.
Community change	North-east Pacific	Plankton	Centre	Temperature	10	1	1975	33	31	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Community change	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1975	33	31	5	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	7	7	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	6	16	7	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	8	7	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365

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Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	No	Yes	Yes	Yes	Yes	5	Consistent	Yes	Yes	Yes	Yes	6	16	7	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Community change	South west Indian Ocean	Vertebrates	Centre	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Community change	South west Indian Ocean	Vertebrates	Centre	Temperature	10	2	1989	19	15	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	Yes	Yes	6	11	5	6	Lloyd, P., S. Weeks, M. Magno-Canto, G. Plaganyi and E. Plaganyi. 2010 Ocean warming alters species abundance patterns and increases species richness in an African sub-tropical reef-fish community. Fisheries Oceanography 21: 78-94
Demography	Arctic Ocean	Benthic	Leading edge	Sea ice / snow	1	1	1969	33	33	4	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	Yes	6	13	5	8	Sejr M.K., M.E. Blicher and S. Rysgaard. 2009. Sea ice cover affects inter-annual and geographic variation in growth of the Arctic cockle Clinocardium ciliatum (Bivalvia) in Greenland. Marine Ecology Progress Series 389:149-158
Demography	Arctic Ocean	Benthic	Leading edge	Sea ice / snow	1	1	1967	32	32	4	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	Yes	6	13	5	8	Sejr M.K., M.E. Blicher and S. Rysgaard. 2009. Sea ice cover affects inter-annual and geographic variation in growth of the Arctic cockle Clinocardium ciliatum (Bivalvia) in Greenland. Marine Ecology Progress Series 389:149-158
Demography	Arctic Ocean	Benthic	Trailing edge	Sea ice / snow	1	1	1982	22	22	2	No	Yes	Yes	No	No	3	No change	Yes	Yes	Yes	Yes	6	11	3	8	Sejr M.K., M.E. Blicher and S. Rysgaard. 2009. Sea ice cover affects inter-annual and geographic variation in growth of the Arctic cockle Clinocardium ciliatum (Bivalvia) in Greenland. Marine Ecology Progress Series 389:149-158
Demography	Arctic Ocean	Benthic	Trailing edge	Sea ice / snow	1	1	1983	25	25	2	No	Yes	Yes	No	No	3	No change	Yes	Yes	Yes	No	5	10	3	7	Sejr M.K., M.E. Blicher and S. Rysgaard. 2009. Sea ice cover affects inter-annual and geographic variation in growth of the Arctic cockle Clinocardium ciliatum (Bivalvia) in Greenland. Marine Ecology Progress Series 389:149-158
Demography	Indian Ocean	Benthic	Centre	Temperature	1000	4	1974	32	32	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	12	8	4	Caputi, N., R. Melville-Smith, S. de Lestang, A. Pearce, and M. Feng. 2010. The effect of climate change on the western rock lobster (Panulirus cygnus) fishery of Western Australia. Canadian Journal of Fisheries and Aquatic Sciences 67:85-96.
Demography	Indian Ocean	Vertebrates	Centre	Temperature	10	1	1983	24	24	3	Yes	Yes	Yes	No	Yes	5	No change	No	No	No	Yes	1	9	5	4	Rivalan, P., C. Barbraud, P. Inchausti and H. Weimerskirch. 2010. Combined impacts of longline fisheries and climate on the persistence of the Amsterdam Albatross Diomedia amsterdamensis. Ibis 152:6-18.
Demography	Irish Sea	Vertebrates	Centre	Temperature	100000	14	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Demography	Irish Sea	Vertebrates	Centre	Temperature	10	2	1985	21	21	3	Yes	Yes	Yes	Yes	Yes	6	Consistent	No	No	No	Yes	1	10	6	4	Votier, S.C., T.R. Birkhead, D. Oro, M. Trinder, M.J. Grantham, J.A. Clark, R.H. McCleery and B.J. Hatchwell. 2008. Recruitment and survival of immature seabirds in relation to oil spills and climate variability. Journal of Animal Ecology 77:974-983.
Demography	Irish Sea	Vertebrates	Centre	Temperature	1	2	1965	44	11	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	Yes	Yes	4	12	6	6	Riou, S., C.M. Gray, M. de L. Brooke, P. Quillfeldt, J.F. Masello, C. Perrins, K.C. Hamer. 2011. Recent impact of anthropogenic climate change on a higher marine predator in western Britain. Marine Ecology Progress Series. 422: 105-112
Demography	Mediterranean Sea	Benthic	Centre	Temperature	100	3	1970	37	4	3	No	Yes	Yes	No	No	3	Consistent	No	Yes	Yes	No	3	9	4	5	Staehli, A., R. Schaerer, K. Hoelzle and G. Ribi. 2008. Temperature induced disease in the starfish Astropecten jonstoni. Journal of the Marine Biological Association 2 - Biodiversity Records
Demography	Mediterranean Sea	Plants	Centre	Temperature	1000	15	1967	26	26	4	No	Yes	Yes	No	Yes	4	Consistent	No	No	No	Yes	1	9	5	4	Marba, N., and C.M. Duarte. 1997. Interannual changes in seagrass (Posedonia oceanica) growth and environmental change in the Spanish Mediterranean littoral zone. Limnology and Oceanography. 42(5): 800-810.
Demography	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100	6	1984	19	19	3	No	Yes	Yes	No	No	3	Consistent	No	Yes	Yes	No	3	9	4	5	Mazaris, A. D., A. S. Kallimanis, S. P. Sgardelis, and J. D. Pantis. 2008. Do long-term changes in sea surface temperature at the breeding areas affect the breeding dates and reproduction performance of Mediterranean loggerhead turtles? Implications for c
Demography	North Sea	Benthic	Centre	Temperature	100	13	1973	29	29	4	Yes	Yes	Yes	No	No	4	Consistent	No	Yes	No	Yes	3	11	6	5	Philippart, C. J. M., H. M. van Aken, J. J. Beukema, O. G. Bos, G. C. Cadee, and R. Dekker. 2003. Climate-related changes in recruitment of the bivalve Macoma balthica. Limnology and Oceanography 48:2171-2185.
Demography	North Sea	Plankton	Centre	Temperature	1000000	NA	1958	43	43	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Beaugrand, G., K.M. Brander, J.A. Lindley, S. Soussi and P.C. Reid. 2003. Plankton effect on cod recruitment in the North Sea. Nature 426:661-664
Demography	North Sea	Vertebrates	Centre	Temperature	100000	1	1970	35	35	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	Yes	No	5	14	7	7	Teal, L.R., J.J. de Leeuw, H.W. van der Veer and A.D. Rijnsdorp. 2008. Effects of climate change on growth of 0-group sole and plaice. Marine Ecology Progress Series 358:219-230
Demography	North Sea	Vertebrates	Centre	Temperature	100000	1	1970	35	35	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	Yes	No	5	14	7	7	Teal, L.R., J.J. de Leeuw, H.W. van der Veer and A.D. Rijnsdorp. 2008. Effects of climate change on growth of 0-group sole and plaice. Marine Ecology Progress Series 358:219-230
Demography	North Sea	Vertebrates	Centre	Temperature	10000	8	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.

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Demography	North Sea	Vertebrates	Centre	Temperature	10000	6	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Demography	North Sea	Vertebrates	Centre	Temperature	10000	7	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Demography	North Sea	Vertebrates	Centre	Temperature	10000	5	1986	19	19	3	No	Yes	Yes	No	No	3	Opposite to expected	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Demography	North Sea	Vertebrates	Centre	Climate oscillation	1	1	1958	48	45	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	12	7	5	Lewis, S., D.A. Elston, F. Daunt, B. Cheney and P.M. Thompson. 2009. Effects of extrinsic and intrinsic factors on breeding success in a long lived seabird. Oikos 118:521.528.
Demography	North-east Atlantic	Vertebrates	Centre	Temperature	100000	3	1986	19	19	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Frederiksen, M., M. Edwards, R.A. Mavor and S. Wanless. 2007. Regional and annual variation in black-legged kittiwake breeding productivity is related to sea surface temperature. Marine Ecology Progress Series 350:137-143.
Demography	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1971	37	37	5	Yes	Yes	No	Yes	No	3	Opposite to expected	No	No	No	No	0	8	8	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Trailing edge	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1972	26	25	3	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	5	5	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1969	28	28	4	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	6	6	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-east Pacific	Vertebrates	Centre	Climate oscillation	10	1	1969	28	28	4	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	6	6	0	Sydeman, W.J., M.M. Hester, J.A. Thayer, F. Gress, P. Martin and J. Buffa. 2001. Climate change, reproductive performance and diet composition of marine birds in the southern California Current system, 1969-1997. Progress in Oceanography 49:309-329.
Demography	North-west Atlantic	Benthic	Leading edge	Temperature	10	4	1979	24	24	3	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	7	5	2	Keser, M., J.T. Swenarton and J.F. Foertch. 2005. Effects of thermal input and climate change on growth of Ascophyllum nodosum (Fucales, Phaeophyceae) in eastern Long Island Sound (USA). Journal of Sea Research 54:211-220

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Demography	North-west Atlantic	Vertebrates	Leading edge	Temperature	100	4	1981	25	26	4	No	Yes	Yes	No	No	3	Consistent	No	Yes	Yes	No	3	10	5	5	Hawkes, L., M. A. C. Broderick, M. H. Godfrey, and B. J. Godley. 2007. Investigating the potential impacts of climate change on a marine turtle population. Global Change Biology 13:923-932.
Demography	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Demography	North-west Atlantic	Vertebrates	Centre	Temperature	10	2	1959	47	47	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Collie, J.S, Wood A.D. and Jeffries H.P. 2008 Long-term shifts in the species composition of a coastal fish community. Canadian Journal of Fisheries and Aquatic Sciences. 65: 1352-1365
Demography	North-west Pacific	Vertebrates	Centre	Temperature	10	1	1975	27	14	3	No	Yes	Yes	Yes	No	4	Consistent	No	Yes	No	No	2	9	5	4	Gjerdum, C., A.M.J. Valle_e, C.C. St. Clair, D.F. Bertram, J.L. Hyder and G.S. Blackburn. 2003. Tufted puffin reproduction reveals ocean climate variability. Proceedings of the National Academy of Science 100: 9377-9382
Demography	Pacific Ocean	BenthicCn	Centre	Temperature	1E+08	10	1979	21	31	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	No	No	No	2	10	8	2	Hoegh-Guldberg, O. (1999) Climate Change, coral bleaching and the world's coral reefs. Marine and Freshwater Research 50: 839-866. and the future of the worldês coral reefs
Demography	Pacific Ocean	BenthicCn	Centre	Temperature	1E+08	NA	1870	121	121	6	Yes	Yes	No	Yes	No	3	Consistent	No	Yes	Yes	Yes	4	13	9	4	Glynn, P.W. (1993) Coral reef bleaching: ecological perspectives. Coral Reefs 12: 1-17.
Demography	Southern Ocean	Benthic	Centre	Temperature	1000	7	1985	19	19	3	Yes	No	No	Yes	No	2	Consistent	No	No	No	Yes	1	6	5	1	Barnes, D.K.A., K. Webb and K. Linse. 2006. Slow growth of Antarctic Bryozoans increases over 20 years and is anomalously high in 2003. Marine Ecology Progress Series 314:187-195
Demography	Southern Ocean	Vertebrates	Centre	Temperature	10	1	1952	49	41	5	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2001. Emperor penguins and climate change. Nature 411:183-186.
Demography	South-west Pacific	BenthicCn	Centre	Temperature	1000000	NA	1980	21	7	2	No	Yes	No	Yes	No	2	Consistent	No	No	No	No	0	4	4	0	Bellwood, D.R., T.P. Hughes, C. Folke and M. Nystrom. (2004) Confronting the coral reef crisis. Nature 429: 827-833.
Demography	Tasman Sea	Vertebrates	Leading edge	Temperature	10	5	1952	43	43	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	6	9	Neuheimer, A.B., Thresher, R.E., Lyle, J.M. and Semmens, J.M. (2011) Tolerance limit for fish growth exceeded by warming waters. Nature Climate Change 1: 110-113
Demography	Tasman Sea	Vertebrates	Leading edge	Temperature	10	5	1924	75	75	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	6	9	Neuheimer, A.B., Thresher, R.E., Lyle, J.M. and Semmens, J.M. (2011) Tolerance limit for fish growth exceeded by warming waters. Nature Climate Change 1: 110-113
Demography	Tasman Sea	Vertebrates	Leading edge	Temperature	10	5	1910	91	91	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	6	9	Neuheimer, A.B., Thresher, R.E., Lyle, J.M. and Semmens, J.M. (2011) Tolerance limit for fish growth exceeded by warming waters. Nature Climate Change 1: 110-113
Demography	Tasman Sea	Vertebrates	Leading edge	Temperature	10	5	1910	91	91	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	6	9	Neuheimer, A.B., Thresher, R.E., Lyle, J.M. and Semmens, J.M. (2011) Tolerance limit for fish growth exceeded by warming waters. Nature Climate Change 1: 110-113
Demography	Tasman Sea	Vertebrates	Centre	Temperature	10	5	1932	69	69	5	No	Yes	Yes	No	Yes	4	Consistent	Yes	Yes	Yes	Yes	6	15	6	9	Neuheimer, A.B., Thresher, R.E., Lyle, J.M. and Semmens, J.M. (2011) Tolerance limit for fish growth exceeded by warming waters. Nature Climate Change 1: 110-113
Distribution	Bass Strait	Benthic	Leading edge	Temperature	1000	6	1960	46	5	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	Yes	6	12	4	8	Ling, S. D., C. R. Johnson, K. Ridgway, A. J. Hobday, and M. Haddon. 2009. Climate-driven range extension of a sea urchin: inferring future trends by analysis of recent population dynamics. Global Change Biology 15:719-731.
Distribution	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Bass Strait	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Beaufort Sea	Vertebrates	Trailing edge	Sea ice / snow	100000	NA	1985	20	18	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	9	4	5	Fischbach, A.S., S.C. Amstrup and D.C. Douglas. 2007. Landward and eastward shift of Alaskan polar bear denning associated with recent sea ice changes. Polar Biology 30:1395-1405
Distribution	Bering Sea	Benthic	Trailing edge	Temperature	100000	405	1975	27	27	4	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	11	5	6	Orensanz J., B. Ernst, D.A. Armstrong, P. Stabeno and P. Livingston 2004. Contraction of the geographic range of distribution of snow crab (Chionoecetes opilio) in the eastern Bering Sea: An environmental ratchet? CalCOFI Report 45: 65-79.
Distribution	Bering Sea	Benthic	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302

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Distribution	Bering Sea	Benthic	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Leading edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Benthic	Trailing edge	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	100000	405	1978	25	25	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Orensanz J., B. Ernst, D.A. Armstrong, P. Stabeno and P. Livingston 2004. Contraction of the geographic range of distribution of snow crab (Chionoecetes opilio) in the eastern Bering Sea: An environmental ratchet? CalCOFI Report 45: 65-79.
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	No	Yes	No	No	No	1	No change	Yes	No	No	Yes	3	7	4	3	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	No	Yes	No	No	No	1	No change	Yes	No	No	Yes	3	7	4	3	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	No	Yes	Yes	Yes	No	4	Consistent	Yes	No	No	Yes	3	10	5	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302

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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
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Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	Bering Sea	Vertebrates	Centre	Temperature	1000000	405	1982	25	25	3	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	11	6	5	Mueter, F.J. and M.A. Litzow. 2008. Sea ice retreat alters the biogeography of the bering sea continental shelf. Ecological Applications 18: 309-302
Distribution	California Current	Squid	Leading edge	Temperature	1000000	8	1985	22	22	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Field, J.C., K. Baltz, A.J. Phillips and W.A. Walker. 2007. Range expansion and trophic interactions of the Jumbo Squid Dosidicus gigas, in the Californian Current. Californian Cooperative Oceanic Fisheries Investigations Reports 48:131-146
Distribution	Chukchi Sea	Benthic	Leading edge	Temperature	10000	20	1933	72	9	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Sirenko B.I. and S.Y. Gagaev. 2007. Unusual abundance of macrobenthos and biological invasions in the Chucki Sea. Russian Journal of Marine Biology 33: 355-364.
Distribution	Chukchi Sea	Benthic	Leading edge	Temperature	10000	20	1933	72	9	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Sirenko B.I. and S.Y. Gagaev. 2007. Unusual abundance of macrobenthos and biological invasions in the Chucki Sea. Russian Journal of Marine Biology 33: 355-364.
Distribution	Chukchi Sea	Benthic	Leading edge	Temperature	10000	20	1933	72	9	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Sirenko B.I. and S.Y. Gagaev. 2007. Unusual abundance of macrobenthos and biological invasions in the Chucki Sea. Russian Journal of Marine Biology 33: 355-364.
Distribution	East China Sea	Benthic	Leading edge	Temperature	100000	27	1959	47	3	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	6	4	2	Ma, Z., Z. Xu and J. Zhou. 2009. Effect of global warming on the distribution of Lucifer intermedius and L. hanseni (Decapoda) in the Changjiang estuary. Progress in Natural Science 19: 1389-1395
Distribution	East China Sea	Benthic	Leading edge	Temperature	100000	27	1959	47	3	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	6	4	2	Ma, Z., Z. Xu and J. Zhou. 2009. Effect of global warming on the distribution of Lucifer intermedius and L. hanseni (Decapoda) in the Changjiang estuary. Progress in Natural Science 19: 1389-1395
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	51	1964	38	5	3	No	No	No	No	No	0	Consistent	No	Yes	No	Yes	3	6	3	3	Herbert, R. J. H., S. J. Hawkins, M. Sheader, and A. J. Southward. 2003. Range extension and reproduction of the barnacle Balanus perforatus in the eastern English Channel. Journal of the Marine Biological Association of the United Kingdom 83:73-82.
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	51	1964	38	3	3	No	No	No	No	No	0	Consistent	No	Yes	No	Yes	3	6	3	3	Herbert, R. J. H., S. J. Hawkins, M. Sheader, and A. J. Southward. 2003. Range extension and reproduction of the barnacle Balanus perforatus in the eastern English Channel. Journal of the Marine Biological Association of the United Kingdom 83:73-82.
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	31	1955	50	12	4	No	No	No	No	No	0	Consistent	Yes	Yes	No	Yes	5	9	4	5	Herbert, R. J. H., A. J. Southward, M. Sheader, and S. J. Hawkins 2007 Influence of recruitment and temperature on the distribution of intertidal barnacles in the English Channel. Journal of the Marine Biological Association of the United Kingdom 87: 487-
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	31	1955	47	4	3	No	No	No	No	No	0	Consistent	Yes	Yes	No	Yes	5	8	3	5	Herbert, R. J. H., A. J. Southward, M. Sheader, and S. J. Hawkins 2007 Influence of recruitment and temperature on the distribution of intertidal barnacles in the English Channel. Journal of the Marine Biological Association of the United Kingdom 87: 487-
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	400	1936	68	8	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	9	4	5	Mieszkowska, N., M.A. Kendall, S.J. Hawkins, R. Leaper, P. Williamson, N.J. Hardman-Mountford and A.J. Southward. 2006. Changes in the range of some common rocky shore species in Britain - a response to climate change? Hydrobiologia 555:241-251.
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	400	1952	52	8	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Mieszkowska, N., M.A. Kendall, S.J. Hawkins, R. Leaper, P. Williamson, N.J. Hardman-Mountford and A.J. Southward. 2006. Changes in the range of some common rocky shore species in Britain - a response to climate change? Hydrobiologia 555:241-251.
Distribution	English Channel	Benthic	Leading edge	Temperature	100000	400	1954	50	5	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	9	4	5	Mieszkowska, N., M.A. Kendall, S.J. Hawkins, R. Leaper, P. Williamson, N.J. Hardman-Mountford and A.J. Southward. 2006. Changes in the range of some common rocky shore species in Britain - a response to climate change? Hydrobiologia 555:241-251.

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Distribution	English Channel	Benthic	Leading edge	Temperature	100000	400	1936	68	7	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	9	4	5	Mieszkowska, N., M.A. Kendall, S.J. Hawkins, R. Leaper, P. Williamson, N.J. Hardman-Mountford and A.J. Southward. 2006. Changes in the range of some common rocky shore species in Britain - a response to climate change? Hydrobiologia 555:241-251.
Distribution	English Channel	Benthic	Leading edge	Temperature	100	51	1958	49	2	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Hinz, H., E. Capasso, M. Lilley, M. Frost, and S. R. Jenkins.2011. Temporal differences across a bio-geographical boundary reveal slow response of sub-littoral benthos to climate change. Marine Ecology Progress Series 423: 69-82
Distribution	English Channel	Benthic	Trailing edge	Temperature	100	51	1958	49	2	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Hinz, H., E. Capasso, M. Lilley, M. Frost, and S. R. Jenkins.2011. Temporal differences across a bio-geographical boundary reveal slow response of sub-littoral benthos to climate change. Marine Ecology Progress Series 423: 69-82
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Distribution	English Channel	Benthic	Centre	Temperature	100	51	1958	49	2	3	No	Yes	No	No	No	1	No change	Yes	Yes	Yes	Yes	6	10	4	6	Hinz, H., E. Capasso, M. Lilley, M. Frost, and S. R. Jenkins.2011. Temporal differences across a bio-geographical boundary reveal slow response of sub-littoral benthos to climate change. Marine Ecology Progress Series 423: 69-82
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Distribution	English Channel	BenthicCn	Leading edge	Temperature	100	51	1958	49	2	3	No	Yes	No	No	No	1	No change	Yes	Yes	Yes	Yes	6	10	4	6	Hinz, H., E. Capasso, M. Lilley, M. Frost, and S. R. Jenkins.2011. Temporal differences across a bio-geographical boundary reveal slow response of sub-littoral benthos to climate change. Marine Ecology Progress Series 423: 69-82
Distribution	Hudson Bay	Vertebrates	Leading edge	Sea ice / snow	1E+07	NA	1903	103	37	6	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	15	8	7	Higdon, J.W. and S. H. Ferguson. 2009. Loss of Arctic sea ice causing punctuated change in the sightings of killer whales (Orcinus orca) over the past century. Ecological Applications 19: 1365-1375
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
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Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Opposite to expected	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
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Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press

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Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
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Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
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Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Opposite to expected	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Opposite to expected	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	Indian Ocean	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Japan Sea	BenthicCn	Leading edge	Temperature	1000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
Distribution	Japan Sea	BenthicCn	Leading edge	Temperature	1000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
Distribution	Japan Sea	BenthicCn	Leading edge	Temperature	1000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
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Distribution	Japan Sea	BenthicCn	Leading edge	Temperature	1000	4	1931	80	36	5	No	Yes	No	No	No	1	No change	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
Distribution	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	No change	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Distribution	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	No change	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Distribution	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	No change	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Distribution	Mediterranean Sea	Plankton	Centre	Temperature	100000	3	1908	98	12	4	No	Yes	No	No	No	1	Opposite to expected	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99

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Distribution	Mediterranean Sea	Plankton	Centre	Temperature	100000	3	1908	98	12	4	No	Yes	No	No	No	1	Opposite to expected	No	No	No	No	0	5	5	0	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Distribution	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100	2	1983	19	1	2	No	Yes	No	No	No	1	Consistent	Yes	No	No	No	2	5	3	2	Azzurro, E. 2008. The advance of thermophilic fishes in the Mediterranean Sea: overview and methodological questions. Climate Warming and Related Changes in Mediterranean Marine Biota. Helgoland May 2008. CIESM F. Briand Ed. 152 pages Monaco
Distribution	Mediterranean Sea	Vertebrates	Leading edge	Temperature	10000	NA	1870	140	18	4	No	Yes	No	No	No	1	Consistent	No	No	No	Yes	1	6	5	1	Francour, P., J.M. Cottalorda, M. Aubert, S. Bava, M. Colombey, P. Gilles, H. Kara, P. Lelong, L. Mangialajo, R. Miniconi and J-P. Quignard 2010 Recent occurrences of Opah, Lampris Guttatus (Actinopterygii, Lampriformes, Lampridae) in the Western Mediterr
Distribution	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100000	NA	1982	22	22	3	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	No	Yes	5	12	5	7	Tsikliras, A.C. 2008. Climate-related geographic shift and sudden population increase of a small pelagic fish (Sardinella aurita) in the estern Mediterranean Sea. Marine Biology Research 4: 477-481
Distribution	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100000	NA	1950	55	15	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	14	7	7	Sabates, A., P. Martin, J. Lloret and V. Raya. 2006. Sea warming and fish distribution: the case of the small pelagic fish, Sardinella aurita, in the western Mediterranean. Global Change Biology. 12: 2209-2219
Distribution	Mediterranean Sea	Vertebrates	Leading edge	Temperature	1E+07	NA	1900	107	37	6	No	Yes	No	Yes	No	2	Consistent	Yes	No	No	Yes	3	11	8	3	Ben Rais Lasram, F. and D. Mouillot. 2009. Increasing southern invasion enhances congruence between endemic and exotic Mediterranean fish fauna. Biological Invasions 11:697-711
Distribution	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Distribution	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Distribution	North Sea	Benthic	Centre	Temperature	100	15	1973	30	2	2	Yes	Yes	No	No	Yes	3	Consistent	Yes	Yes	No	Yes	5	10	4	6	Beukema, J.J. and R. Dekker. 2005. Decline of recruitment success in cockles and other bivalves in the Wadden Sea: possible role of climate change, predation on postlarvae and fisheries. Marine Ecology Progress Series 287: 149-167
Distribution	North Sea	Benthic	Leading edge	Temperature	100000	400	1952	52	19	4	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	11	5	6	Mieszkowska, N., M.A. Kendall, S.J. Hawkins, R. Leaper, P. Williamson, N.J. Hardman-Mountford and A.J. Southward. 2006. Changes in the range of some common rocky shore species in Britain - a response to climate change? Hydrobiologia 555:241-251.
Distribution	North Sea	Plankton	Leading edge	Temperature	1000000	NA	1948	57	57	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Johns, D.G., M. Edwards, W. Greve and A.W.G.S. John. 2005. Increasing prevalence of the marine cladoceran Penilia avirostris (Dana, 1852) in the North Sea. Helgolands Marine Research 59: 214-218
Distribution	North Sea	Plankton	Leading edge	Temperature	100000	NA	1958	45	45	5	No	Yes	No	Yes	No	2	Consistent	No	Yes	No	Yes	3	10	7	3	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Distribution	North Sea	Plankton	Leading edge	Temperature	100000	NA	1981	22	22	3	No	Yes	No	Yes	No	2	No change	No	Yes	No	Yes	3	8	5	3	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Distribution	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	No	Yes	No	Yes	No	2	No change	No	Yes	No	Yes	3	10	7	3	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Distribution	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	No	Yes	No	Yes	No	2	No change	No	Yes	No	Yes	3	10	7	3	Edwards, M., D.G. Johns, S.C. Leterme, E. Svendsen and A.J. Richardson. 2006. Regional climate change and harmful algal blooms in the northeast Atlantic. Limnology and Oceanography 51: 820-829
Distribution	North Sea	Vertebrates	Leading edge	Temperature	100000	100	1969	40	40	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	13	8	5	van Hal, R., K. Smits and A.D. Rijnsdorp 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research 64: 76-84.
Distribution	North Sea	Vertebrates	Leading edge	Temperature	100000	100	1969	40	40	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	No	No	Yes	3	13	8	5	van Hal, R., K. Smits and A.D. Rijnsdorp 2010. How climate warming impacts the distribution and abundance of two small flatfish species in the North Sea. Journal of Sea Research 64: 76-84.
Distribution	North Sea	Vertebrates	Leading edge	Temperature	1000000	84	1980	25	25	3	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	No	Yes	5	12	6	6	Dulvy, N.K. , S.I. Rogers, S. Jennings, V. Stelzenmuller, S.R. Dye and H.R. Skjoldal. 2008. Climate change and deepening of the North Sea fish assemblage: a biotic indicator of warming seas. Journal of Applied Ecology 45:1029-1039.
Distribution	North Sea	Vertebrates	Trailing edge	Temperature	1000000	84	1980	25	25	3	Yes	Yes	No	Yes	Yes	4	Consistent	Yes	Yes	No	Yes	5	12	6	6	Dulvy, N.K. , S.I. Rogers, S. Jennings, V. Stelzenmuller, S.R. Dye and H.R. Skjoldal. 2008. Climate change and deepening of the North Sea fish assemblage: a biotic indicator of warming seas. Journal of Applied Ecology 45:1029-1039.

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Distribution	North Sea	Vertebrates	Centre	Temperature	1000000	NA	1977	25	24	3	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	Yes	3	11	6	5	Perry, A. L., P. J. Low, J. R. Ellis and J. D. Reynolds. 2005. Climate change and distribution shifts in marine fishes. Science. 308: 1912:1915
Distribution	North Sea	Vertebrates	Centre	Temperature	1000000	NA	1977	25	24	3	No	Yes	Yes	Yes	No	4	Opposite to expected	Yes	No	No	Yes	3	10	5	5	Perry, A. L., P. J. Low, J. R. Ellis and J. D. Reynolds. 2005. Climate change and distribution shifts in marine fishes. Science. 308: 1912:1915
Distribution	North Sea	Vertebrates	Leading edge	Temperature	1000000	NA	1923	85	75	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Engelhard, G.H. Pinnegar, J.K., Kell, L.T., Rijnsdorp, A.D. 2011. Nine decades of North Sea sole and plaice distribution. ICES J. Mar. Sci. 68(6): 1090-1104.
Distribution	North Sea	Vertebrates	Leading edge	Temperature	1000000	NA	1913	95	77	5	Yes	Yes	Yes	Yes	Yes	6	Consistent	Yes	Yes	Yes	Yes	6	17	8	9	Engelhard, G.H. Pinnegar, J.K., Kell, L.T., Rijnsdorp, A.D. 2011. Nine decades of North Sea sole and plaice distribution. ICES J. Mar. Sci. 68(6): 1090-1104.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	50	1972	35	4	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Wethey, D. S. and S. A. Woodin. 2008. Ecological hindcasting of biogeographic responses to climate change in the European intertidal zone. Hydrobiologia 606:139-151.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	50	1972	35	2	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Wethey, D. S. and S. A. Woodin. 2008. Ecological hindcasting of biogeographic responses to climate change in the European intertidal zone. Hydrobiologia 606:139-151.
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	10000	50	1923	84	5	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Wethey, D. S. and S. A. Woodin. 2008. Ecological hindcasting of biogeographic responses to climate change in the European intertidal zone. Hydrobiologia 606:139-151.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
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Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.

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Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	10000	9	1960	47	10	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Lima, F. P., P. A. Ribeiro, N. Queiroz, S. J. Hawkins, and A. M. Santos. 2007. Do distributional shifts of northern and southern species of algae match the warming pattern? Global Change Biology 13: 2592-2605.
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	1000	12	1955	51	1	3	No	Yes	No	No	Yes	2	Consistent	No	No	No	Yes	1	6	4	2	Lima, F. P., N. Queiroz, P. A. Ribeiro, S. J. Hawkins, and A. M. Santos. 2006. Recent changes in the distribution of a marine gastropod, Patella rustica Linnaeus, 1758, and their relationship to unusual climatic events. Journal of Biogeography 33:812-822
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	1000	12	1955	51	1	3	No	Yes	No	No	Yes	2	Consistent	No	No	No	Yes	1	6	4	2	Lima, F. P., N. Queiroz, P. A. Ribeiro, S. J. Hawkins, and A. M. Santos. 2006. Recent changes in the distribution of a marine gastropod, Patella rustica Linnaeus, 1758, and their relationship to unusual climatic events. Journal of Biogeography 33:812-822
Distribution	North-east Atlantic	Benthic	Trailing edge	Temperature	1000	NA	1960	48	3	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	No	4	8	4	4	Beukema, J.J., Dekker, R., Jansen, J.M. 2009. Some like it cold: populations of the tellinid bivalve Macoma balthica (L.) suffer in various ways from a warming climate. Marine Ecology Progress Series 384: 135_145
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	1000000	118	1967	39	7	3	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	No	4	10	6	4	Edward, D.A., J.E. Blyth, R. McKee and A. Simon Gilburn. 2007. Change in the distribution of a member of the strand line community: the seaweed fly (Diptera: Coelopidae). Ecological Entomology 32: 741_746
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	1000	100	1963	42	5	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	No	4	8	4	4	Mieszkowska, N., S. J. Hawkins, M. T. Burrows, and M. A. Kendall. 2007. Long-term changes in the geographic distribution and population structures of Osilinus lineatus (Gastropoda : Trochidae) in Britain and Ireland. Journal of the Marine Biological Assoc
Distribution	North-east Atlantic	Benthic	Leading edge	Temperature	1000	100	1971	33	5	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	No	4	8	4	4	Mieszkowska, N., S. J. Hawkins, M. T. Burrows, and M. A. Kendall. 2007. Long-term changes in the geographic distribution and population structures of Osilinus lineatus (Gastropoda : Trochidae) in Britain and Ireland. Journal of the Marine Biological Assoc
Distribution	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1958	45	45	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Bonnet et al. 2005. An overview of Calanus helgolandicus ecology in European waters. Progress in Oceanography 65: 1-53
Distribution	North-east Atlantic	Plankton	Centre	Temperature	1000000	NA	1958	45	45	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Bonnet et al. 2005. An overview of Calanus helgolandicus ecology in European waters. Progress in Oceanography 65: 1-53
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1000000	NA	1978	23	23	3	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	Yes	1	8	5	3	Lindley JA, Daykin S. 2005. Variations in the distributions of Centropages chierchiae and Temora stylifera (Copepoda: Calanoida) in the north-eastern Atlantic Ocean and western European shelf waters. ICES Journal of Marine Science 62: 869-877.
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1000000	NA	1978	23	23	3	No	Yes	Yes	Yes	No	4	Consistent	No	No	No	Yes	1	8	5	3	Lindley JA, Daykin S. 2005. Variations in the distributions of Centropages chierchiae and Temora stylifera (Copepoda: Calanoida) in the north-eastern Atlantic Ocean and western European shelf waters. ICES Journal of Marine Science 62: 869-877.
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1000000	NA	1958	47	47	5	No	Yes	No	No	No	1	Consistent	No	Yes	Yes	Yes	4	10	6	4	Hays, G.C., A.J. Richardson and C. Robinson. 2005. Climate change and marine plankton. Trends in Ecology and Evolution 20: 337-344
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Trailing edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Trailing edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Trailing edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Leading edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Plankton	Trailing edge	Temperature	1E+08	NA	1958	48	48	6	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	No	Yes	5	13	7	6	Beaugrand, G., C. Luczak and M. Edwards. 2009. Rapid biogeographical plankton shifts in the North Atlantic Ocean. Global Change Biology 15: 1790-1803
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1966	30	23	3	No	No	No	No	No	0	Consistent	No	No	No	No	0	3	3	0	Swaby, S.E. and G.W. Potts 1999. The sailfin dory, a first British record. Journal of Fish Biology 54: 1338-1340
Distribution	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1967	39	10	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	No	2	10	6	4	Dufour, F., H. Arrizabalaga, X. Irigoien and J. Santiago. 2010. Climate impacts on albacore and bluefin tunas migrations phenology and spatial distribution. Progress in Oceanography 86: 283-290
Distribution	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Opposite to expected	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Trailing edge	Temperature	1000	NA	1980	22	9	2	No	Yes	No	No	No	1	Opposite to expected	Yes	Yes	Yes	No	5	8	3	5	Brander, K., G. Blom, M.F. Borges, K. Erzini, G. Henderson, B.R. McKenzie, H. Mendes, J. Ribeiro, A.M.P. Santos and R. Toresen. 2003. Changes in fish distribution in the eastern North Atlantic: Are we seeing a coherent response to a changing temperature?
Distribution	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1980	24	24	3	No	Yes	Yes	Yes	No	4	Consistent	Yes	No	No	No	2	9	5	4	Wynn, R.B., S.A. Josey, A.P. Martin, D.G. Johns and P. Ye ?sou. 2007. Climate-driven range expansion of a critically endangered top predator in northeast Atlantic waters. Biology Letters 3: 529-532
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1966	30	19	3	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	4	4	0	Quero, J. 1998. Changes in the Euro-Atlantic fish species composition resulting from fishing and ocean warming. Italian Journal of Zoology 65:493-499

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1963	33	11	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Quero, J. 1998. Changes in the Euro-Atlantic fish species composition resulting from fishing and ocean warming. Italian Journal of Zoology 65:493-499
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1960	36	36	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Quero, J. 1998. Changes in the Euro-Atlantic fish species composition resulting from fishing and ocean warming. Italian Journal of Zoology 65:493-499
Distribution	North-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1960	36	36	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Quero, J. 1998. Changes in the Euro-Atlantic fish species composition resulting from fishing and ocean warming. Italian Journal of Zoology 65:493-499
Distribution	North-east Pacific	Benthic	Centre	Temperature	1	1	1978	32	32	4	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	No	Yes	5	13	6	7	Harley, C.D.G. and R.T. Paine. 2009 Contingencies and compounded rare perturbations dictate sudden distributional shifts during periods of gradual climate change. Proceedings of the National Academy of Science of the United States of America 106: 11172-11
Distribution	North-east Pacific	Benthic	Leading edge	Temperature	1000	NA	1970	27	4	2	No	Yes	No	No	Yes	2	Consistent	No	Yes	No	Yes	3	7	3	4	Dawson, M. N., R. K. Grosberg, Y. E. Stuart, and E. Sanford. 2010. Population genetic analysis of a recent range expansion: mechanisms regulating the poleward range limit in the volcano barnacle Tetraclita rubescens. Molecular Ecology 19:1585-1605
Distribution	North-east Pacific	Benthic	Leading edge	Temperature	100	11	1966	31	9	3	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
Distribution	North-east Pacific	Benthic	Leading edge	Temperature	100	2	1954	40	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	Yes	Yes	Yes	6	11	4	7	Sagarin, R. D., J. P. Barry, S. E. Gilman, and C. H. Baxter. 1999. Climate-related change in an intertidal community over short and long time scales. Ecological Monographs 69:465-490
Distribution	North-west Atlantic	Plankton	Leading edge	Sea ice / snow	1E+07	NA	1962	43	30	6	No	Yes	No	No	No	1	Consistent	No	Yes	No	Yes	3	10	7	3	Reid, P.C., D.G. Johns, M. Edwards, M. Starr, M. Poulin and P. Snoeijs. 2007. A biological consequence of reducing Artic ice cover: arrival of the Pacific diatom Neodenticula seminae in the North Atlantic for the first time in 800 000 years. Global Change
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
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Distribution	North-west Atlantic	Vertebrates	Trailing edge	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Consistent	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
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Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1968	40	40	5	Yes	Yes	No	Yes	No	3	Opposite to expected	Yes	Yes	No	Yes	5	13	8	5	Nye, J.A., J.S. Link, J.A. Hare and W.J. Overholtz. 2009. Changing spatial distribution of fish stocks in relation to climate and population size on the Northeast United States continental shelf. Marine Ecology Progress Series. 393: 111-129
Distribution	North-west Pacific	BenthicCn	Leading edge	Temperature	10000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
Distribution	North-west Pacific	BenthicCn	Leading edge	Temperature	10000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641
Distribution	North-west Pacific	BenthicCn	Leading edge	Temperature	10000	4	1931	80	36	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	Yes	5	11	6	5	Yamano, H. K. Sugihara and K. Nomura. 2011. Rapid poleward range expansion of tropical reef corals in response to rising sea surface temperatures. Geophysical Research Letters 38: L04641

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Distribution	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	52	52	5	Yes	Yes	Yes	No	No	4	Consistent	No	Yes	Yes	Yes	4	13	7	6	Hsieh, C., C.S., Reiss, R.P. Hewitt and G. Sugihara. 2008. Spatial analysis shows that fishing enhances the climatic sensitivity of marine fishes. Canadian Journal of Fisheries and Aquatic Sciences 65: 947-961
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Distribution	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	52	52	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
Distribution	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	52	52	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
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Distribution	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	52	52	5	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
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Distribution	North-west Pacific	Larval bony fish	Centre	Temperature	1000000	54	1951	52	52	5	Yes	Yes	Yes	Yes	No	5	No change	Yes	Yes	No	Yes	5	15	8	7	Hsieh, C., H.J. Kim, W. Watson, E. Di Lorenzo and G. Sugihara. 2009. Climate-driven changes in abundance and distribution of larvae of oceanic fishes in the southern Californian region. Global Change Biology 15: 2137-2152
Distribution	South-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1970	37	2	3	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	6	4	2	Crawford, R.J.M., A.J. Tree, P.A. Whittington, J. Visagie, L. Upfold, K.J. Roxburg, A.P. Martin, and B.M. Dyer. 2008. Recent distributional changes of seabirds in South Africa: is climate having an impact? African Journal of Marine Science 30: 189-193.
Distribution	South-east Atlantic	Vertebrates	Leading edge	Temperature	1000000	NA	1987	20	2	2	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	5	3	2	Crawford, R.J.M., A.J. Tree, P.A. Whittington, J. Visagie, L. Upfold, K.J. Roxburg, A.P. Martin, and B.M. Dyer. 2008. Recent distributional changes of seabirds in South Africa: is climate having an impact? African Journal of Marine Science 30: 189-193.
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1962	39	2	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1975	26	2	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	9	4	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1947	54	2	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1949	52	2	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1958	43	2	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1962	39	2	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1975	26	2	2	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	9	4	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1947	54	2	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1962	39	2	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
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Distribution	South-east Pacific	Benthic	Leading edge	Temperature	100000	53	1949	52	2	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	Yes	No	Yes	5	10	5	5	Rivadeneira, M.M. and Fernandez, M. 2005 Shifts in southern endpoints of distribution in rocky intertidal species along the south-eastern Pacific coast. Journal of Biogeography 32: 203-209
Distribution	SOUTHERN OCEAN	Plankton	Leading edge	Temperature	100000	NA	1983	24	9	2	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	3	3	0	Cubillos, J.C., S.W. Wright, G. Nash, M.F. de Salas, B. Griffiths, B. Tilbrook., A. Poisson and G.M. Hallegraeff. 2007. Calcification morphotypes of the coccolithophorid Emiliania huxleyi in the Southern Ocean: changes in 2001 to 2006 compared to histori

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Distribution	Southern Ocean	Vertebrates	Trailing edge	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	No	4	8	4	4	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
Distribution	Southern Ocean	Vertebrates	Trailing edge	Temperature	1000000	NA	1981	27	8	2	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	No	4	8	4	4	Peron, C., M. Authier, C. Barbraud, K. Delord, D. Besson and H. Weimerskirch. 2010. Interdecadal changes in at-sea distribution and abundance of subantarctic seabirds along a latitudinal gradient in the Southern Indian Ocean. Global Change Biology 16: 189
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Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
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Distribution	South-west Pacific	Benthic	Leading edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	Consistent	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
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Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Opposite to expected	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
Distribution	South-west Pacific	Benthic	Trailing edge	Temperature	1000	500	1951	50	2	3	No	Yes	No	No	No	1	Consistent	Yes	No	No	Yes	3	7	4	3	Wernberg T., Russell, B., Thomsen M., Gurgel, F., Bradshaw C, Poloczanska E and Connell S 2011 Seaweed communities in retreat from global warming. Current Biology In press
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Distribution	South-west Pacific	BenthicCn	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	BenthicCn	Trailing edge	Temperature	1000	22	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	Yes	No	Yes	5	10	5	5	Poloczanska, E.S., Smith, S., Fauconnet, L., Healy, J., Tibbetts, I., Burrows, M.T. and Richardson, A.J. 2011. Little change in the distribution of rocky shore faunal communities on the East Australian coast after 50 years of rapid warming. Journal of Exp
Distribution	South-west Pacific	Plants	Centre	Sea level rise	1000	1	1961	44	6	3	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	7	5	2	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position. Environmental Monitoring and Assessment 124:105-130
Distribution	South-west Pacific	Plants	Centre	Sea level rise	100	1	1961	44	7	3	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	Yes	Yes	6	13	5	8	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position Environmental Monitoring and Assessment 124:105-130
Distribution	South-west Pacific	Plants	Centre	Sea level rise	100	1	1961	44	8	3	Yes	Yes	Yes	No	No	4	Consistent	Yes	Yes	Yes	Yes	6	13	5	8	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position Environmental Monitoring and Assessment 124:105-130
Distribution	South-west Pacific	Plants	Centre	Sea level rise	1000	1	1961	44	6	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position Environmental Monitoring and Assessment 124:105-130
Distribution	South-west Pacific	Plants	Centre	Sea level rise	100	1	1961	44	7	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position Environmental Monitoring and Assessment 124:105-130
Distribution	South-west Pacific	Plants	Centre	Sea level rise	100	1	1961	44	8	3	No	Yes	No	No	No	1	Consistent	Yes	Yes	Yes	Yes	6	10	4	6	Gilman, E., Ellison, J. And Coleman, R. 2007 Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position Environmental Monitoring and Assessment 124:105-130
Distribution	Tasman Sea	Benthic	Leading edge	Temperature	1000	12	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	Yes	3	8	5	3	Pitt N, Poloczanska E.S. and Hobday A.J. 2010 Climate-driven range changes in Tasmanian intertidal fauna. Marine and Freshwater Research 61: 963-970
Distribution	Tasman Sea	Benthic	Leading edge	Temperature	1000	12	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	Yes	3	8	5	3	Pitt N, Poloczanska E.S. and Hobday A.J. 2010 Climate-driven range changes in Tasmanian intertidal fauna. Marine and Freshwater Research 61: 963-970

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Distribution	Tasman Sea	Benthic	Leading edge	Temperature	1000	12	1955	54	4	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	Yes	3	8	5	3	Pitt N, Poloczanska E.S. and Hobday A.J. 2010 Climate-driven range changes in Tasmanian intertidal fauna. Marine and Freshwater Research 61: 963-970
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Distribution	Tasman Sea	Benthic	Leading edge	Temperature	1000	12	1955	54	4	3	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	Yes	3	8	5	3	Pitt N, Poloczanska E.S. and Hobday A.J. 2010 Climate-driven range changes in Tasmanian intertidal fauna. Marine and Freshwater Research 61: 963-970
Distribution	Tasman Sea	Plankton	Leading edge	Temperature	10000	NA	1950	56	27	5	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	6	6	0	Hallegraeff G., W. Hosja, R. Knuckey and C. Wilkinson 2008. Recent range expansion of the red-tide dinoflagellate Noctiluca scintillans in Australian coastal waters. IOC-UNESCO Algae Newsletter 38:10-11.
Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	Consistent	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	No change	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	No change	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	No change	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
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Distribution	Tasman Sea	Vertebrates	Centre	Temperature	1000000	NA	1880	131	2	3	No	Yes	No	No	Yes	2	No change	Yes	No	No	Yes	3	8	4	4	Last, P.R., W.T. White, D.C. Gledhill, A.J. Hobday, R. Brown, G.J. Edgar and G. Pecl. 2010. Long-term shifts in abundance and distribution of a temperate fish fauna: a response to climate change and fishing practices. Global Ecology and Biogeography.
Phenology	Baltic Sea	Vertebrates	Centre	Temperature	1000000	4	1951	48	25	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Ahas, R. and A. Aasa 2006. The effects of climate change on the phenology of selected Estonian plant, bird and fish populations. International Journal of Biometeorology 51:17:26
Phenology	Bass Strait	Vertebrates	Centre	Temperature	1	1	1968	31	31	4	Yes	Yes	Yes	No	No	4	Opposite to expected	No	No	No	No	0	8	6	2	Chambers, L.E. 2004. Delayed breeding in Little Penguins-- evidence of climate change? Australian Meteorological Magazine 53: 13-19.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	21	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	22	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	21	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	24	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	22	4	Yes	Yes	Yes	Yes	No	5	Opposite to expected	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	21	4	Yes	Yes	Yes	Yes	No	5	Opposite to expected	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.

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Phenology	Bering Sea	Vertebrates	Centre	Temperature	10	1	1975	31	21	4	Yes	Yes	Yes	Yes	No	5	Opposite to expected	No	No	No	No	0	9	7	2	Byrd, G.V., W.J. Sydeman, H.M. Renner, and S. Minobe. 2008. Responses of piscivorous seabirds at the Pribilof Islands to ocean climate. Deep-Sea Research II 55: 1856-1867.
Phenology	Greenland Sea	Vertebrates	Centre	Temperature	100	1	1963	46	18	4	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	Yes	Yes	6	15	7	8	Moe, B., L. Stempniewicz, D. Jakubas, F. Angelier, O. Chastel, F. Dinessen, G.W. Gabrielsen, F. Hanssen, N.J. Karnovsky, B. Ronning, J. Welcker, K. Wojczulanis-Jakubas and C. Bech. Climate change and phenological responses of two seabird species breeding
Phenology	Greenland Sea	Vertebrates	Centre	Temperature	100	2	1970	39	18	4	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	Yes	Yes	Yes	6	15	7	8	Moe, B., L. Stempniewicz, D. Jakubas, F. Angelier, O. Chastel, F. Dinessen, G.W. Gabrielsen, F. Hanssen, N.J. Karnovsky, B. Ronning, J. Welcker, K. Wojczulanis-Jakubas and C. Bech. Climate change and phenological responses of two seabird species breeding
Phenology	Hudson Bay	Vertebrates	Trailing edge	Temperature	10	1	1984	20	20	3	No	Yes	Yes	Yes	Yes	5	Consistent	No	No	No	No	0	8	5	3	Gaston, A.J., H.G. Gilchrist and J.M. Hipfner. 2005. Climate change, ice conditions and reproduction in an Arctic nesting marine bird: Brunnich's guillemot (Uria lomvia L.). Journal of Animal Ecology 74:832-841.
Phenology	Irish Sea	Vertebrates	Centre	Temperature	10	3	1973	36	23	4	Yes	Yes	Yes	Yes	Yes	6	Opposite to expected	No	No	No	Yes	1	11	7	4	Votier, S.C., B.J. Hatchwell, M. Mears and T.R. Birkhead. 2009. Changes in the timing of egg-laying of a colonial seabird in relation to population size and environmental conditions. Marine Ecology Progress Series 393:225-233.
Phenology	Mediterranean Sea	Plankton	Centre	Temperature	100000	6	1908	98	12	4	No	Yes	No	No	No	1	Consistent	Yes	No	No	No	2	7	5	2	Tunin-Ley, A., F. Ibanez, J-P. Labat, A. Zingone and R. Lemee. 2009. Phytoplankton biodiversity and the NW Mediterranean Sea warming: changes in the dinoflagellate genus Ceratium in the 20th century. Marine Ecology Progress Series 375: 85-99
Phenology	Mediterranean Sea	Plants	Centre	Temperature	10000	NA	1973	32	31	5	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	No	5	13	6	7	Diaz-Almela, E., N. Marb_, and C. M. Duarte. 2007. Consequences of Mediterranean warming events in seagrass (Posidonia oceanica) flowering records. Global Change Biology. 13: 224-235.
Phenology	Mediterranean Sea	Plants	Centre	Temperature	1E+07	NA	1973	32	24	5	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	No	5	13	6	7	Diaz-Almela, E., N. Marb_, and C. M. Duarte. 2007. Consequences of Mediterranean warming events in seagrass (Posidonia oceanica) flowering records. Global Change Biology. 13: 224-235.
Phenology	Mediterranean Sea	Plants	Centre	Temperature	1000000	NA	1973	32	24	4	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	No	5	12	5	7	Diaz-Almela, E., N. Marb_, and C. M. Duarte. 2007. Consequences of Mediterranean warming events in seagrass (Posidonia oceanica) flowering records. Global Change Biology. 13: 224-235.
Phenology	Mediterranean Sea	Plants	Centre	Temperature	1000000	NA	1973	32	24	4	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	No	5	12	5	7	Diaz-Almela, E., N. Marb_, and C. M. Duarte. 2007. Consequences of Mediterranean warming events in seagrass (Posidonia oceanica) flowering records. Global Change Biology. 13: 224-235.
Phenology	Mediterranean Sea	Plants	Centre	Temperature	1E+07	NA	1973	32	18	5	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	Yes	No	5	13	6	7	Diaz-Almela, E., N. Marb_, and C. M. Duarte. 2007. Consequences of Mediterranean warming events in seagrass (Posidonia oceanica) flowering records. Global Change Biology. 13: 224-235.
Phenology	Mediterranean Sea	Vertebrates	Leading edge	Temperature	100	6	1984	19	19	3	No	Yes	Yes	No	No	3	Consistent	No	Yes	Yes	No	3	9	4	5	Mazaris, A. D., A. S. Kallimanis, S. P. Sgardelis, and J. D. Pantis. 2008. Do long-term changes in sea surface temperature at the breeding areas affect the breeding dates and reproduction performance of Mediterranean loggerhead turtles? Implications for c
Phenology	Mediterranean Sea	Vertebrates	Centre	Temperature	10	6	1984	24	24	3	No	Yes	Yes	No	No	3	Consistent	Yes	Yes	No	Yes	5	11	4	7	Mazaris, A. D., A. S. Kallimanis, S. P. Sgardelis, and J. D. Pantis. 2009. Sea surface temperature variations in core foraging grounds drive nesting trends and phenology of loggerhead turtles in the Mediterranean Sea. Journal of Experimental Marine Biolog
Phenology	North Sea	Benthic	Centre	Temperature	1	1	1973	29	29	3	No	Yes	Yes	No	No	3	Consistent	No	Yes	No	No	2	8	4	4	Philippart, C. J. M., H. M. van Aken, J. J. Beukema, O. G. Bos, G. C. Cadee, and R. Dekker. 2003. Climate-related changes in recruitment of the bivalve Macoma balthica. Limnology and Oceanography 48:2171-2185.
Phenology	North Sea	Benthic	Centre	Temperature	100	15	1969	39	35	5	No	Yes	No	No	No	1	Consistent	Yes	Yes	No	No	4	10	6	4	Beukema, J.J., Dekker, R., Jansen, J.M. 2009. Some like it cold: populations of the tellinid bivalve Macoma balthica (L.) suffer in various ways from a warming climate. Marine Ecology Progress Series 384: 135_145
Phenology	North Sea	Larval bony fish	Centre	Temperature	100000	NA	1958	45	45	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	10	8	2	Edwards, M. and A.J. Richardson. 2004. Impact of climate change on marine pelagic phenology and trophic mismatch. Nature 430: 881-884.
Phenology	North Sea	Larval bony fish	Centre	Temperature	100000	NA	1958	45	45	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	10	8	2	Edwards, M. and A.J. Richardson. 2004. Impact of climate change on marine pelagic phenology and trophic mismatch. Nature 430: 881-884.
Phenology	North Sea	Larval bony fish	Centre	Temperature	1	1	1975	19	19	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	4	4	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Phenology	North Sea	Larval bony fish	Centre	Temperature	1	1	1975	19	19	2	Yes	Yes	No	No	No	2	Consistent	No	No	No	No	0	4	4	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
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Phenology	North Sea	Larval bony fish	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1973	29	29	3	No	Yes	Yes	No	No	3	No change	No	No	No	No	0	6	4	2	Philippart, C. J. M., H. M. van Aken, J. J. Beukema, O. G. Bos, G. C. Cadee, and R. Dekker. 2003. Climate-related changes in recruitment of the bivalve Macoma balthica. Limnology and Oceanography 48:2171-2185.
Phenology	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	10	8	2	Edwards, M. and A.J. Richardson. 2004. Impact of climate change on marine pelagic phenology and trophic mismatch. Nature 430: 881-884.
Phenology	North Sea	Plankton	Centre	Temperature	100000	NA	1958	45	45	5	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	10	8	2	Edwards, M. and A.J. Richardson. 2004. Impact of climate change on marine pelagic phenology and trophic mismatch. Nature 430: 881-884.
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Phenology	North Sea	Plankton	Centre	Temperature	1	1	1975	19	19	2	Yes	Yes	No	No	No	2	Opposite to expected	No	No	No	No	0	4	4	0	Greve, W., F. Reiners and J. Nast. 1996. Biocoenotic changes of the zooplankton in the German Bight: the possible effects of eutrophication and climate. ICES Journal of Marine Science. 53: 951-956.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1962	40	40	4	No	Yes	Yes	Yes	No	4	No change	No	No	No	Yes	1	9	6	3	Wiltshire, K.H. and B.F.J. Manly. 2004. The warming trend at Helgoland Roads, North Sea: phytoplankton response. Helgoland Marine Research 58: 269-273
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1975	30	30	3	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	7	5	2	Schluter, M.H., A. Merico, M. Reginatto, M. Boersma, K.H. Wiltshire and W. Greve. 2010. Phenological shifts in three interacting zooplankton groups in relation to climate change. Global Change Biology doi: 10.1111/j.1365-2486.2010.02246.x
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1975	30	30	3	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	7	5	2	Schluter, M.H., A. Merico, M. Reginatto, M. Boersma, K.H. Wiltshire and W. Greve. 2010. Phenological shifts in three interacting zooplankton groups in relation to climate change. Global Change Biology doi: 10.1111/j.1365-2486.2010.02246.x
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1975	30	30	3	Yes	Yes	Yes	No	No	4	No change	No	No	No	No	0	7	5	2	Schluter, M.H., A. Merico, M. Reginatto, M. Boersma, K.H. Wiltshire and W. Greve. 2010. Phenological shifts in three interacting zooplankton groups in relation to climate change. Global Change Biology doi: 10.1111/j.1365-2486.2010.02246.x
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	31	31	4	No	Yes	No	No	No	1	Consistent	No	No	No	Yes	1	6	5	1	Greve, W, Reiners, F, Nusta, Hoffmann S. 2004. Helgoland Roads meso- and macrozooplankton time-series 1974 to 2004: lessons from 30 years of single spot, high frequency sampling at the only off-shore island of the North Sea. Helgoland Marine Research 58:
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Consistent	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1962	45	45	4	No	Yes	No	No	No	1	Opposite to expected	No	No	No	No	0	5	5	0	Wiltshire, K.H., A. Kraberg, I. Bartsch, M. Boersma, H-D Franke, J. Freund, C. Gebu_hr, G. Gerdts, K. Stockmann and A. Wichels. 2010. Helgoland Roads, North Sea: 45 years of change. Estuaries and Coasts 33:295-310
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Opposite to expected	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	No change	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	No change	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	No change	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.

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Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Plankton	Centre	Temperature	1	1	1974	32	32	4	No	Yes	No	No	Yes	2	Consistent	No	No	No	No	0	6	5	1	ICES 2006 Zooplankton monitoring results in the ICES area, summary status report 2004/2005. ICES Cooperative Research Report No. 281. 43 pp.
Phenology	North Sea	Vertebrates	Centre	Temperature	100000	1	1970	35	35	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	Yes	No	5	14	7	7	Teal, L.R., J.J. de Leeuw, H.W. van der Veer and A.D. Rijnsdorp. 2008. Effects of climate change on growth of 0-group sole and plaice. Marine Ecology Progress Series 358:219-230
Phenology	North Sea	Vertebrates	Centre	Temperature	100000	1	1970	35	35	5	No	Yes	Yes	Yes	No	4	Consistent	Yes	Yes	Yes	No	5	14	7	7	Teal, L.R., J.J. de Leeuw, H.W. van der Veer and A.D. Rijnsdorp. 2008. Effects of climate change on growth of 0-group sole and plaice. Marine Ecology Progress Series 358:219-230
Phenology	North Sea	Vertebrates	Centre	Temperature	10000	242	1929	70	70	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	Yes	5	15	8	7	Moller, A.P., E. Flensted-Jensen and W. Mardel. 2006. Rapidly advancing laying date in a seabird and the changing advantage of early reproduction. Journal of Animal Ecology 75:657-665.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1971	36	36	5	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1972	35	35	5	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1983	24	24	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	7	5	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1979	28	19	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	7	5	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1971	36	36	5	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1972	35	33	5	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1979	28	21	3	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	7	5	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1976	31	27	5	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.

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Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1976	31	24	4	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	8	6	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1972	35	35	5	Yes	Yes	No	No	No	2	Consistent	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1981	26	26	4	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	No	2	8	6	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1974	33	33	5	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1971	36	36	5	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1971	36	36	5	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1972	35	27	5	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1972	35	28	5	Yes	Yes	No	No	No	2	No change	Yes	No	No	No	2	9	7	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1982	25	25	3	Yes	Yes	No	No	No	2	Opposite to expected	Yes	No	No	No	2	7	5	2	Wanless, S., M. Frederiksen, J. Walton and M.P. Harris. 2009. Long-term changes in breeding phenology at two seabird colonies in the western North Sea. Ibis 151:274-285.
Phenology	North Sea	Vertebrates	Centre	Temperature	10	1	1969	34	34	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Frederiksen, M., M.P. Harris , F. Daunt, P. Rothery, and S. Wanless. 2004. Scale-dependent climate signals drive breeding phenology of three seabird species. Global Change Biology 10: 1214-1221.
Phenology	North-east Atlantic	Benthic	Leading edge	Temperature	100	4	1946	62	9	3	No	Yes	No	Yes	No	2	Consistent	Yes	Yes	No	No	4	9	5	4	Moore, P.J., R.C. Thompson and S.J. Hawkins. 2010. Phenological changes in intertidal con-specific gastropods in response to climate warming. Global Change Biology
Phenology	North-east Atlantic	Benthic	Trailing edge	Temperature	100	4	1946	62	9	3	No	Yes	No	Yes	No	2	Consistent	Yes	Yes	No	No	4	9	5	4	Moore, P.J., R.C. Thompson and S.J. Hawkins. 2010. Phenological changes in intertidal con-specific gastropods in response to climate warming. Global Change Biology
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	100000	NA	1981	25	10	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	No	2	9	5	4	Dufour, F., H. Arrizabalaga, X. Irigoien and J. Santiago. 2010. Climate impacts on albacore and bluefin tunas migrations phenology and spatial distribution. Progress in Oceanography 86: 283-290
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	NA	1967	39	10	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	No	2	10	6	4	Dufour, F., H. Arrizabalaga, X. Irigoien and J. Santiago. 2010. Climate impacts on albacore and bluefin tunas migrations phenology and spatial distribution. Progress in Oceanography 86: 283-290
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	100	1	1978	31	31	5	Yes	Yes	Yes	Yes	No	5	Consistent	Yes	Yes	No	No	4	14	8	6	Kennedy, R. J. and W. W. Crozier. 2010. Evidence of changing migratory patterns of wild Atlantic salmon Salmo salar smolts in the River Bush, Northern Ireland, and possible associations with climate change. Journal of Fish Biology. 76: 1786-1805
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	1	1	1977	30	30	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	11	6	5	D'Alba, L., P. Monaghan, and R.G. Nager. 2010. Advances in laying date and increasing population size suggest poistive responses to climate change in Common Eiders Somateria mollissima in Iceland. Ibis 152:19-28.
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	1000000	17	1980	28	28	4	Yes	Yes	Yes	Yes	No	5	Opposite to expected	Yes	No	No	No	2	11	7	4	Wanless, S., M.P. Harris, S. Lewis, M. Frederiksen and S. Murray. 2008. Later breeding in northern gannets in the eastern Atlantic. Marine Ecology Progress Series 370:263-269.
Phenology	North-east Atlantic	Vertebrates	Trailing edge	Temperature	10	1	1982	21	23	3	Yes	Yes	Yes	No	No	4	Opposite to expected	No	No	No	No	0	7	5	2	Frederiksen, M., M.P. Harris , F. Daunt, P. Rothery, and S. Wanless. 2004. Scale-dependent climate signals drive breeding phenology of three seabird species. Global Change Biology 10: 1214-1221.
Phenology	North-east Atlantic	Vertebrates	Centre	Temperature	10	1	1981	22	22	3	Yes	Yes	Yes	No	No	4	Opposite to expected	No	No	No	No	0	7	5	2	Frederiksen, M., M.P. Harris , F. Daunt, P. Rothery, and S. Wanless. 2004. Scale-dependent climate signals drive breeding phenology of three seabird species. Global Change Biology 10: 1214-1221.
Phenology	North-east Pacific	Plankton	Centre	Temperature	1	1	1975	22	12	2	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	5	3	2	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.
Phenology	North-east Pacific	Plankton	Centre	Temperature	1	1	1975	24	8	1	No	Yes	No	No	No	1	Consistent	No	Yes	No	No	2	4	2	2	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1973	29	29	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	No	No	No	0	9	7	2	Abraham, C.L. and W.J. Sydeman. 2004. Ocean climate, euphausiids and auklet nesting: inter-annual trends and variation in phenology, diet and growth of a planktivorous seabird, Ptychoramphus aleuticus. Marine Ecology Progress Series 274: 235-250.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1975	25	12	3	Yes	Yes	Yes	No	No	4	Consistent	No	Yes	No	No	2	9	5	4	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1975	25	10	2	Yes	Yes	Yes	No	No	4	Consistent	No	Yes	No	No	2	8	4	4	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1975	25	7	2	Yes	Yes	No	No	No	2	Consistent	No	Yes	No	No	2	6	4	2	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1975	25	9	2	Yes	Yes	Yes	No	No	4	No change	No	Yes	No	No	2	8	4	4	Bertram, D.F., D.L. Mackas, and S.M. McKinnell. 2001. The seasonal cycle revisited: interannual variation and ecosystem consequences. Progress in Oceanography 49: 283-307.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1988	19	19	3	Yes	No	Yes	No	No	3	Consistent	No	No	No	No	0	6	4	2	Schroeder, I.D., W.J. Sydeman, N. Sarkar, S.A. Thompson, S.J. Bograd and F.B. Schwing. 2009. Winter pre-conditioning of seabird phenology in the California Current. Marine Ecology Progress Series 393:211-223.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1988	19	19	3	Yes	No	Yes	No	No	3	Opposite to expected	No	No	No	No	0	6	4	2	Schroeder, I.D., W.J. Sydeman, N. Sarkar, S.A. Thompson, S.J. Bograd and F.B. Schwing. 2009. Winter pre-conditioning of seabird phenology in the California Current. Marine Ecology Progress Series 393:211-223.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1972	35	35	5	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	8	8	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Phenology	North-east Pacific	Vertebrates	Centre	Temperature	10	1	1973	35	35	5	Yes	Yes	No	Yes	No	3	Consistent	No	No	No	No	0	8	8	0	Sydeman, W.J., K.L. Mills, J.A. Santora, S.A. Thompson, D.F. Bertram, J.M. Hipfner, B.K. Wells and S.G. Wolf. 2009. Seabirds and climate in the California Current--A synthesis of change. CalCOFI Report 50:82-104.
Phenology	North-west Atlantic	Plankton	Centre	Temperature	1000	1	1951	53	15	4	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	8	6	2	Costello, J.H, B.K. Sullivan and D.J. Gifford. 2006. A physical-biological interaction underlying variable phenological responses to climate change by coastal zooplankton. Journal of Plankton Research 28:1099-1105
Phenology	North-west Atlantic	Vertebrates	Leading edge	Temperature	100	4	1983	23	24	3	No	Yes	Yes	No	No	3	No change	No	No	No	No	0	6	4	2	Hawkes, L., M. A. C. Broderick, M. H. Godfrey, and B. J. Godley. 2007. Investigating the potential impacts of climate change on a marine turtle population. Global Change Biology 13:923-932.
Phenology	North-west Atlantic	Vertebrates	Centre	Temperature	1	1	1978	23	23	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	10	5	5	Juanes, F., S. Gephard and K.F. Beland. 2004. Long-term changes in migration timing of adult Atlantic salmon (Salmo salar) at the southern edge of the species distribution. Canadian journal of Fisheries and Aquatic Sciences 61:2392-2400
Phenology	North-west Atlantic	Vertebrates	Centre	Temperature	1	1	1978	23	23	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	10	5	5	Juanes, F., S. Gephard and K.F. Beland. 2004. Long-term changes in migration timing of adult Atlantic salmon (Salmo salar) at the southern edge of the species distribution. Canadian journal of Fisheries and Aquatic Sciences 61:2392-2400
Phenology	North-west Atlantic	Vertebrates	Centre	Temperature	1	1	1978	24	24	2	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	10	5	5	Juanes, F., S. Gephard and K.F. Beland. 2004. Long-term changes in migration timing of adult Atlantic salmon (Salmo salar) at the southern edge of the species distribution. Canadian journal of Fisheries and Aquatic Sciences 61:2392-2400
Phenology	North-west Atlantic	Vertebrates	Centre	Temperature	1	1	1967	33	32	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	12	7	5	Juanes, F., S. Gephard and K.F. Beland. 2004. Long-term changes in migration timing of adult Atlantic salmon (Salmo salar) at the southern edge of the species distribution. Canadian journal of Fisheries and Aquatic Sciences 61:2392-2400
Phenology	North-west Atlantic	Vertebrates	Centre	Temperature	1	1	1954	39	39	4	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	Yes	3	12	7	5	Juanes, F., S. Gephard and K.F. Beland. 2004. Long-term changes in migration timing of adult Atlantic salmon (Salmo salar) at the southern edge of the species distribution. Canadian journal of Fisheries and Aquatic Sciences 61:2392-2400
Phenology	North-west Pacific	Plankton	Centre	Temperature	1	1	1968	29	17	2	No	Yes	Yes	No	No	3	Consistent	No	No	No	No	0	5	3	2	Mackas, D.L., H. Goldblatt and A.G. Lewis. 1998. Interdecadal variation in developmental timing of Neocalanus plumchrus populations at Ocean Station P in the subarctic North Pacific. Canadian Journal of Fisheries and Aquatic Sciences 55: 1878-1893
Phenology	North-west Pacific	Vertebrates	Centre	Temperature	10	1	1975	28	16	3	Yes	Yes	Yes	Yes	No	5	Consistent	No	Yes	No	No	2	10	6	4	Gjerdum, C., A.M.J. Valle_e, C.C. St. Clair, D.F. Bertram, J.L. Ryder and G.S. Blackburn. 2003. Tufted puffin reproduction reveals ocean climate variability. Proceedings of the National Academy of Science 100: 9377-9382
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1950	55	44	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1950	55	44	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1960	45	28	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.

Obs.Type	Ocean Basin	Taxa	Range Section	Main Climate Varible	Spatial Area	No. Sites	Start Year	Time Span	No. Years of Data	Data Score	Bio. Trend	Phys. Trend	Bio-Phys Relationship	Spatial/Temp Autocorr.	Alt. Driver Test	Quant. Anal. Score	Consistent?	Prior expecation	Specific Evidence	Multi-evidence	AD or CF expressed	Expectations Score	Total Score	Detection Score	Understanding Score	Reference
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1950	55	37	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1959	46	36	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1980	25	19	3	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	7	5	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1950	55	41	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1950	55	40	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.
Phenology	Southern Ocean	Vertebrates	Centre	Sea ice / snow	10	1	1970	35	31	5	Yes	Yes	Yes	No	No	4	Consistent	No	No	No	No	0	9	7	2	Barbraud, C. and H. Weimerskirch. 2006. Antarctic birds breed later in response to climate change. Proceedings of the National Academy of Sciences 103: 6248-6251.

Table S3. Examples of directional and testable expectations for responses, direct and indirect, of marine ecosystems to warming, CO_2 increase and sea level rise, expanded from Brierley and Kingsford (2009). For each expectation, examples of supporting theoretical, experimental or paleo evidence (T, E and P) are indicated. Example evidence is not comprehensive, and is drawn from the broader literature on different marine ecosystems. The same data or models used as evidence would therefore not be used to test for climate change impacts in these systems. This approach should also highlight types of evidence that are under-represented or areas in need of additional research to generate expectations.

System	Threat	Expectation	T	E	P
GENERAL	Climate change	Reduced calcification rates in marine calcifiers with higher vulnerability of aragonite structures over calcite	*1,2*	*1*	*3*
		Shifts in geographic ranges towards deeper waters and higher latitudes	*4*		*5*
		Higher vulnerability of polar and tropical taxa due to narrow physiological limits	*6*	*6*	
		Within trophic levels, trend to smaller body size distributions	*7*	*8,9*	
		Shifts in phenology, with spring events occurring earlier	*10*	*9*	
		Increased incidences of disease	*11*	*12*	
		Reduced population connectivity	*13,14*		
COASTAL					
Sandy shore	Warming	Decreased growth rates of cold-adapted macrofauna		*15*	
		Decreased survival rates of macrofauna		*15*	
		Skewing of hatchling sex ratios from marine turtle nests towards females	*16,17*	*18,19*	
		Decreased reproductive output of beach-breeding macrofauna	*20,21*	*15*	
		Warming effects exacerbated by cyclic warming events, *e.g.* ENSO	*20*		
	OA	Increased surf-zone diatom production and input to beach food chain	*20,22*		
	SLR	Increased erosion and loss of habitat, especially on developed or defended shores	*23*	*24-26*	*27*
Salt marshes	Warming	Reduction of spatial extent of marshes due to increased desiccation	*28*		
		Increased growth and photosynthetic rates		*29*	
		Increased proportion of C4 *vs* C3 species	*30*		
		Reduction in diversity	*31*		
	Atm CO_2	Increased growth and primary productivity where nitrogen is not limited, but no effect where there is N limitation		*32*	

		Enhanced growth and biomass including below ground biomass leading to increased surface elevation rates		*33,34*	
	SLR	Landward progression			*35*
		Increased erosion and loss of habitat, especially on developed or defended shores	*28*		
		Regions with small tidal ranges are more vulnerable than regions with large tidal ranges	*36*		
Mangroves	Warming	Reduced freezing risk will allow poleward range expansion	*37,38*	*39*	
		Marginal increases in photosynthesis in areas of high rainfall		*40*	
		Decline in photosynthesis in arid regions		*40,41*	
	Atm CO_2	Increased growth and greater total biomass leading to increased rate of surface elevation	*42,43*		
		CO_2 increases productivity, but effects highly contingent on salinity, nutrients and water availability		*40*	
		No change in net primary production, but changes in species composition		*40*	
	SLR	Landward progression or habitat loss	*44,45*		*40,46,47*
		Geographic redistribution within climate zone depending on land use and topography		*45*	*46*
		Reduced abundance due to lower recruitment or reduced resilience	*37,44*	*37*	
Estuaries	Warming	Increased desiccation rate at low tide	*28*		
	SLR	Shoreline retreat and habitat loss	*48*	*48*	
		Gradual shift of freshwater plant communities into salt-tolerant dominated plant and animal communities			
		Reductions in the abundance of benthic intertidal fauna and associated large consumers, (especially birds) and alteration of trophic interactions	*48*		
ROCKY SUBSTRATES					
Rocky intertidal and subtidal reefs	Warming	Increased aerial temperatures leading to increased thermal stress/desiccation at low tide and increased mortalities		*49,50*	
		Poleward range extensions of warm-water species	*6,51-53*		*54*
	OA	Reduction in recruitment as larval survival is reduced		*55,56*	

		Decline in coralline algae		*57,58*	
	SLR	Species distributions will track sea-level rise and move up the shore providing suitable substrate is available	*59*	*60*	
Canopy forming macroalgae	Warming	Decline in canopy forming kelp	*61*	*62*	
		Increased temperature will increase metabolism and hence primary production	*63*	*64*	
	OA	Increased photosynthesis rates for CO_2 limited algae		*65,66*	
	SLR	Restricted kelp depth distribution, photosynthesis, recruitment, and area of substrate available for settlement due to increased erosion, turbidity and sedimentation	*61*		
Coral reefs	Warming	Increased frequency of mass coral bleaching	*67*	*68*	
	OA	Increased productivity of CO_2-limited algal symbionts		*69*	
		Increased abundance of taxa with 'buffered' *vs* 'unbuffered' skeletogenesis		*70*	
		Reduction in calcification rates	*71-73*	*74-76*	
	SLR	Drowning of slow growing high latitude reefs	*77*		
SOFT SUBSTRATES					
Seagrass meadows	Warming	Increased respiration relative to photosynthesis leading to metabolic stress	*78*	*79*	
		Decreased growth in summer and increased growth in spring and fall in temperate species, and decreased growth all year round in tropical species	*78*	*80,81*	
		Increased flowering			*82*
		Increased microbial metabolism		*80*	
		Increased mortality rates		*83.84*	
	OA	Increased productivity		*75*	
	SLR	Landward expansion providing suitable substrate is available	*85*		
Shelf Benthos	Warming	Decline in benthic forams		*86*	
		Decline in growth in calcifiers (gastropods, echinoderms and bryozoans)		*87-89*	
Pelagic	Warming	Dominance of pelagic heterotrophs over autototrophs because of greater increase in respiration than in primary production as	*90*	*90,91*	

		temperatures warm			
		Decreased primary productivity and sinking of organic matter as the oceans stratify, less nutrients are injected into the surface layer and the size of primary producers declines		*92*	
		Increased abundance of picoautotrophs	*7*	*9*	
		Faster growth rates and longer growing seasons	*93*		
	OA	Increased photosynthesis of phytoplankton that are CO_2 limited such as coccolithophores		*94*	
		Decline in calcifying plankton such as pteropods, foraminifera	*1*		*95*
		Compromised metazoan respiration		*75*	
		Increase in abnormal development and mortality of larvae		*56,96,97*	
Polar and ice-edge	Warming	Reduction of ice-algae and sea ice blooms, alteration of food-webs	*98*		
		Increasing pelagic primary production and associated trophic responses	*99*		
		Increasing sunlit benthic habitat and benthic productivity	*100*		
		Declining mammal populations due to loss of sea ice habitat	*98*		
		Invasion by subpolar or trans-polar species			*101*
	OA	Increased primary production		*75*	
Deep-Sea	Warming	Changes in carbon flux from surface with impacts on community composition	*28*		
	OA	Increasing benthic standing crop, bioturbation rates and depths, and carbon sequestration in deep-sea sediments	*102*		

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