

USER INSTRUCTIONS FOR THE OA-ICC BIBLIOGRAPHIC DATABASE



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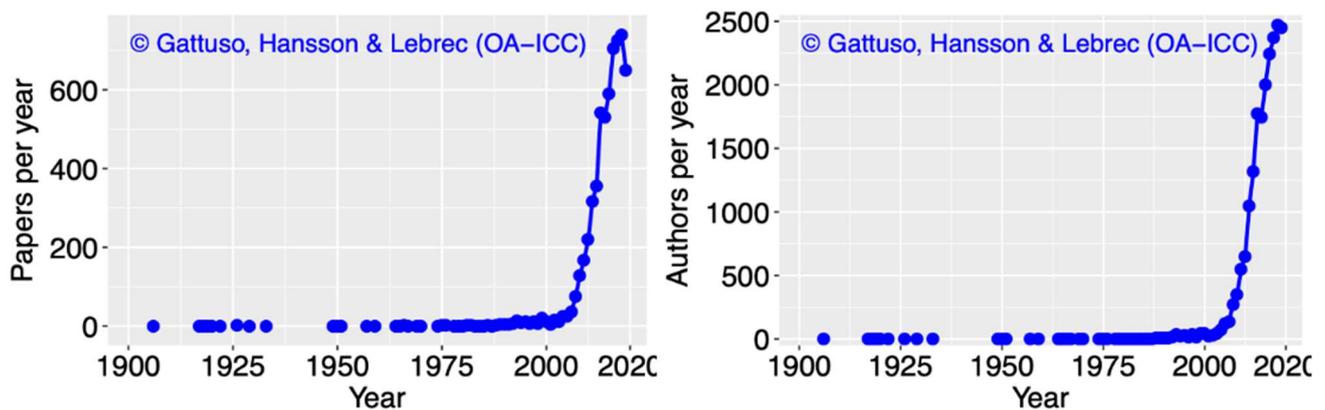
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1. Background

The OA-ICC bibliographic database is based on an initiative developed by Jean-Pierre Gattuso (CNRS/UPMC) in 1995. The database continued to evolve and was maintained as part of the *European Project on Ocean Acidification* (EPOCA) from 2008 to 2012 (Gattuso & Hansson, 2011). In July 2012, the maintenance and update of the database became one of the activities of the IAEA Ocean Acidification International Coordination Centre ([OA-ICC](#)).

2. Database



2.1 Summary and use

The OA-ICC bibliographic database is a comprehensive collection of the corpus of literature on ocean acidification. It includes journal articles, MSc and PhD dissertations, books, and book chapters, from 1922 to the present, and has been consistently maintained for over 15 years.

The OA-ICC bibliographic database has been regularly used to analyse the number of authors and papers published each year, the geographical distribution of first authors, and the topics investigated. Relevant papers of interest are:

- Gattuso J.-P. & Hansson L., 2011. Ocean acidification: background and history. In: Gattuso J.-P. & Hansson L. (Eds.), *Ocean acidification*, pp. 1-20. Oxford: Oxford University Press. [Book](#).
- Riebesell U. & Gattuso J.-P., 2015. Lessons learned from ocean acidification research. *Nature Climate Change* 5: 12-14. [Article](#).

Through this bibliographic database we continue to track the development of the study of ocean acidification while providing a powerful tool for marine scientists, policy makers, and students conducting research. The bibliography may be downloaded or accessed through the Zotero cloud and is useful for conducting literature reviews and building bibliographies for scientific publications and reports.

Every entry in the bibliography has been made with a standardized format, which allows ease of use and compatibility across widely different citation formats and styles. Entries are checked for errors by the OA-ICC team, advised by Lina Hansson and Jean-Pierre Gattuso, and updated such as when an in-press paper goes to press.

An expert developed vocabulary of keywords has been applied systematically to every entry, using a standardized protocol that allow users to easily identify papers tagged with keywords that they are interested in. This keyword vocabulary has remained remarkably constant since the start of the bibliography, lending great consistency to all our entries.

Through a collaboration with the [State Key Laboratory of Marine Environmental Science at Xiamen University](#), the data from studies on the biological response of organisms to ocean acidification have been standardized and made available on the online data center, [Pangaea](#). To facilitate meta-analysis and review of biological response research the data compilation is also available on a [user-friendly portal](#).

Papers of interest are:

- Nisumaa A.-M., Pesant S., Bellerby R. G. J., Middelburg J. J., Orr J. C., Riebesell U., Tyrrell T., Wolf-Gladrow D. & Gattuso J.-P., 2010. EPOCA/EUR-OCEANS data compilation on the biological and biogeochemical responses to ocean acidification. *Earth System Science Data* 2: 167-175. [Article](#).
- Yang Y., Hansson L. & Gattuso J.-P., 2016. Data compilation on the biological response to ocean acidification: an update. *Earth System Science Data* 8: 79-87. [Article](#).

2.2 pCloud and bibliographic management

pCloud is a secure cloud-storage service which allows fast, convenient and safe file sharing across user accounts. Those interested in downloading a copy of the OA-ICC bibliographic database may do so via this [access-link](#). File formats are available in RIS and Bibtext and updated monthly. Once downloaded the bibliography may be managed by a number of different services. This article provides more information about the kinds of software available: [Comparison of reference management software - Wikipedia](#). Below are a few of our suggestions:

- [Mendeley](#)
- [Zotero](#)
- [Bookends](#)
- [EndNote](#)

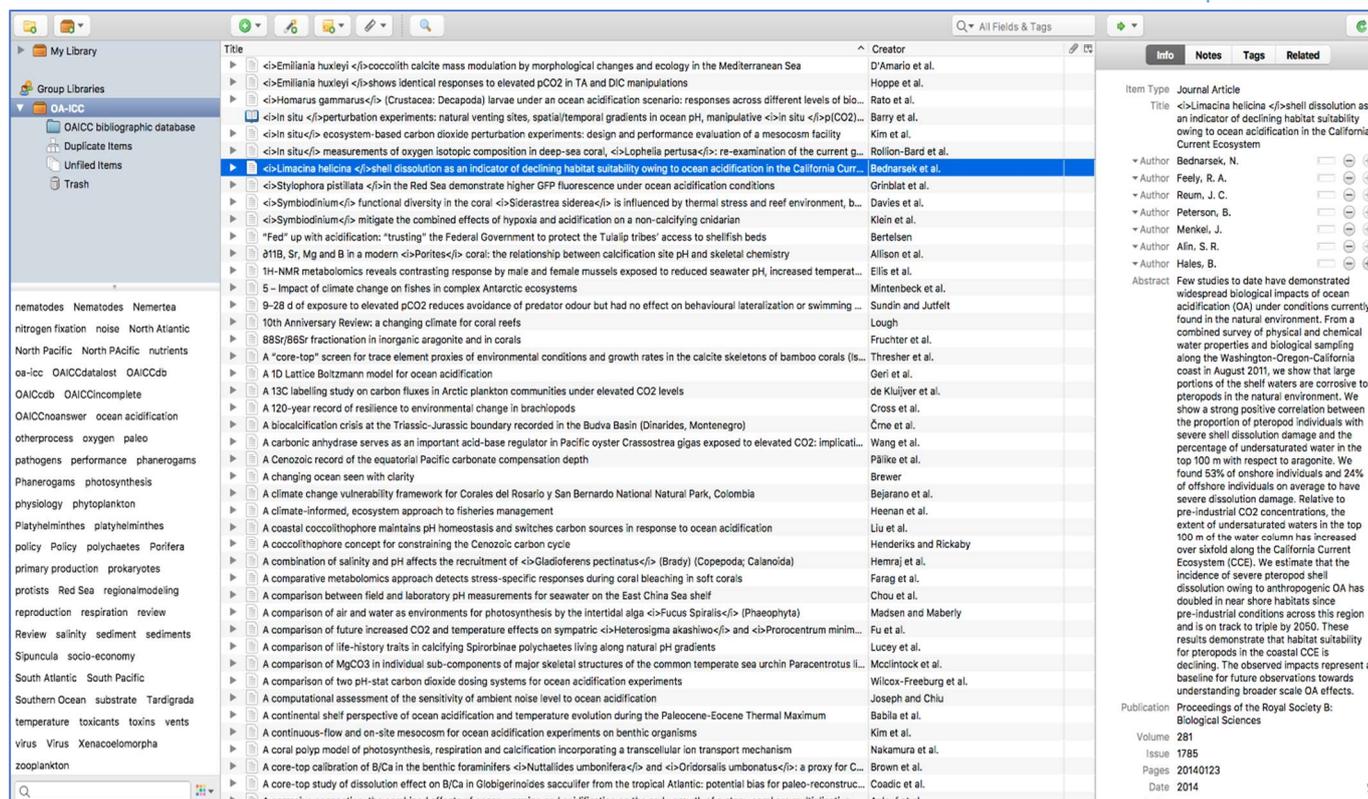
2.4 Zotero

The database is freely available on Zotero, in the [OA-ICC group](#). In July 2021, the database held more than 8,800 references. The online version of the base includes citations, DOI's, abstracts and keywords allocated by the OA-ICC (see list below). Please note that the keywords identified by journals are not included. The 'Tags' in Zotero are in fact the keywords specified by the OA-ICC.

An update to the database is provided to users every month.

2.5 How to access the database from Zotero

1. Go to the [Zotero homepage](#) and create a free account.
2. Click on the Groups tab, search for the group "[OA-ICC](#)", and join this group.
3. Users can work with the bibliographic database online, but some features will not be available. Instead, it is recommended to download the Zotero desktop application available for Mac, Windows and Linux.



2.6 How to search the database (in Zotero Desktop)

➤ Running a Quick Search

To begin searching, click inside the search box at the top-right of the center pane (or type Ctrl/Cmd-F) and start typing your search terms. As you type, only those items in the center column that match the search terms will remain.

Quick search can be used in three different modes:

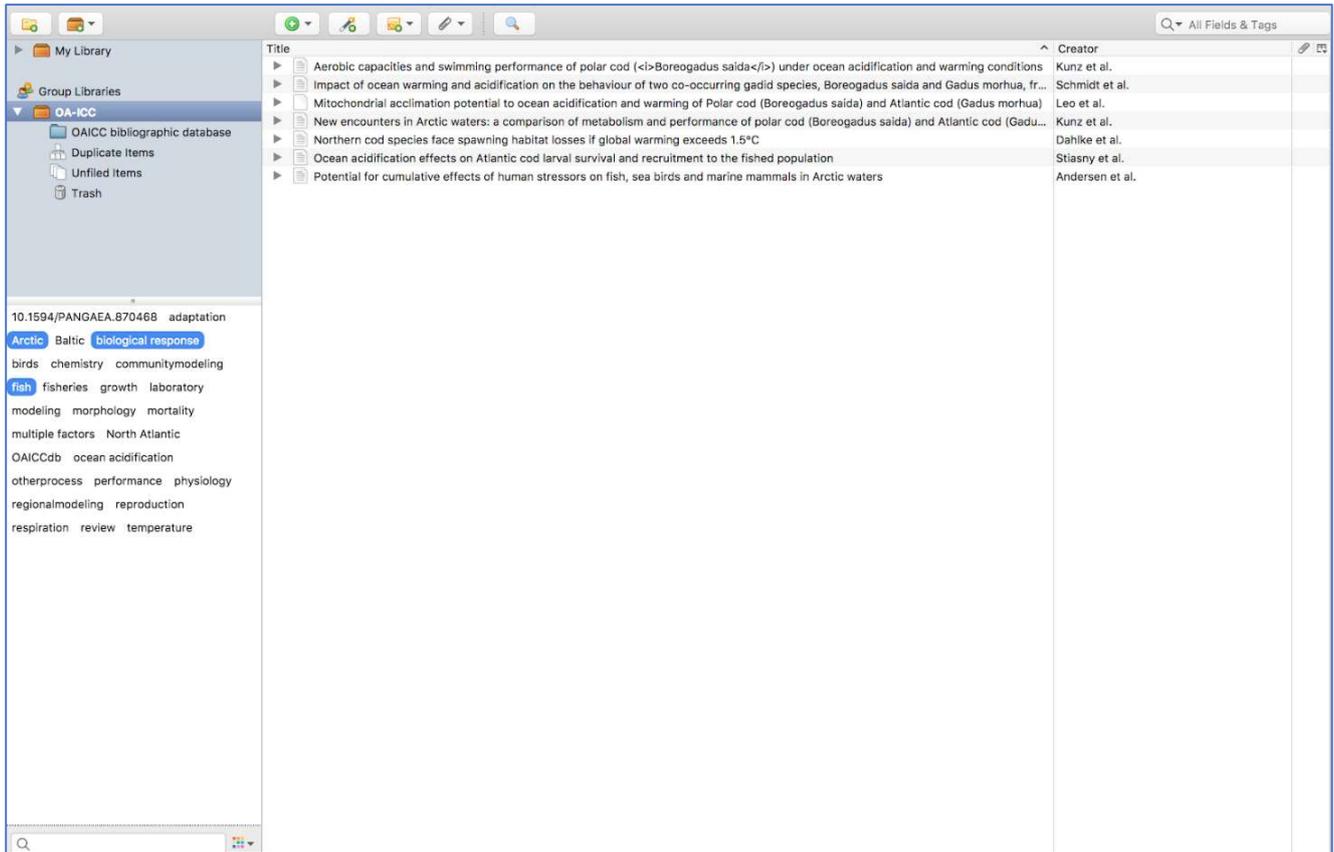
Title, Year, Creator	matches against these three fields, as well as publication titles
All Fields & Tags	matches against all fields, as well as tags and text in notes
Everything	matches against all fields, tags, text in notes, and indexed text in PDFs (this requires that PDF indexing be enabled)

➤ Running an Advanced Search in Zotero, see the [Zotero Searching page](#).

➤ Search using the OA-ICC keywords (Tags)

Note that the ‘Tags’ are not added by the authors, but instead are allocated by the OA-ICC. The list of OA-ICC keywords, with explanations, is available below. Several tags can be selected at once for specific results.

Example: In the screenshot below, three tags are selected (**Arctic**, **biological response**, and **fish**), which yields seven references which include all three of these keywords. Tags can be unselected by simply re-clicking on them.

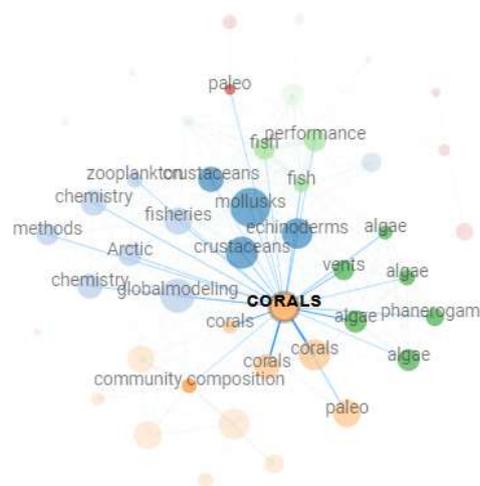


The screenshot shows a web application interface for a bibliographic database. On the left is a sidebar with navigation options: 'My Library', 'Group Libraries', and 'OA-ICC'. Under 'OA-ICC', there are links for 'OAICC bibliographic database', 'Duplicate Items', 'Unfiled Items', and 'Trash'. Below the sidebar is a list of tags: '10.1594/PANGAEA.870468 adaptation', 'Arctic', 'Baltic', 'biological response', 'birds', 'chemistry', 'communitymodeling', 'fish', 'fisheries', 'growth', 'laboratory', 'modeling', 'morphology', 'mortality', 'multiple factors', 'North Atlantic', 'OAICcdb', 'ocean acidification', 'otherprocess', 'performance', 'physiology', 'regionalmodeling', 'reproduction', 'respiration', 'review', 'temperature'. The main area contains a table with columns for 'Title' and 'Creator'. The table lists several scientific articles related to ocean acidification and cod species.

Title	Creator
Aerobic capacities and swimming performance of polar cod (<i>Boreogadus saida</i>) under ocean acidification and warming conditions	Kunz et al.
Impact of ocean warming and acidification on the behaviour of two co-occurring gadid species, <i>Boreogadus saida</i> and <i>Gadus morhua</i> , from the Arctic	Schmidt et al.
Mitochondrial acclimation potential to ocean acidification and warming of Polar cod (<i>Boreogadus saida</i>) and Atlantic cod (<i>Gadus morhua</i>)	Leo et al.
New encounters in Arctic waters: a comparison of metabolism and performance of polar cod (<i>Boreogadus saida</i>) and Atlantic cod (<i>Gadus morhua</i>)	Kunz et al.
Northern cod species face spawning habitat losses if global warming exceeds 1.5°C	Dahke et al.
Ocean acidification effects on Atlantic cod larval survival and recruitment to the fished population	Stiasny et al.
Potential for cumulative effects of human stressors on fish, sea birds and marine mammals in Arctic waters	Andersen et al.

3. OA-ICC Keywords (last updated 30 July 2021)

Keywords have been used consistently since the initiative was started and have undergone relatively little modification since. This provides great consistency when searching for papers across multiple decades of OA research. Keywords are also focused on the kinds of experiments and studies going on in ocean acidification science, particularly those studying biological response. Thus, there are many keywords for papers studying the impacts of OA on biology. Here we present the keywords available and when they are applied to a scientific article.



3.1 LISTS OF KEYWORDS

Sub keywords are keywords which always follow the primary keyword. These are marked with – and indented. Keywords are case sensitive and appear in bold.

MAIN CATEGORIES	STUDY ORGANISMS	PROCESSES AND PARAMETERS	METHODS	LOCATION
Type of paper, usually referring to issue/topic studied. Several keywords can be used to describe a study.	All sub-keywords of biological response <i>Note:</i> for some organisms several keywords will be added, e.g. For pteropods, both mollusks and zooplankton need to be added, for copepods both crustaceans and zooplankton should be added.	All sub-keywords of biological response biological response and characterizes that response.	Methods applied in the field, includes special keywords to highlight certain experimental approaches or topics.	Study area or where study organisms were collected, if wild.
biological response biogeochemistry chemistry methods paleo review policy socio-economy education mitigation fisheries modeling - individualmodeling (one organism) - communitymodeling (e.g. mesocosm experiments) - regionalmodeling (one region of the ocean) - globalmodeling NOTSTAT (not peer reviewed) NOTSTAT DISC (discussion paper; not yet peer reviewed)	BRcommunity (used for a paper studying the response of a mix of organisms and their interactions), annelids, archaea, birds, brachiopods, Bryozoa, chordata, cnidaria (except corals), corals (including coral reefs), crustaceans, cryptophyta, echinoderms, fish, fungi, gastrotricha, kinorhyncha, mammals, mollusks, nematodes, nemertea, phanerogams, phytoplankton, platyhelminthes, porifera, prokaryotes (including cyanobacteria), protists (including foraminifera zooxanthellae, and free-living and symbionts), sediment, sipuncula, tardigrada, tracheophyta, virus, xenacoelomorpha, zooplankton.	abundance, adaptation, calcification, community composition, dissolution, growth, mortality, morphology, nitrogen fixation, otherprocess, performance, photosynthesis, physiology, primary production, reproduction, respiration	field, laboratory, vents, mesocosms, molecular biology, multiple factors (and select all independent variables that apply) - temperature - light - salinity - nutrients - oxygen - toxicants - fishing pressure - pathogens - metals - bioturbation - communityMF - flow - predation - noise - substrate - origin	North Atlantic, South Atlantic, North Pacific, South Pacific, Arctic, Antarctic, Indian, Mediterranean, Baltic, Red Sea, Black Sea

3.2 KEYWORD DETAILED DESCRIPTIONS

The set of keywords were developed by Jean-Pierre Gattuso and Lina Hansson in 2008 with only slight modifications since.

3.2.1 MAIN CATEGORIES

<p>biogeochemistry</p>	<p>Chemical and geological observations relating to ocean acidification that are more than the four carbonate chemistry variables. DOC is a classic example. The research of biological and/or geological chemical aspects that provide insights into ocean acidification. This is different than paleo papers that do use geological chemistry at times but are looking at past and not present conditions.</p> <p>If the paper also includes 2 or more of the carbonate system measurements also, then “chemistry” keyword is used as well.</p> <p>Terms may include:</p> <ul style="list-style-type: none"> - Export, fluxes, biogeochemical cycles (carbon, nitrogen, sulfur, iron, and phosphorus cycles), vertical transport, etc. - Elemental ratios (C:N, C:P, N:P) - POC, PIC, TEP, DOC... - DMS, climate relevant gases - Feedbacks to the atmosphere <p>Examples:</p> <ul style="list-style-type: none"> - Becherucci et al 2021 - Huang et al 2021 - Duke et al 2021
<p>chemistry</p>	<p>Must include pH and a clear ocean acidification interest or 2 or more of any of the four carbonate system measurements (pH, pCO₂, TA, DIC). CO₂ flux papers, without measurement of other carbonate chemistry parameters, are NOT included.</p> <p>Examples:</p> <ul style="list-style-type: none"> - field observations for: <ul style="list-style-type: none"> ➤ pH ➤ aragonite ➤ calcite ➤ temperature ➤ salinity ➤ dissolved organic carbon (DOC) ➤ dissolved inorganic carbon (DIC), etc. - data collection (time series, cruises, etc.) - methods discussions with chemical equations (saturation states, pH, etc.) - impact of OA on the speciation or dissolution of elements/metals - sound absorption (borate speciation) - biological activity alters the chemistry of the porewater, e.g. - Sharp et al 2021 - Anglada-Ortiz et al 2021

<p>modeling</p>	<p>Models must be statistical, not just conceptual and include a clear prediction about a theoretical outcome, generally in the future. The keyword generally refers to computer modeling where parameters/conditions are simulated, and not statistical models such as linear regressions that make certain kinds of predictions. If the paper uses the word modeling to describe their work, but does not meet the above conditions, then “modeling” keyword is NOT used.</p> <p><i>There are different kinds of modeling by scope, and you must include one or more of these additional keywords below:</i></p> <ul style="list-style-type: none"> - Individualmodeling (physiological process within one organism) see Hendrickx et al 2021 - communitymodeling (e.g. mesocosm experiments, modeling of coral reef response to OA etc.) see Carriger e al 2021 - regionalmodeling (one region of the ocean) see Siedlecki et al 2021 - globalmodeling see Kwiatkowski et al 2020
<p>paleo</p>	<p>Any paper examining geological records estimating the carbonate system state of past oceans in ways directly related to ocean acidification. The paper must more than just mention OA.</p> <p>The paper must contain paleo data (keyword is not used when the paper only briefly discusses a paleo implication of a method e.g.)</p> <p>Examples:</p> <ul style="list-style-type: none"> - Balestrieri et al 2021 - Kitch et al 2021 - Wei et al 2021 - Li et al 2021
<p>methods</p>	<p>Any paper about scientific methodology, technology, instrumentation, techniques, and other process focused research. Needs to be the focus or one of the main focal areas of a paper (not added if only mentioned or discussed briefly).</p> <p>Examples:</p> <ul style="list-style-type: none"> - Strait et al, in press - Fassbender et al 2021 - Batista et al 2020 - Munday et al 2020
<p>review</p>	<p>A paper which largely or entirely does not present its own data for consideration but reviews the data, metadata, and general findings of aggregate information from a variety of sources.</p> <p>Review papers often coincide with other keywords like methods, biological response, chemistry, paleo, etc.</p>

	<p>If a paper review data from other papers, but at the end produces its own data, then the “review” keyword is NOT used.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Kroeker et al 2021 - van der Geest et al 2021 - Bramwell et al 2021
<p>education</p>	<p>For peer-reviewed papers examining an educative approach or effort on ocean acidification.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Pietarinen et al, in press - Fauville et al 2020 - Boaventura et al 2020 - Fauville et al 2013 - Fauville et al 2013
<p>mitigation</p>	<p>If a paper includes investigation and review of designs which may mitigate or ameliorate the effects of ocean acidification on the marine environment.</p> <p>This may include:</p> <ul style="list-style-type: none"> - aquaculture technologies - seagrass - oyster and kelp buffering influence on seawater and more <p>Examples:</p> <ul style="list-style-type: none"> - Bonnail et al 2021 - Mongin et al 2021 - Butenschön et al, in press - Miller et al, in review - Turk et al 2017
<p>fisheries</p>	<p>This keyword refers to the economic/subsistence activity of fishing. Only used if the effects of ocean acidification are substantially discussed in the context of fisheries.</p> <p>If a paper studies a response of a fish in the lab but has no direct connection to fisheries and aquaculture, then the “fisheries” keyword is NOT used.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Wilson et al 2020 - Zeng et al 2019 - Steiner et al 2019
<p>socio-economy</p>	<p>If the impacts of ocean acidification on society and the economy are assessed, reviewed, or strongly considered by the paper.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Siedlecki et al 2021

	<ul style="list-style-type: none"> - Licker et al 2019 - Cooley et al 2015 - Brander et al 2012 - Cross et al 2019 												
<p>policy</p>	<p>Papers which:</p> <ul style="list-style-type: none"> - the effects/impacts of policy decisions on OA. - are designed to inform policy makers about OA. - study the procedures and methodology related to policy making in an OA context. <p>Examples:</p> <ul style="list-style-type: none"> - Petterson et al 2021 - Visbeck et al 2021 - Harrould-Kolieb 2020 - Harrould-Kolieb and Kerr 2012 												
<p>biological response</p>	<table border="1"> <tr> <td data-bbox="419 826 703 1323"> <p>- algae:</p> </td> <td data-bbox="703 826 1444 1323"> <p>Only used for macroalgae and coralline algae. Does not include microscopic forms of algae which should instead be given the keyword phytoplankton.</p> <ul style="list-style-type: none"> - rhodoliths <p>Examples:</p> <ul style="list-style-type: none"> - Johnson et al 2021 - Zemah-Shamir et al 2021 - Cavalcanti et al 2018 </td> </tr> <tr> <td data-bbox="419 1323 703 1382"> <p>- annelids:</p> </td> <td data-bbox="703 1323 1444 1382"> <p>Worms, see Ulrich et al 2021</p> </td> </tr> <tr> <td data-bbox="419 1382 703 1440"> <p>- archaea:</p> </td> <td data-bbox="703 1382 1444 1440"> <p>see Danovaro et al 2017</p> </td> </tr> <tr> <td data-bbox="419 1440 703 1498"> <p>- birds:</p> </td> <td data-bbox="703 1440 1444 1498"> <p>see Andersen et al 2016</p> </td> </tr> <tr> <td data-bbox="419 1498 703 1588"> <p>- brachiopods:</p> </td> <td data-bbox="703 1498 1444 1588"> <p>Lampshell, see Müller et al 2020 Often accompany the paleo keyword.</p> </td> </tr> <tr> <td data-bbox="419 1588 703 2067"> <p>- BRcommunity:</p> </td> <td data-bbox="703 1588 1444 2067"> <p>Used for papers studying the response of a community of organisms or species in an ecosystem and their interactions. If two species or more are studied in a paper but not studied as a community, than “BRcommunity” is NOT used.</p> <p>Examples:</p> <ul style="list-style-type: none"> - the response of a mix of organisms - mesocosm experiments - microorganisms present in the sediment - Murie & Bourdeau 2021 - Kolzenburg et al 2021 - Fernández-Juárez et al, in press </td> </tr> </table>	<p>- algae:</p>	<p>Only used for macroalgae and coralline algae. Does not include microscopic forms of algae which should instead be given the keyword phytoplankton.</p> <ul style="list-style-type: none"> - rhodoliths <p>Examples:</p> <ul style="list-style-type: none"> - Johnson et al 2021 - Zemah-Shamir et al 2021 - Cavalcanti et al 2018 	<p>- annelids:</p>	<p>Worms, see Ulrich et al 2021</p>	<p>- archaea:</p>	<p>see Danovaro et al 2017</p>	<p>- birds:</p>	<p>see Andersen et al 2016</p>	<p>- brachiopods:</p>	<p>Lampshell, see Müller et al 2020 Often accompany the paleo keyword.</p>	<p>- BRcommunity:</p>	<p>Used for papers studying the response of a community of organisms or species in an ecosystem and their interactions. If two species or more are studied in a paper but not studied as a community, than “BRcommunity” is NOT used.</p> <p>Examples:</p> <ul style="list-style-type: none"> - the response of a mix of organisms - mesocosm experiments - microorganisms present in the sediment - Murie & Bourdeau 2021 - Kolzenburg et al 2021 - Fernández-Juárez et al, in press
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<p>- mammals:</p>	<ul style="list-style-type: none"> - whales - dolphins - seals <ul style="list-style-type: none"> - sealions - polar bears - etc. <p>Examples:</p> <ul style="list-style-type: none"> - Werth and Whaley 2019 - Alvava et al 2018
<p>- mollusks:</p>	<ul style="list-style-type: none"> - octopus - nautilus - squid - snails - conches - gastropods - bivalves (mussels, oysters, clams, etc.) <ul style="list-style-type: none"> - cuttlefish - chitons - abalone - limpets - tusk shells - pteropods <p>Used together with the keyword “zooplankton” when relevant (microscopic organisms such as pteropods).</p> <p>Examples:</p> <ul style="list-style-type: none"> - Sokolowski et al 2021 - Minutti and Russel 2020 - Peijnenburg et al 2020
<p>- nematodes:</p>	<p>Small slender worms, often parasitic see Hua et al 2019</p>
<p>- nemertea:</p>	<p>Ribbon worms. see Ericson et al 2010</p>
<p>- phanerogams:</p>	<p>Are flowering plants, NOT algae</p> <ul style="list-style-type: none"> - seagrasses, see Artika et al 2021
<p>- phytoplankton:</p>	<p>Marine microscopic algae, mainly:</p> <ul style="list-style-type: none"> - diatoms, see Nour et al 2021 - dinoflagellates, see Dörner et al 2020 - coccolithophores, see Li et al 2021
<p>- platyhelminthes:</p>	<p>Flat worms see Franzova et al 2019</p>
<p>- porifera:</p>	<ul style="list-style-type: none"> - sponges, see Page et al 2021 - calcareous sponges, see Posadas et al, in press
<p>- prokaryotes:</p>	<ul style="list-style-type: none"> - bacteria, see Lin et al 2021 - cyanobacteria, see Zhang et al 2019 - any non-eukaryote life
<p>- protists:</p>	<p>Mainly used for:</p> <ul style="list-style-type: none"> - foraminifera (often used for paleo papers) see Bernhard et al 2021 and Stuhr et al 2021

	<ul style="list-style-type: none"> - zooxanthellae (free-living and symbionts) see Scucchia et al 2021 and Jiang et al, in press <p>Can also be:</p> <ul style="list-style-type: none"> - amoebae, see Coleman 2020 - haptophytes, see Hama et al 2016 - radiolarians, see Alibrahim 2016
- sediment:	<p>Specifically referring to the microbiome living component of the sediment. Paper must specifically mention sediment. May also include any taxa that is specified in the paper.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Tangherlini et al 2021 - Suokhrie et al 2021 - Bernhard et al 2021
- sipuncula:	see Stubler and Peterson 2016 and Hermoso-Salazar et al 2013
- tardigrada:	Water bears see Sarmiento et al 2015
- tracheophyta:	see Chou et al, in press and Walden et al 2019
- virus:	see Malits et al 2021 and Danovaro et al 2017
- xenacoelomorpha	see Dupont et al 2012
- zooplankton:	Often an assemblage see Thangal et al 2021

3.2.2 PROCESSES AND PARAMETERS

These keywords are generally used in the context of a biological response but may also be mentioned in a methods paper that specifically examines the measurement of such a process.

calcification

Must have a rate.

If calcification rate is not measured do NOT use.

Examples:

- Rate: (dry mass (CaCO₃ or C)/time unit) [mmol/m²/h, g/m²/h...]
- ΔPIC, PIC production (PIC/time unit)
- Percent weight increase/month (skeletal weight)
- Alkalinity anomaly (A_T down), buoyant weight methods etc.
- [Ulrich et al 2021](#)
- [Hendrickx et al 2021](#)
- [Zerveas et al 2021](#)
- [Cornwall et al 2021](#)

<p>primary production</p>	<p>Must have a rate. If rate is not measured do NOT use.</p> <p>Examples:</p> <ul style="list-style-type: none"> - <u>Rate</u>: (O₂/time unit, CO₂/time unit, C/time unit), carbon fixation, ¹⁴C uptake, ΔPOC, POC production (POC/time unit) - Kroeker et al, in review - Davis et al 2021 - Kolzenburg et al 2021 - Perez e al 2018
<p>photosynthesis</p>	<p>Does not need a rate (also look to see if rate for primary production is used).</p> <p>Examples:</p> <ul style="list-style-type: none"> - <u>Underlying biological mechanisms</u>: CA activities, CCM, Fv/Fm... - Scucchia et al 2021 - Kessouri et al 2021
<p>growth</p>	<p>If cell division or linear extension rate(s) are NOT measured, then keyword used is “morphology”.</p> <p>Examples:</p> <ul style="list-style-type: none"> - <u>Pelagic</u>: Cell division rate (μ) - Growth rate (e.g. g/m³/d) - Linear extension (e.g. cm/yr) (for benthic organisms). For example, length or weight increase per time unit of the same organism. Growth of one organism (different from comparing 2 organisms’ sizes at the end of the experiment). - Kwan et al 2021 - Bednaršek et al 2021 - Pereira et al 2019 - Parker et al 2010
<p>reproduction</p>	<p>Any time early life stages are studied, even if the focus is not principally recommendation such as when larvae are used in a laboratory experiment.</p> <p>Terms may include:</p> <ul style="list-style-type: none"> - fecundity - hatching, see Thangal et al 2021 - fertilization - reproductive fitness - embryonic development, see Kaviyarasan et al 2020 - recruitment/settlement, see Kluibenschedl, in press - mating behaviours like courtship - fish settlement competency, see Holmberg et al 2019
<p>performance</p>	<p>Performance should generally be active and not passive. Does not include reproductive behaviours.</p> <p>Terms may include:</p>

	<ul style="list-style-type: none"> - swimming - locomotory scope - motility - risk behaviour - avoidance behaviour - righting response - stress response/resistance - feeding behaviour/rates/activity <p>Examples:</p> <ul style="list-style-type: none"> - Bednaršek et al 2021 - Ericson & Ragg 2021 - Wang et al, in press
dissolution	<p>Any terms referring to dissolution of calcifying organisms, including bioerosion.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Cornwall et al 2021 - Lardies et al 2021 - Dove et al 2020
nitrogen fixation	<p>Nitrogen fixation only. Nitrification etc. goes under “otherprocess”.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Zheng et al 2021 - Singh et al, in press - Fernández-Juárez et al, in press
physiology	<p>Any physiological process or measurement which doesn't already have its own keyword (e.g. photosynthesis, primary production, respiration, calcification...)</p> <p>Examples:</p> <ul style="list-style-type: none"> - metabolism - acid-base balance - immune response - aerobic and anaerobic respiration - oxygen content - thermal tolerance - ion regulation - protein and RNA synthesis - lipid class composition - toxicant concentrations - Gibbs et al 2021 - Meseck et al 2021 - Sokołowski et al 2021 - energy budgets - intracellular pH - immune suppression - metabolic rate - apoptosis - heart rate/activity - enzyme activities - carotenoid synthesis - fatty acid composition
respiration	<p>Oxygen and CO2 levels as indicator measurements. Check if physiology and metabolism are included. Both should be used.</p>

	<p>Examples:</p> <ul style="list-style-type: none"> - Dellisanti et al 2021 - Schubert et al 2021 - Dove et al 2020
mortality	<p>Any time survival is measured. see Hurst et al 2021</p>
morphology	<p>Any morphological change or features, including growth by weight and volume.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Morphology, morphometry <p>(shape, shell or body (org.) weight or length at a given moment/stage (no rate), i.e. comparison of SIZE of different organisms subjected to different conditions, at a given moment). See Parker et al 2010 for a clear example.</p> <ul style="list-style-type: none"> - Skeletogenesis/shell formation but no rate (e.g. number of spines...). - Morphological differences (e.g. scanning electron photographs), - abnormalities... - Observations of coccolith weights (<i>e.g.</i> Beaufort et al 2008 and Beaufort et al 2007). For example, field studies (Marshall et al 2008).
adaptation	<p>(formerly under otherprocess) – entry as keyword on 26 November 2010.</p> <p>Used for papers related to:</p> <ul style="list-style-type: none"> - Adaptation, - Acclimation (including evolutionary). <p>The keyword “otherprocess” is kept for these papers. If statistical analysis is done with papers added prior to this date, this keyword cannot be used, “otherprocess” must be used instead.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Lardies et al 2021 - Wang et al 2021 - Gravili et al 2021 - Leung et al 2021 - Zerveas et al 2021 - Uthicke et al, in press - Fitzer et al 2019
community composition	<p>(formerly under otherprocess) – entry as keyword on 14 August 2009.</p> <p>Used for papers related to:</p> <ul style="list-style-type: none"> - Relative abundance of <p>Plankton, Diversity, Biodiversity, Competition, Community composition.</p> <p>The keyword “otherprocess” is kept for these papers.</p>

	<p>If statistical analysis is done with papers added prior to this date, this keyword cannot be used, “otherprocess” must be used instead.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Suokhrie et al 2021 - Gravili et al 2021 - Bernhard et al 2021 - Maggione et al, in review
<p>abundance</p>	<p>(formerly under otherprocess) – entry as keyword on 12 May 2012.</p> <p>Often in combination with community composition.</p> <p>The keyword “otherprocess” is kept for these papers.</p> <p>If statistical analysis is done with papers added prior to this date, this keyword cannot be used, “otherprocess” must be used instead.</p> <p>Examples:</p> <ul style="list-style-type: none"> - Malits et al 2021 - Tangherlini et al 2021 - Ragazzola et al 2021 - Becherucci et al, in press
<p>otherprocess</p>	<p>Any process which is not covered by the keywords above.</p> <p>Try to generally avoid this keyword unless using community composition, abundance and adaptation.</p> <p>Examples:</p> <ul style="list-style-type: none"> - deMayo et al 2021 - Jiang et al, in press - Tai et al 2021

3.2.3 LABORATORY AND FIELD METHODS

<p>laboratory</p>	<p>Any studies / experiments which entirely occur in the lab or in a controlled field environment.</p> <p>Does not include computer modeling or instrument testing (methods).</p> <p>Examples:</p> <ul style="list-style-type: none"> - Loeppky et al 2021 - Page et al 2021
<p>field</p>	<p>Examples:</p> <ul style="list-style-type: none"> - cruises - on-site experiments - observation - shipboard experiments, etc. - Johnson et al 2021 - Pérez et al 2021

	<p>A study may include both laboratory and field keywords have the three sub-keywords below (also listed earlier):</p>
<p>mesocosms:</p>	<p>Field mesocosms and lab when the word mesocosm is explicitly used in the paper. see Tew et al 2021</p>
<p>molecular biology:</p>	<p>ONLY for experimental studies. Examples:</p> <ul style="list-style-type: none"> - gene expression - genetic diversity - DNA - RNA - Luo et al 2021 - Wang et al 2021
<p>vents:</p>	<p>Any study that takes place on or near vents or studies organisms collected from vents. See Barruffo et al 2021</p>
<p>multiple factors</p>	<p>Must also use the sub-keyword(s) that describe the additional factors. All factors must be manipulated, simultaneously with each other to use this keyword. The other factors considered (ONLY for “biological response” experimental papers). The OA-ICC will continue to name and add any new factors studied in combination with OA conditions to this list.</p> <p>Sub-keywords (parameters of a change that are manipulated so that the organism is responding to this change, alongside with OA):</p> <ul style="list-style-type: none"> - temperature - salinity - oxygen - fishing pressure - metals - predation - substrate - flow - noise - origin - communityMF (community composition; the “communityMF” keyword reflects that this is a sub-keyword of the “multiple factors” category, since community composition already exists as a keyword of its own). see Guy-Haim et al 2020, Doo et al 2020 and Stumpp et al 2020. <ul style="list-style-type: none"> - light - nutrients - toxicants - pathogens - bioturbation

3.2.4 GEOGRAPHY

Select the geography of the study area(s) (collection site of the organism).

Can include multiple ocean basins. For sites bordering two oceans pick the closest or use both. If study is global do not use any geography keywords.

This is only used when a geographical region is clearly indicated. It is not used for organisms that have been cultured for a long time in the laboratory.

Keywords:

- North Atlantic	- South Atlantic	- Black Sea
- North Pacific	- South Pacific	- Red Sea
- Arctic	- Antarctic	- Indian
- Baltic	- Mediterranean	

For **'biological response'** and **'field'** use the field study location(s).

For **'biological response'** and **'laboratory'** use the location organisms were collected (often you will need to read the methods to find this). Only use geography keywords if organism was collected from the wild. Aquaculture, laboratory culture, cell culture, aquarium or other does not count.

3.2.5 PEER REVIEWED AND NOTSTAT

We include in the blog and bibliography some discussion papers which are not peer reviewed OR which do not have any statistical data. **For example**, short communications.

If the paper is peer reviewed and has data, this keyword does NOT apply.

Note: that this keyword is all caps.

NOTSTAT

Articles that have not undergone peer review or peer-reviewed short communications or research notes without statistical data.

Articles that have not yet undergone peer review (so-called discussion papers, which are currently in peer review) and similar papers.

Biogeosciences discussions is the most common case for this keyword.

3.2.6 MISCELLANEOUS

- Papers that only briefly mentions ocean acidification are **NOT ADDED** to the Biblio database.
- Papers that discuss ocean acidification briefly, are given the keywords **"ocean acidification"** and **"NOTSTAT"**.
- Reports and non-peer reviewed documents are given the keyword **"NOTSTAT"**.
- Discussion papers (BGD etc.) are given the keyword **"NOTSTAT"**.
- Submitted articles are not included.
- Address: EU reflects Europe, not the European Union.
- The type **"Conference Proceedings"** are **ONLY** used for oral and poster presentations, and shorter meeting reports and are not taken into consideration for statistical analysis. Important conference

proceedings (that should be included in the statistical analysis) are placed in “**Books**” or “**Book chapters**” or “**Journal**”.

- The type “**Report**” is only used for reports which should not be taken into account in the statistical analysis.
- **EPOCA keywords:**
 - **epoca paper**
 - **epoca oral**
 - **epoca** (newsletters, FAQ etc., products which are not peer-reviewed papers)
 - **epoca poster**
 - **epoca thesis**

Comments, problems, missing references?

We are grateful for suggestions for improvement. Please send your feedback to the OA-ICC point of contact for the biblio: OAICC.Contact-Point@iaea.org

How to cite the bibliographic database

To cite this database, please use similar wording to the example below:

“For this study we relied on the bibliographic database from the IAEA Ocean Acidification International Coordination Centre (OA-ICC) updated from (Gattuso and Hansson, 2011).”

On the OA-ICC

As research activities on ocean acidification and related stressors continue to develop, there is a growing need for international collaboration and coordination. Following a call by leading scientists for an international effort to coordinate, promote and facilitate science and related activities concerning ocean acidification, the Ocean Acidification International Coordination Centre (OA-ICC) was established by the IAEA, with direct and in-kind contributions from several of its Member States and key international projects. The OA-ICC promotes overarching international activities to serve not only the scientific community but also science users, including policy makers, media, and the general public. Among its activities, the OA-ICC is helping to establish an international observing OA network, promoting joint use of research platforms and experiments, stimulating collaboration between natural and social sciences, facilitating updates to recommendations for best practices, building science capacity especially in developing countries, and communicating science to non-scientists. Its related science products include

(1) the *OA-ICC news stream* (news-oceanacidification-icc.org) that informs scientists of recent publications, media coverage, meeting announcements, and jobs

(2) the *OA-ICC data compilation on the biological response to ocean acidification* that provides easy access to regularly updated experimental data (<http://tinyurl.com/oaicc-data>) and

(3) the *OA-ICC bibliographic database* with currently more than 8,300 references that include citations, abstracts and keywords to simplify searches and bibliographic statistical analysis

For more information about the OA-ICC and its activities, please refer to the OA-ICC web site (<https://www.iaea.org/services/oa-icc>).