#	Overall comments on the second draft of the second world ocean assessment (WOA II)		
	Section	**Comment**	**Responses**
Australia			
1		Australia considers that the first draft of the WOA II report is well written and has some useful policy recommendations, many of which Australia is aware of and addressing.	Noted, with thanks. While there are no direct policy recommendations, some implications for policies may flow from the facts reported.
2		Australia acknowledges that with a report as wide-ranging as this, some terms, such as 'sustainable', will be used in interchangeable ways. We suggest that as part of the overall review of the first draft, consideration could be given to clarifying the use of the term 'sustainable' when it is used in different contexts – such as whether it refers to ecological, economical, or social sustainability.	In general, "sustainable" and related words are used in the Assessment in relation to all aspects of the concept – environmental, social and economic. A note is being added to clarify this. The intention is to identify cases where some other meaning is intended.
3		Given the progress of ocean-related matters since the draft report was being developed, the draft could benefit from an overall review to incorporate latest relevant information over the past year, particularly over the first half of 2020. A number of recent main updates are highlighted in the relevant chapters below.	The process mandated by the arrangements endorsed by the General Assembly does not allow time for a further general review by writing teams to incorporate information that has become available since the main drafting was completed (i.e. across the first half of 2020). Specific points have been included where practical and where word limits placed on chapters can allow for the insertion of additional information.
EU			
4	**Comment 12 by the EU**	Observations and recommendation from the EU on the replies by UN colleagues:	Noted, with thanks.

	from 1st draft	- We would like to thank you for clarifying the length constraints on World Ocean Assessment text and we would like to confirm we fully understand the related concerns and accept that some of our comments have not been retained. From our side we also clarify comment 12 should be read as well as a resume of the main points raised in the whole of the text as regards air pollution from ships and its relevance in the Mediterranean Sea for the direct impacts on health (SOx NOx and primary and secondary PM), biodiversity, climate change and sea related economic activities. - In this context, we would like to thank you for having included in relevant chapters encompassing regional content relating to the EU Seas, the Mediterranean Sea and the work under the Barcelona Convention addressing the severe health and environmental pressures in the area and which to also reflect other States' concerns such as Greece (their comment 70, 147 et al.), Spain and France. We would like to stress this is very important for us. - In particular as regards Chapter 11, we would like to thank you as we understand that the proposals provided in the previous round of comments for the said chapter 11 – both text and references (See comment 1735 below) on Emission Control Areas have been taken into account. We would like to stress this is very important for us. We do apologise for some edit mistakes from our side but the text of the report is very voluminous and providing comments was quite challenging (we would be happy to help in shortening our proposed text if need be).	

Philippines			
5	**All discussions related to SDG 16**	While noting the writing team's comments, the Philippines reiterates its comments, amended as follows: The Philippines draws attention to the environmental impact of militarization and disputes on ~~territorial and~~ maritime boundaries. The South China Sea figures prominently in the WOA but is generally limited to an extolling of the expansion of maritime research and a rather passive take on climate change effects such as coral bleaching; the draft is ominously silent on the destruction of coral reefs as a result of island-building. The Philippines cites, as an example, the construction of the following sentence under Chapter 3 on the scientific understanding of the ocean: "Intensive expansion of marine research capability and capacity, including remote sensing and in situ platforms and land-based infrastructures, by the People's Republic of China (Xu and 47 Lei, 2019), has enhanced monitoring capacity in the South China Sea and adjacent seas. This has supported progress in regional cooperation in sustainable development and marine and climate research." To counter this incomplete and therefore misleading narrative, UNCLOS should be given more prominence in the draft by including it in all discussions related to SDG 16 (peace, justice and strong institutions) and highlighting, in consequence, the importance of adherence to the rule of law. Precisely since the assessment takes an expert-driven and evidence-based approach, the Philippines recommends	As said in response to similar comments on the first draft of the Assessment, such issues are outside the scope of the Regular Process. However, passages to which this comment is relevant have been reviewed and some amendments are being made. Additional text has also been included in section 9 on the importance of UNCLOS.

		inserting appropriate reference to the detrimental effects of escalation of tensions and militarization of ~~territorial and~~ maritime disputes on the marine environment in order to "de-politicize" the discourse, without naming any countries, by framing it within a global environmental and sustainable development context.	

#	Chapter 1: Overall summary		
	Section	**Comment**	**Responses**
Australia			
6	Key points	Suggest including a comment on the impacts of COVID-19 restrictions on ocean and coasts, both here and in a new section of the chapter.	Mention of COVID-19 and associated impacts had been included in the Joint Coordinators' Preface, together with specific material in relevant chapters (e.g. Chapters 1, 4 and 8C). As suggested, an additional keynote point has been included in Chapter 1, together with a sentence in the Introduction
7	Section 2: Drivers, point c	The link between technological advances and oversubscription of fisheries seems tenuous. Technology is definitely helping fishers be more efficient and work farther afield, but it is failure of management that leads to overfishing and oversubscription in fisheries. Perhaps something like deep-sea mining or deep oil and gas extraction which rely more directly on technology would be better examples here?	The text has been amended to point out that the technological improvements **enable** the benefits or disbenefits, not automatically lead to them.
8	6.2 Hazards from the ocean	Climate change is not the only driver of hazards from the ocean. The other key driver would be tectonic activity which can trigger tsunami. Tsunami can also be triggered by	A phrase has been added to make clear that this section is dealing with threats that are increasing, and that there are other threats (such as

		submarine landslides and submarine volcanism. All coastal communities have some risk due to tsunami, the risk increasing with proximity to a subduction zone/active ocean trench. Although these events are relatively rare compared to seasonal hazards like tropical cyclones, the impacts can be devastating and widespread as was observed with the 2004 Indian Ocean Tsunami and the 2011 Tohoku tsunami.	tsunamis) that are continuing.
9	Section 6.2: Hazards from the ocean	Should note sea-level rise as a potential major driver of coastal erosion.	A sentence has been added on the potential problem.
10	Section 7.2: Marine capture fisheries	This section cites research about the estimated increase in landings – citation needed. Section introduces a key point also reiterated in chapter 15 – that is, with appropriate management and governance stocks could be rebuilt within a ten year recovery timeframe. Citation needed, particularly if it is a key premise of the Chapter 15 outlook. Statement seems general in nature and likely gives false hope. More specifically, 'rebuilding' occurs according to a set of objectives which becomes relevant to the recovery period. Our experience in RFMOs (and probably domestic fisheries?) shows us that a rebuilding objective can take a long time – in some cases 20, 30 or more years.	Given that chapter 1 is summarising the content of chapters, citations are not provided. Rather, the reader is referred to the relevant chapter, where the necessary citations are provided. The text notes that research has identified that, if appropriate governance structures are put in place, rebuilding of overfished stocks *could occur over a median period* of 10 years. Depending on the fishery and the governance framework applied, this recovery period therefore could be shorter or longer than 10 years.
11	Section 7.3: Aquaculture	Could note the negative impacts on benthic environments that can arise from aquaculture.	Given that chapter 1 is summarising the content of chapters, it is important that material that is not included in chapters is not inserted

			here. Chapter 16 (Aquaculture) has not noted any developments beyond those that were already covered in WOA1 in respect of degradation to benthic environments by aquaculture.
12	Section 8.5: Tourism and recreation	Infrastructure for cruise ships is also a growing issue in developing countries.	See reply to comment 11. Chapter 8C (Maritime Industries) (which covers cruise ships) has not noted any developments in issues relating cruise-ship infrastructure beyond those covered in WOA I.
13	Section 9.3: Implementation and regulatory gaps	'*Many small island developing States and least developed countries lack the detailed knowledge and skilled human resources needed for ocean management because of the large 10 ocean areas under their jurisdiction and their limited resources and capacity*.' Suggest reframing this statement – while capacity is an issue in SIDS, the current construction could be construed as being insensitive.	The section has been rephrased to try to limit the possibility of it being construed as insensitive.
Brazil			
14	4.3 open ocean and deep sea, line 4	***Sargassum*** is in Italic and capital S (is a macroalgae taxon genus)	Corrected
15	7.4 seaweed production, line 5	Nutr**A**ceuticals, instead "I"	Corrected.
16	7.4 seaweed production, line 6	Delete "vegetable" (algae are not vegies). Chlorophyta is the only group with evolutionary relationship with terrestrial plants	Deleted

EU			
17	**Comment 51 by the EU**	• However, many pressures from human activities continue to degrade the ocean, 12 including important habitats such as mangroves and coral reefs. Pressures include 13 Atmospheric emissions polluting the air and those associated with climate change also leading to acidification and eutrophication of oceans; unsustainable fisheries, including illegal, 14 unreported and unregulated (IUU) fishing; introduction of invasive species; …… We believe that 'Atmospheric emissions both polluting the air and altering climate change' are both very relevant in causing ocean acidification (SOx and CO2) and eutrophication (NOx) with major impacts on ocean biodiversity (beyond of course the health impacts avoided by reducing SOx NOx which are the precursors of very harmful particulate matter,s adding up to those produce directly, and ozone. Therefore, as also other commenters refer to this issue, we would suggest you to reconsider the proposed edit as it does not lead in our view to a significant expansion of text.	A phrase ("atmospheric pollution leading to acidification and eutrophication") has been added to the keynote point.
18	**Comment 52 by the EU**	With apologies, we confirm the comments/edits pertain only to paragraph 22	Noted, with thanks.
Japan			
19	P7 4.2. Coastal ecosystems	About 6 per cent of known fish species are listed as threatened or vulnerable, including 50 per cent of sharks and other elasmobranchs. Globally, the status of marine mammals varies, with 75 per cent of species in some groups (sirenians, freshwater dolphins, polar bears and otters) threatened or vulnerable. Many large whale species are now recovering from past harvesting as a result of international bans on commercial catches and national recovery plans. Should be changed to About 6 per cent of known fish species are listed as threatened	The paragraph is summarising, among other things, Table 3 of Chapter 6C (Fish). The proportion of elasmobranch species that are threated or vulnerable has been corrected ("nearly 30 per cent") to align with the data in that table. The reference to "sharks and other elasmobranchs" has been amended to refer only to elasmobranchs, since this is the terminology used in the table.

		or vulnerable, including many species of sharks and other elasmobranchs. Globally, the status of marine mammals varies, with 75 per cent of species in some groups (sirenians, freshwater dolphins, polar bears and otters) threatened or vulnerable. Many large whale species are now recovering from past harvesting as a result of international prohibition of catches and national recovery plans. (Justification) Although the response of the Group of Experts says "The percentage is given by the experts…", it has to be noted there are variety of opinions in this regard. It seems inappropriate to adopt only one specific opinion without concrete scientific evidence. A neutral description should be used in order not to mislead readers. IWC has never ever adopted "bans on commercial catches" but prohibited catches of some whale species fallen in dangerous state. It has to be also noted that when so-called moratorium on commercial whaling was adopted in 1982, such prohibitions had been already in effect and therefore the so-called moratorium was just redundant.	Amendment made to the description of measures associated with whaling.
20	P13 7.2. Marine capture fisheries	Estimated global landings of marine capture fisheries increased by 3 per cent to 80.6 million tonnes, valued at 127 billion United States dollars (in 2017 prices) between 2012 and 2017. About 33 per cent of world fisheries, especially at higher trophic levels, are classified as being fished at biologically unsustainable levels, with close to 60 per cent "maximally fished". The sustainability of many of the world's capture fisheries continues to be hampered by over-exploitation, overcapacity, ineffective management, harmful subsidies, by-catch, in particular of threatened endangered and protected	Amended to use the phrase "maximally sustainably fished" to reflect the term used in Chapter 15 (Capture Fisheries).

		species, and illegal, unreported and unregulated (IUU) fishing, with ongoing habitat degradation and loss of gear creating further pressures on the marine environment. Should be changed to Estimated global landings of marine capture fisheries increased by 3 per cent to 80.6 million tonnes, valued at 127 billion United States dollars (in 2017 prices) between 2012 and 2017. About 33 per cent of world fisheries, especially at higher trophic levels, are classified as being fished at biologically unsustainable levels, with close to 60 per cent "maximally fished" <u>at biologically sustainable levels.</u> The sustainability of many of the world's capture fisheries continues to be hampered by over-exploitation, overcapacity, ineffective management, harmful subsidies, by-catch, in particular of threatened endangered and protected species, and illegal, unreported and unregulated (IUU) fishing, with ongoing habitat degradation and loss of gear creating further pressures on the marine environment. (Justification) In order to avoid any misunderstandings by readers on the unfamiliar expression of "maximally fished", similar clarification to "at biologically sustainable levels" should be used in accordance with the definition by FAO.	
Korea, Republic of			
21	p.16, line 5 in t he second draft of WOA II (pdf file) / Response to the #109 Re	→ The concept of the 'blue economy' is controversial among experts: some define the term as only socio-economic activities in the ocean, while others stress the sea's sustainable economic aspects. In light of the broad spectrum of the terminology, it is, therefore, desirable to highlight the efforts to abate carbon and pollutants	The emphasis here is on the sectors seeing specifically planned growth. However, as pointed out, established sectors can also be regarded as part of the "blue economy". A phrase has been

	p. of Korea comment	generated from marine economic activities. We thereby recommend including 'eco-friendly shipping' in the blue economy concept. We also recommend including 'sustainable fishing' as well, which has been recognized as primary example of the 'blue economy'.	added to make this clear.
22		**Blue Economy Definitions** According to the **World Bank**, the blue economy is the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem." **European Commission** defines it as "All economic activities related to oceans, seas and coasts. It covers a wide range of interlinked established and emerging sectors." **The Commonwealth of Nations** considers it "an emerging concept which encourages better stewardship of our ocean or 'blue' resources." Conservation International adds that "blue economy also includes economic benefits that may not be marketed, such as carbon storage, coastal protection, cultural values and biodiversity." The **Center for the Blue Economy** says "it is now a widely used term around the world with three related but distinct meanings- the overall contribution of the oceans to economies, the need to address the environmental and ecological sustainability of the oceans, and the ocean economy as a growth opportunity for both developed and developing countries."	

		A **United Nations** representative recently defined the Blue Economy as an economy that "comprises a range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable. An important challenge of the blue economy is to understand and better manage the many aspects of oceanic sustainability, ranging from sustainable fisheries to ecosystem health to preventing pollution. Secondly, the blue economy challenges us to realize that the sustainable management of ocean resources will require collaboration across borders and sectors through a variety of partnerships, and on a scale that has not been previously achieved. This is a tall order, particularly for Small Island Developing States (SIDS) and Least Developed Countries (LDCs) who face significant limitations." The UN notes that the Blue Economy will aid in achieving the UN Sustainable Development Goals, of which one goal, 14, is "Life Below Water".	
Philippines			
23	**2. Drivers**	While noting the writing team's comments, the Philippines reiterates its comments, amended as follows: The Philippines draws attention to the environmental impact of militarization and disputes on ~~territorial and~~ maritime boundaries. The South China Sea figures prominently in the WOA but is generally limited to an extolling of the expansion of maritime research and a rather passive take on climate change effects such as coral bleaching; the draft is ominously silent on the destruction of coral reefs as a result of island-building. The Philippines cites, as an example, the construction of the	See the responses to comments 5 and 33.

		following sentence under Chapter 3 on the scientific understanding of the ocean: "Intensive expansion of marine research capability and capacity, including remote sensing and in situ platforms and land-based infrastructures, by the People's Republic of China (Xu and 47 Lei, 2019), has enhanced monitoring capacity in the South China Sea and adjacent seas. This has supported progress in regional cooperation in sustainable development and marine and climate research." To counter this incomplete and therefore misleading narrative, UNCLOS should be given more prominence in the draft by including it in all discussions related to SDG 16 (peace, justice and strong institutions) and highlighting, in consequence, the importance of adherence to the rule of law. <u>Precisely since the assessment takes an expert-driven and evidence-based approach, the Philippines recommends inserting appropriate reference to the detrimental effects of escalation of tensions and militarization of ~~territorial and~~ maritime disputes on the marine environment in order to "de-politicize" the discourse, without naming any countries, by framing it within a global environmental and sustainable development context.</u>	
24	**7.5 Key knowledge and capacity-building gaps**	The Philippines notes that there is currently a global seaweed project which addresses knowledge and capacity-building gap, as it focuses on safeguarding the seaweed industry especially in developing countries. (http://www.globalseaweed.org/)	A reference to this project has been inserted after "Many knowledge gaps remain with regard to the large-scale production of seaweeds and likely impacts of climate change, <u>although there are global efforts to address these knowledge</u>

			and capacity-building gaps". A paragraph has also been added in Chapter 17, Section 6.

#	Chapter 2: Approach to the assessment		
	Section	**Comment**	**Responses**
		Australia	
25	Section 4: Use of terminology	Definitions for key terms "continental shelf", "open ocean", "deep sea" and "areas beyond national jurisdiction" are noted and agreed.	Noted, with thanks.
		Philippines	
26	**2.4. Changing governance structures and geopolitical instability**	While noting the writing team's comments, the Philippines reiterates its comments, amended as follows: Consistent with our comment on Chapter 1(2) on Drivers, we suggest that the following language be added: "Where there is conflict over access to resources and property rights, policies and agreements focused on sustainability can be undermined by such conflicts (Suarez-de Vivero and Rodriguez Mateos, 2017). Escalation and militarization of maritime ~~and territorial~~ conflicts adversely impact marine environmental protection, food sustainability and economic activity."	As explained in our responses to States' comments on the first draft of WOA II, the AHWGW has made clear that the Regular Process should not undertake policy analysis. The suggested passage is focused on policy, and is therefore outside the scope of the Regular Process as defined by the AHWGW.

#	Chapter 3: Scientific understanding of the ocean		
	Section	**Comment**	**Responses**
		Australia	
27	Section 3.5 Noise GBRMPA Synthesis and Reporting	Sentence at line 22 "Understanding of the impacts of anthropogenic noise on marine biodiversity 22 has increased over the last two decades, with a range of direct and indirect impacts observed across a number of taxa." Should be supported with references. A relevant reference for the Great Barrier Reef which could be used can be found here (http://hdl.handle.net/11017/3245)	This comment appears to relate to section 3.5 of Chapter 1 (Summary). As pointed out in relation to comment 10, Chapter 1 is summarising the various chapters. Citations are therefore not given in chapter 1, but the reader is referred to the chapters where full citations are given, as is done in this section, with a reference to Chapter 21.
28	Section 2: Description of changes in the data …	Suggest noting the significance of the Nippon Foundation-GEBCO Seabed 2030 project: the new data will improve oceanographic modelling and better inform the management of seabed environments.	The chapter (as are all chapters of WOA2) details changes in understanding since WOA1. The GEBCO Seabed 2030 project is yet to produce outputs that have been uptaken and have clearly improved ocean models, that could be incorporated into an assessment of changes in understanding since WOA1. Note that this project has been mentioned in this section in regard to the potential data it can provide.
29	Section 3.7: The Southern Ocean	This paper may be relevant to this section 2020 Hindell MA, Reisinger RR, Ropert-Coudert Y, Huckstadt LA, Trathan PN, et al., 'Tracking of marine predators to protect Southern Ocean ecosystems', Nature, 580, (7801) pp. 87-92.	Thank you for the reference. Unfortunately due to word limits placed on chapters, all studies that might have been conducted since WOA1 cannot be included in the chapter. In this regard, citations that directly support the text have been

			included.
30	Section 5: Key remaining knowledge gaps And/or Section 6: Key remaining capacity-building gaps	We also currently don't integrate data sets well to better understand systems. For example, physical and chemical processes likely have flow on effects for biological elements of ocean ecosystems, but we rarely integrate data streams to try to understand these interactions.	Section 6 identifies the need for "further integration of multidisciplinary observations"
31	Section 5: Noise	Sentence at line 22 "Understanding of the impacts of anthropogenic noise on marine biodiversity 22 has increased over the last two decades, with a range of direct and indirect impacts observed across a number of taxa." Should be supported with references. A relevant reference for the Great Barrier Reef which could be used can be found here (http://hdl.handle.net/11017/3245)	See the response to comment 27.
Colombia			
32	**Key remaining knowledge gaps**	We suggest including a comment on the utility of non-official information to understand user behavior and activities on the sea, by different economic sectors (page 43).	It is not clear what is being referred to in terms of "non-official information". However the section does refer to the need to respectfully acknowledge and integrate traditional forms of knowledge.
Philippines			
33	**3.5 The North Pacific Ocean**	While noting the writing team's comments, the Philippines reiterates its comments: The Philippines draw attention to the environmental impact of militarization and disputes on ~~territorial and~~ maritime	As identified in comments made in response to the first review by member States, these issues are outside the remit of the Regular

		boundaries. The South China Sea figures prominently in the WOA but is generally limited to an extolling of the expansion of maritime research and a rather passive take on climate change effects such as coral bleaching; the draft is ominously silent on the destruction of coral reefs as a result of island-building. The Philippines cites, as an example, the construction of the following sentence under Chapter 3 on the scientific understanding of the ocean: "Intensive expansion of marine research capability and capacity, including remote sensing and in situ platforms and land-based infrastructures, by the People's Republic of China (Xu and 47 Lei, 2019), has enhanced monitoring capacity in the South China Sea and adjacent seas. This has supported progress in regional cooperation in sustainable development and marine and climate research." To counter this incomplete and therefore misleading narrative, UNCLOS should be given more prominence in the draft by including it in all discussions related to SDG 16 (peace, justice and strong institutions) and highlighting, in consequence, the importance of adherence to the rule of law. Precisely since the assessment takes an expert-driven and evidence-based approach, the Philippines recommends inserting appropriate reference to the detrimental effects of escalation of tensions and militarization of ~~territorial and~~ maritime disputes on the marine environment in order to "de-politicize" the discourse, without naming any countries, by framing it within a global environmental and sustainable development context.	Process and their inclusion in this chapter therefore inappropriate. The importance of UNCLOS as the legal framework within which all activities in the oceans and seas must be carried out is highlighted in Chapters 1 and 31 and is beyond the scope of this chapter.

Portugal			
34	**End of the 1st paragraph if the Introduction to Chapter 3**	The Portuguese Government would kindly draw your attention to the importance of including, at the end of the first paragraph of the Introduction to Chapter 3, a reference to the Atlantic International Research Centre (AIR Centre), following the same rationale regarding the reference to the All-Atlantic Ocean Research Alliance. The AIR Centre is also a science diplomacy effort at the Atlantic level to promote marine research and innovation, and therefore we would appreciate that a reference to it is included in WOa ii. As the All-Atlantic Ocean Research Alliance is mentioned twice in the same place (footnotes 19 and 20), we would suggest replacing footnote 20 with https://www.aircentre.org	In the interests of not providing reference to initiatives from exclusively one region we have amended the footnotes to reflect an example from the Atlantic and an example from the Pacific.

#	Chapter 4: Drivers		
	Section	**Comment**	**Responses**
Australia			
35	Section 2.5: Climate change: Page 49, line 18.	Suggest authors use the title of the report: 'The IPCC Special Report, The Ocean and Cryosphere in a Changing Climate' Page 49 line 29: There is no Chapter 9 in the IPCC report, this should read 'Cross-Chapter Box 9'.	The text is referring to the topic that the report covers, it does not need to refer to the full title of the report, just as it doesn't for any other reference cited. Reference to a chapter 9 of the IPCC report is not included in the text. Perhaps the reviewer is confusing the reference to Chapter 9 of WOA2 with that to the IPCC report. Referencing to chapters of the assessment has been clarified in the text.
36	Section 2.5: Page 49, line 29.	There is no Chapter 9 in the IPCC report, this should read 'Cross-Chapter Box 9'.	Reference to a chapter 9 of the IPCC report is not included in the text. Perhaps the reviewer is confusing the reference to Chapter 9

			of WOA2 with that to the IPCC report. Referencing to chapters of the assessment has been clarified in the text.
37	Section 5: Key remaining knowledge and capacity-building gaps	One thing that is not present here is the potential use of oceans as clean energy sources. Are there potential implications of turbines and other in water infrastructure on habitats and species? Do we understand how these energy systems might alter ocean ecosystems?	The second paragraph of this section identifies the need to develop approaches to "explore the effects of multiple drivers and their cumulative effects on marine ecosystems" and "allow for the planning and implementation of sustainable approaches to the use of the ocean". This includes all potential uses of the ocean. Given the word limits placed on all chapters, it is impossible to unpack both considerations (impacts and sustainable pathways) for all potential uses of the ocean and include those assessments in this chapter.

#	Chapter 5: Physical and chemical state of the ocean		
	Section	**Comment**	**Responses**
Australia			
38	Keynote points	The first point should be expanded to specify thermal expansion, e.g.: "Thermal expansion from a warming ocean, together with land ice melt, are the main causes …"	Done.
39	Introduction	Should this set the scene with the past/palaeorecord? E.g.:	The chapter focuses on recent changes.

		• Large changes in sea level are generally a result of changes in the size of the ice sheets • Over the glacial cycles of the past 800,000 years, sea level varied by more than 120 metres. • During past warm periods, sea level was metres above present-day values. For example, sea level was between about 5 metres and 10 metres above current levels during the last interglacial (warm) period (129,000 to 116,000 years ago). During this time, global average surface temperatures were less than 2°C warmer than just before the mid-19th century. • During cold periods, major ice sheets formed over North America and northern Europe and Asia and increased in size in Antarctica. As a result, sea level fell to more than 120 metres below present-day values. • After the last glacial maximum about 20,000 years ago, sea level rose at over 1 metre/century for many thousands of years (with peak rates of about 4 metres/century) as these ice sheets decayed. About 6,000 years ago sea levels stabilised with only small rates of change over the last thousand years.	
40	Section 2.7: Sea ice	Overall: There is considerable variability in the maximum and minimum sea-ice extent in the Arctic and Antarctic. Perhaps a range should be included (e.g. Antarctic maximum extent of 19-20 x 10^6 sq. kms). And there is certainly no need to include the decimal place (e.g. 18.5 x 10^6 sq. km should probably be written as 18 x 10^6 sq. km, given the large interannual variability).	Change to give a range for maximum extent.
41	Section 2.7: Sea ice	Overall: There are inconsistencies in citing observed extents. E.g. for the Arctic this is written as 6.4 million sq. km, whereas for the Antarctic this is written 18.5 x 10^6 sq. km.	Changed.

42	Section 2.7: Sea ice: Page 71, line 17.	"The trends in Antarctic sea ice are …" – should this be "The trends in Antarctic sea-ice extent are …"?	Added “extent”.
43	Section 2.7: Sea ice: Page 71, lines 18-20.	"Unlike in the 18 Arctic, the expected changes in sea ice due to climate change overall in Antarctica are muted 19 and may even be increasing." This sentence should probably be re-written – or perhaps deleted for a more enlightening explanation. Net Antarctic sea-ice extent showed a statistically significant increase from 1979-2015. From 2016 onwards, net Antarctic sea-ice extent has been consistently below average and set new record low values. Given that this sudden variability in Antarctic sea-ice cover is largely attributed to changes in the ocean mixed layer, it is highly relevant to expand this explanation. See for example, Meehl et al. 2019, and Reid et al. 2019. The net overall changes in sea-ice cover have been very regionally variable. Meehl, G. A., Arblaster, J. M., Chung, C. T. Y., Holland, M. M., DuVivier, A., Thompson, L., … Bitz, C. M. (2019). Sustained ocean changes contributed to sudden Antarctic sea ice retreat in late 2016. Nature Communications, 10(1), 14. https://doi.org/10.1038/s41467-018-07865-9. Reid, P., S. Stammerjohn, R. A. Massom, S. Barreira, T. Scambos, and J. L. Lieser, 2019: Sea ice extent, concentration, and seasonality [in “State of the Climate in 2018”]. Bull. Amer. Meteor. Soc., 100 (9), S178-S181.	Changed as suggested. References added.
44	Section 2.7: Sea ice: Page	A dichotomy is drawn between trends in Arctic and Antarctic sea-ice cover. However, the contrast is difficult to understand in this context. It is suggested that Antarctic sea-ice cover is	I added “The 40-y record reveals gradual Antarctic sea ice increases

	71, lines 20-24.	limited in its expansion during winter by the ACC and during summer its retreat is limited by the continental edge – both statements are true. But the analogy breaks down when you ask why the winter-time Antarctic sea-ice cover is not reducing – as it is in the Arctic. Accordingly, the dichotomy statement needs to be better explained or removed and replaced with a suitable explanation of the contrasting trends. Perhaps Parkinson, 2019, or Stammerjohn et al. 2012. Parkinson, Claire L. "A 40-y record reveals gradual Antarctic sea ice increases followed by decreases at rates far exceeding the rates seen in the Arctic." would be of assistance. See also: Proceedings of the National Academy of Sciences of the United States of America 116 (2019): 14414 – 14423; and Stammerjohn, S., R. Massom, D. Rind, and D. Martinson. 2012. Regions of rapid sea ice change: An inter-hemispheric seasonal comparison. Geophysical Research Letters 39, L06501, http://dx.doi.org/10.1029/2012GL050874.	followed by decreases at rates far exceeding the rates seen in the Arctic." to the end of the paragraph.
45	Section 2.7: Sea ice: Page 71, lines 24-27.	Please note that while the text over these lines refers to trends in sea-ice extent, the figure used to explain these trends (Figure 10) shows trends in sea-ice concentration. The two are not synonymous.	Added "concentration" to clarify what is shown in the figure.
46	Section 2.7: Sea ice: Page 71, lines 27-29.	This sentence is unclear – suggest rephrasing to improve clarity.	Done.
47	Section 2.7: Sea ice: Page	This figure is rather crude and probably needs to be reproduced at a higher quality.	Attached higher resolution image to email.

	72, Figure 10.		
48	Section 2.7: Sea ice: Page 72, line 10.	Suggest a reference of Massom et al. 2018. Massom, R.A., T.A. Scambos, L.G. Bennetts, P. Reid, V.A. Squire, and S.E. Stammerjohn, 2018: Antarctic Ice shelf disintegration triggered by sea ice loss and ocean swell. Nature. 558, 383-389, doi:10.1038/s41586-018-0212-1.	Included.
Colombia			
49	**Introduction**	According to the profile users who consult the WOA (experts, students, educators, decision makers) we suggest including a glossary, add references or to explain very briefly at the beginning of the chapter, what meaning each climate change indicators. You could unify the references format in "and others" or "*et al.*"	References are given for each indicator. "and others" is the UN editor´s choice.
50	**Introduction**	Considering that the seven variables presented are key indicators of climate change, it should be included a diagram, where the variables that have an effect on them could be visualized, as well as which ones that have been more studied and require additional studies to overcome the information gaps.	There is a limit to the number of tables and figures that can be included in each chapter.
51	**Introduction**	It should include the relationship between these key indicator of climate change regarding the impact of the SDGs	Done in chapter1.
52	**Sea level**	Due to sea-level rise poses threats to many coasts, anthropogenic processes that will perturb the hydrological cycle and cause sea level change, can be considered.	Done in chapter 9.
53	**Ocean circulation**	It would be interesting if the authors could include influence ocean circulation and wind in the formation of the islands of garbage.	Marine litter is analysed in another chapter.

		Based on other research, the authors mention that AMOC has been weakening during the last century. We consider that it could be interesting to include a briefly explanation of the reason. We believe it is important to encourage the continuation of not only these great programs (Global Drifter Program and the Argo Program), but also regional and local programs of research.	An explanation is already given. This is a Global Assessment.
54	**Sea surface temperature**	We propose highlight the importance of strengthen local studies to identify that the local system masks global and regional processes.	This is a Global Assessment.

#	Chapter 6B: Marine invertebrates		
	Section	**Comment**	**Responses**
		Australia	
55	Section 3.2: Assessment and state of marine invertebrate biodiversity: Page 118, line 6.	Seems to be a repeat of part of an earlier dot point on previous pages.	Already deleted (this comment seems to be based on a previous version).
56	Section 4: International governmental responses: Page 121, lines	• Not clear what policy change implementation is being referred to. An expectation under what? Suggest replace with "In relation to the Great Barrier Reef in the South Pacific, a comprehensive joint-government strategy the	Text modified (this comment seems to be based on previous version).

	3-9.	Reef 2050 Long-term Sustainability Plan is directing investment into protection of the Reef and mitigation of pressures. To support this, an integrated monitoring, modelling and reporting program is under development to measure the condition of values over time and support future management decisions". • Replace *"…downgrading of the reef condition from.."* with the correct, more specific, *"downgrading of the outlook for the Reef's ecosystem..."* • Suggest giving 'reef' a capital letter when referring to the Great Barrier Reef as a whole. This is a style guide consideration. Replace *"Management Protection Authority"* with *"Marine Park Authority"*.	
57	References – Page 123, line 'GBR- (2019)'	• Author should be "GBRMPA" not just GBR For additional publication details, see http://elibrary.gbrmpa.gov.au/jspui/handle/11017/3474.	Text modified (this comment seems to be based on previous version).
Colombia			
58	**Description of the environmental changes (between 2010 and 2020). Figure 1.**	Add the meaning of the abbreviation IHO.	Added.
.59	**International and**	Organize the content by better relating the international and governmental responses to the	Text modified (This comment seems to be based on previous

	governmental responses. Recent governmental actions	pressures and drivers mentioned in the previous section. It seems that the only responses have been made with regard to bottom trawl fisheries.	version).
60	**Recent governmental actions**	Add the meaning of the abbreviation OECMs, which is mentioned for the first time.	Added.
Japan			
61	3. Description of the environmental changes (between 2010 and 2020) 3.1 Marine invertebrate biodiversity	"Sea-area between Japan and Korean Peninsula" needs to be replaced by "Sea of Japan", the only internationally established name for the sea area concerned. In fact, the United Nations (UN) recognized "Sea of Japan" as the standard geographical term in March 2004, and UN policy states that the standard geographical term be used in official UN publications. It does not make sense to refer to the labelling of a regional sea programme only here while other seas are defined by its established names. The ROK contends that the UN and the International Hydrographic Organization (IHO) have issued resolutions that advocate the name "East Sea" be used together with "Sea of Japan". However, neither UNCSGN Resolution III/20 nor IHO Technical Resolution A.4.2.6 includes any specific recommendation to use "East Sea" alongside "Sea of Japan". Further, these resolutions presume that the geographical feature concerned is under the sovereignty of two or more countries, such as in the case of a bay or strait, and does not apply to the high seas such as with the Sea of Japan. Following the ROK's assertion, if even one of the countries bordering the Atlantic or the Pacific were to raise an objection to the names of these oceans, it would lead to the use of multiple names for these	Comment 428 of the first round of comments from States alerted the Group of Experts to the fact that the approach used in World Ocean Assessment I (WOA I) for describing the waters in question had not been followed. The intention was that the designation used in WOA I should be used. Unfortunately, the designation was not followed precisely, and the term "sea area between Japan and the Korean peninsula" was used. The term is therefore being corrected to follow precisely the designation used in World Ocean Assessment I, that is "waters between Japan and the Korean peninsula". Account also needs to be taken of the disclaimer which will be included in World Ocean Assessment II, following that

		oceans, which would clearly be unmanageable. The international community cannot accept such an argument. Furthermore, as stated above the UN has already officially confirmed its policy of requiring the use of Sea of Japan as the standard geographical term in all official UN publications. The IHO publication "Limits of Oceans and Seas" (S-23) also uses the name Japan Sea for the sea area concerned. This demonstrates that there is no UN or IHO resolution recommending the use of "East Sea" together with “Sea of Japan”.	used in WOA I. This will make it clear that “The designations and the presentation of the materials used in this publication, including their respective citations, maps and bibliography, do not imply the expression of any opinion whatsoever on the part of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Also, the boundaries and names shown and the designations used in this publication do not imply official endorsement or acceptance by the United Nations.” The disclaimer goes on to state that “The contributions of the members of the Group of Experts and the Pool of Experts, who participated in the writing of the second world ocean assessment, were made in their personal capacity. The members of the Group and the Pool are not representatives of any Government or any other authority or organization.”

#	Chapter 6C: Fish						
	Section	Comment					Responses
Colombia							
62	**Documented change in fish biodiversity**	Line 5 of the paragraph change “speciec” by “species”					Done as requested.
63	**2.2 Ocurrences**	Line 3 of the paragraph change “incudes” by “includes”					Done as requested.
USA							
		From Page	From Line	To Page	To Line	Comment	Done as requested.
64	References	129	39	129	39	US comment on first draft: This study only looks at data deficient sharks in Europe. They make a case to extrapolate to world populations, but it hasn't been done. Authors: [No comment.] US comment on second draft: The Walls and Dulvy study, as noted in the Reference on pg 137 of the first draft WOA, confirms that this study was specific to Europe. **Suggested revision: “Ecological and trait-based methods for predicting the conservation status of DD species suggest that, at least for Europe’s sharks and rays, around a half to two-thirds of species in this category should also to be considered at risk of extinction (Walls and Dulvy, 2019).”**	Done as requested.

#	Chapter 6D: Marine mammals		
	Section	Comment	Responses
Australia			
65	Section 2: Cetaceans – Line 36-37	Direct take is not an ongoing threat to Antarctic minke whales following the cessation of Japan's Southern Ocean whaling.	As identified in comments made in response to the first review by member states, the threats listed in each section of this chapter are those that have been identified on the basis of the International Union for Conservation of Nature (IUCN) Red List assessments carried out by the IUCN Species Survival Commission Specialist Groups for cetaceans, pinnipeds, sirenia, otters and polar bears (as set out in Section 1 of the chapter). The text reflects what is contained in those assessments, noting that the WOA is to reflect current literature. A footnote identifying that this threat is likely to have reduced post cessation of whaling in Antarctic waters has been added.
66	Section 6.1: Consequences of change on human communities, economies and	Japanese catches in Antarctic waters no longer occur following their 2019 withdrawal from the whaling convention. Text reads as though this is ongoing. Japan is whaling only in their Exclusive Economic Zone.	It is not clear what text is being referred to given that the text reads: "Commercial catches in the western north Pacific have remained broadly stable since WOA I (IWC, 2019, catches taken under Special Permit) and catches

	well-being – Line 38-40		in Antarctic waters were suspended in 2019 (IWC, 2019)."
67	Section 6.1: Consequences of change on human communities, economies and well-being – Line 40-43	While NAMMCO manage more marine mammal species than the IWC (seals etc.), the global body (IWC) should be referenced before the regional agreement.	Text amended as suggested.
68	Section 7: Outlook	This section should mention the bio-accumulation of persistent organic pollutants including polychlorinated biphenyls (PCBs) in some cetaceans, and the possibility of population collapse for orcas. See https://science.sciencemag.org/content/361/6409/1373.abstract and others	Pollution is identified as a threat to a number of species under earlier sections of the sub-chapter and in particular has been raised as a threat to orcas in the first paragraph of section 2.2.2. There is therefore no need to repeat it again.
69	Section 9: Capacity building gaps	Could include the challenges in integrating regional, national, and international laws to protect migratory species (i.e. how range states can best collaborate).	Noted. Although this is a key challenge in managing highly dispersed and migratory species (not just marine mammals), word limits imposed on chapters preclude in-depth discussion of those challenges. Further, such a discussion and in particular identifying how range states can best collaborate might be interpreted as being policy prescriptive and/or making recommendations, which the WOA cannot do.

Colombia			
70	**1. Introduction**	Check punctuation, page 151: "….but also vertical (through the water column) and horizontal (between foraging and calving ground) vectors of nutrients (Roman and others, 2014). . Similar…" When talking about the new conservations challenges emerging from the "blue economies" is important to mention the threats and the actions taken. Also important to highlight the actions regarding specifically oil spills, due to its huge impact. Within ship strikes it is relevant to mention the propeller wounds and their impact on the animals affected (lost flukes, long term injuries, etc)	Text amended. The Introduction provides an overview of changes since the WOA1. It is not intended to provide a detailed description of threats or actions taken. Further, word limits imposed on chapters preclude in-depth discussion of those challenges. To the extent that is possible, given the word limits placed on the sub-chapter, these are covered in the following sections of the sub-chapter.
71	**2. Cetaceans**	Check species in italics, page 152: "…harvesting (common (B. acutorostrata) and Antarctic minke…" Check species in italics in section 2.2.2. Abundance and main threats. Pelagic toothed whales, dolphins and porpoises. It is worth to mention the status of the Amazon River dolphin in other areas of its distribution (not only Brazil) and point threats and managements taken.	All editorial/formatting changes to the italicising of species names have been corrected. While we would like to provide information on changes in population abundance of the Amazon River dolphin outside of Brazil, this is not readily available in the public or peer literature. See also response to comment 69.
72	**4. Sirenians**	Mention the impact of natural disasters over natural populations (as an example, hurricane María in 2017, over	If the member state can provide reference to the literature that

		Caribbean populations). Mention conservation measurements and ongoing projects that contribute to strengthen scientific research on those species.	identifies changes in abundance of populations as a result of natural disasters and conservation efforts being conducted, we will endeavour to include such evidence within the context of the word limits placed on the sub-chapter. We have not been able to find such literature in the public and peer domains.
Japan			
73	P150 Keynote points	The number of species for which a conservation status is available has increased, with eight species moving from a status of data deficiency as a result of new information. Of baleen whales, 36 per cent of species are increasing in abundance. Overall, the status of coastal dolphins, sirenians and marine otters is deteriorating, with the vacquita close to extinction. Many species lack population abundance information. Should be changed to The number of species for which a conservation status is available has increased, with eight species moving from a status of data deficiency as a result of new information. Of baleen whales, most of species are increasing or have increased in abundance. Overall, the status of coastal dolphins, sirenians and marine otters is deteriorating, with the vacquita close to extinction. Many species lack population abundance information. (Justification)	As identified in comments made in response to the first review by member states, replacing "36 per cent" of species with "the most" would give the idea that more than 50% of all species that have been assessed and assigned a conservation status have been identified as increasing, which is not what assessments and the literature reflect. The justification provided by the member state suggests that they are confusing numbers of species with numbers of individuals within a species, which is not what this sentence is referring to. As in the first response to this comment, this has therefore not been changed.

		It might be true that less than 50% of baleen whale species is "currently" increasing. But it has to be noted that other whale species such as Antarctic minke whale have increased substantially and are now not increasing any more. Under such situation, in order to avoid a misunderstanding that 64% of species is decreasing, comprehensive description adding those species that have already increased should be used.	
74	P150 Keynote points	Fisheries bycatch continues to be a dominant conservation threat for many species. Indirect threats such as habitat alteration, including overfishing of prey, land-based pollution, anthropogenic noise, ship strikes and disturbances are becoming more prevalent, particularly in coastal zones. Should be changed to Human activities continue to be a dominant conservation threat for many species. In addition to direct threats of Fisheries bycatch, indirect threats such as habitat alteration, land-based pollution, ship strikes and disturbances are becoming more prevalent, particularly in coastal zones. (Justification) As explained by the Group of Experts, there are a number of papers in the scientific literature that identify bycatch as a significant contributor to reductions of the populations of many species in the north Atlantic and north Pacific, where developed western countries have mainly conducted fishing activities and such bycatch have not been used. However, in other areas, such as temperate, sub-tropical and tropical areas, so-called bycatch are not categorized as such but instead treated as catch and used for food. In such areas, other causes such as habitat alteration	As identified in comments made in response to the first review by member states, there are many papers in the scientific literature that identify fisheries bycatch as the most important contributor to reductions of the populations of many species. Changing the text as requested would reduce the importance of this threat. Note that the text being referred to does not directly identify the north Atlantic and north Pacific as suggested by the reviewer, rather it reflects an overall assessment of threats globally. The text therefore has not been modified. Please also refer to the responses to comments 65 and 75.

		and pollution are as serious as bycatch or even more serious than bycatch. Therefore, in order to describe the both situations in balanced manner, all those contributors should be treated with the same level.	
75	P151 1. Introduction	Intentional takes for subsistence or for commercial harvest and bycatch and entanglement in other fisheries continue to be identified as the main conservation threats for all groups of marine mammals under assessments conducted by the IUCN (Figure 2; IUCN, 2019). Should be changed to Bycatch and entanglement in fisheries, human activities, climate change and pollution are identified as the main conservation threats for all groups of marine mammals under assessments conducted by the IUCN (Figure 2; IUCN, 2019). (Justification) Intentional takes of marine mammals for both subsistence or for commercial harvest have been strictly managed under the relevant international organizations or in accordance with the management procedure adopted by those organizations. Therefore, they cannot be regarded as threat. On the other hand, comparing to the past, negative effects by climate change, pollution and other human activities have increased seriousness and are expected to increase furthermore under IUCN's assessment. The above two aspects have to be reflected in the description.	As identified in comments made in response to the first review by member states, the threats listed in each section of this chapter are those that have been identified on the basis of the International Union for Conservation of Nature (IUCN) Red List assessments carried out by the IUCN Species Survival Commission Specialist Groups for cetaceans, pinnipeds, sirenia, otters and polar bears (as set out in Section 1 of the chapter). The text reflects what is contained in those assessments, noting that the WOA is to reflect current literature. The text therefore has not been modified. Please also refer to the response to comment 65.
76	P152	Main ongoing threats for baleen whales identified by IUCN Red	Please refer to the responses to

	2.1.2. Abundance and main threats	List assessments include entanglement in fishing gear (fin, gray, humpback and North Atlantic right whales), harvesting (common (B. acutorostrata) and Antarctic minke whales and sei whales) and ship strike (blue, fin, gray, humpback and northern and southern right whales) (IUCN, 2019). Should be changed to Main ongoing threats for baleen whales include human activities including entanglement in fishing gear (fin, gray, humpback and North Atlantic right whales), and ship strike (blue, fin, gray, humpback and northern and southern right whales). (Justification) Harvests of common and Antarctic minke whales as well as sei whales are (were) done based on scientific advices by the IWC Scientific committee and therefore cannot be considered as "threat" which is considered as a partial description lacking neutrality. It seems more appropriate to use scientific information and/or advices of the IWC Scientific Committee than those of IUCN.	comments 65 and 75.
77	Page158 Line4-6	Some elements below do not seem to be relevant to this part yet. In that sense, Japan kindly suggests that following modification be made in order to make the descriptions more accurate to avoid any misunderstanding: "Catches in the western north Pacific have remained broadly stable since WOA I (IWC, 2019) and catches in Antarctic waters have been ceased since 2019 (IWC, 2019)."	The text reflects that in the citation and therefore has not been amended.

#	Chapter 6E: Marine reptiles		
	Section	**Comment**	**Responses**
Colombia			
78	Marine turtles	For the group of sea turtles, the work done by different conservation programs around the world that contribute to the raising of neonatal and the introduction of juveniles into the natural environment, should be highlighted. Also, for the threats of sea turtles, it is important to highlight the change in the coastline, due to effects of coastal erosion, and the poor environmental education of the coastal communities. It is relevant to mention information regarding *Lepidochelys olivacea* and *Natator depressus*	Mention of conservation efforts has been included in section 4. Continuing threats associated with habitat degradation has been included in section 4.1. Information on olive Ridley and flatback turtles is provided in Table 2.
79	**4.1 Sea turtles**	It is relevant to mention information regarding impact of drillships, offshore platforms and noise pollution on sea turtles populations.	Discussion of the impacts of marine debris has been expanded to cover pollution more broadly. Note that the impact of oil releases from offshore platforms, in particular in association with the Deepwater Horizon explosion has been included in section 4.1 and the impacts of noise on marine animals is included in chapter 21.
Japan			
80	P169 4. Threats	Globally, threats to marine reptiles remain much the same as those identified in WOA I. Mortality from bycatch in fisheries (both regulated and illegal, unreported and unregulated) remains the most significant threat to marine turtle and sea snakes (Lewison and others, 2014; Rees and others, 2016; Riskas and	Text amended to "....a significant threat...".

		others, 2018). Should be changed to Globally, threats to marine reptiles remain much the same as those identified in WOA I. Mortality from bycatch in fisheries (both regulated and illegal, unreported and unregulated) remains the significant threat to marine turtle and sea snakes (Lewison and others, 2014; Rees and others, 2016; Riskas and others, 2018). (Justification) As there seems no comprehensive analysis on the causal relationship among the possible threats, the moderate description should be used.	

#	Chapter 6F: Seabirds		
	Section	**Comment**	**Responses**
Colombia			
81		Mention the impact of permanent offshore structures lighting, especially over migration periods.	Light pollution both on land and at sea has been included in Section 2.
Japan			
82	P179 Keynote points	Pressures related to fishing (by-catch and prey depletion) are now affecting more species, while pollution is affecting fewer species (although marine debris, especially plastics, is an	The changes suggested do not uphold the context (and intent) of the sentence which is identifying that pressures associated with

		emerging threat with poorly understood consequences). Should be changed to In addition to pressures related to fishing (by-catch and possible prey depletion), pollution is affecting species(marine debris, especially plastics, is an emerging threat with poorly understood consequences). (Justification) I do not believe that comparison of only the two papers can provide us with the real state and that there is a comprehensive statistical analysis on the gravity of the negative effects, and therefore such baseless comparison should be avoided.	fishing are impacting more species and those associated with pollution are affecting fewer species, noting that of all sources of pollution, impacts associated with marine debris are not well known. The following sentence in the chapter text clearly relates the decreasing number of species being affected by pollution to reductions in the number of oil spills globally, which is a well-recognised phenomena (see also Chapter 20). The suggested changes therefore have not been made.
83	P184 4. Outlook	In this context, the transition of fisheries to lower trophic levels, especially those targeting mesopelagic species (St. John and others, 2016), may be particularly problematic because mesopelagic fishes are an important part of the diet of many pelagic seabirds (Watanuki and Thiebot, 2018). Should be changed to In this context, the transition of fisheries to lower trophic levels, including those targeting mesopelagic species (St. John and others, 2016), may be problematic because mesopelagic fishes are an important part of the diet of many pelagic seabirds	The change suggested does not uphold the context of the sentence which is highlighting that mesopelagic fish comprise the diet of many seabird species and so transition of fisheries to in particular this group of fish may be problematic. The suggested change has therefore not been made however the text has been amended to ensure that the context for the sentence is clear.

		(Watanuki and Thiebot, 2018). (Justification) Even if the text is a part of the Outlook section, it could be used as an independent description by some. Therefore, description should be neutral and eliminate exaggerated expressions which could easily mislead readers.					
USA							
		From Page	**From Line**	**To Page**	**To Line**	**Comment**	
84	References	186	5		23	US comment on first draft : this might be best summarized in a table Authors: [No comment.] US comment on second draft: The chapter makes broad use of charts/tables and this data seems ideal for a table or chart, so request clarification as to why the initial comment was ignored, and whether a chart or table is possible for this data.	This comment was not included in the compiled comments provided after the first review by member States, so it was not able to be considered. It is unclear why it is being suggested that a sub-group of references in the reference list be placed in a table or figure. Listing of references and the format used for references follows that set by the UN.

#	Chapter 6G: Marine plants and macroalgae (merged with Chapter 6H and incorporates elements from Chapter 7H)		
	Section	**Comment**	**Responses**
Australia			
85	5.2 Current status and trends	'This species 25 lost around 50 per cent of its total biomass during heat waves an anomaly that reached 2.66 degrees above the mean normally observed for the respective period (Gouvea and others, 27 2017).' - which period? Needs rewriting.	Rewritten as "This species lost around 50 per cent of its total biomass during heat waves from Oct 8 to Nov 13, 2014 when temperatures reached 2.66 degrees above the threshold calculated for the above calendar days, Gouvêa, and others, 2017).

#	Chapter 7AB Biogenic Reefs, Sandy, Muddy and Rocky Shore Substrates		
	Section	**Comment**	**Responses**
Brazil			
86	1. Introduction, line 12	Instead "algae", I suggest to insert "coralline or calcareous red algae"	We have inserted "calcareous red" before algae.

#	Chapter 7C Intertidal Zone		
	Section	**Comment**	**Responses**
Brazil			
87	Table 1, line 6	Instead "algae", I suggest to insert "coralline or calcareous red algae"	No change. Intertidal algae are not limited to the calcareous reds.

#	Chapter 7E: Tropical and subtropical coral reefs		
	Section	**Comment**	**Responses**
Australia			
88	References	A study by De'ath and others (2012) is referenced in section 4.4. Pacific Ocean; however, it does not appear in the reference list.	Section 4.4 has been reworked and this reference is no longer cited.
89	Keynote points: Page 238, lines 3-5.	• Sentence structure makes it sound a little like rising ocean temperatures are caused not only by climate change but also by the list of things that come after it Page 238 Suggest rewording second dot point from: *The frequency of disturbances caused by heatwaves, storms, flooding and crown-of- thorns starfish outbreaks has increased as recovery time between disturbances has decreased.* To: *The frequency of disturbances caused by heatwaves, storms, flooding and crown-of- thorns starfish outbreaks has increased, resulting in a decrease in recovery time between disturbances.*	Text amended as suggested.
90	2. Description of the environmental changes (between 2010 and 2020)	The fact that the Great Barrier Reef has experienced three mass coral bleaching events in the past five years (2016, 2017 and 2020) should be mentioned here or in section 4.4. Pacific Ocean	The section is discussing bleaching across the Pacific Ocean region collectively A reference that discusses bleaching across the Great Barrier Reef has been included. It should be noted that the peer review literature lacks an assessment of all three episodes of bleaching (2016, 2017 and 2020) at present.
Brazil			
91	5. Outlook 3th	Insert "Symbiotic microalgae"	Text amended as suggested

	paragraph , line 6		
Colombia			
92	**Description of the environmental changes (2010-2020)**	Due to the increasing impacts in the coral reef through decade, the biodiversity of the associated taxa can be different from the different results reported in WOA I (e g. Spalding and others, 2001), we suggest to look for more recent studies according to their availability to use it in the WOA II.	All references cited in section 2 have publication dates of 2011 to 2019, reflecting the literature associated with the time period being discussed. The only Spalding and others reference included in the chapter is dated 2017.
93	**Atlantic Ocean, particularly Wider Caribbean**	According to the fact that the Caribbean is a coral disease hotspot, we suggest to describe more in detail the information about the "stony coral tissue loss disease". The overfishing as other impacts in the region has an increasing effect on the coral reef and the community of fish associated with it, for this fact it´s important to consider the presence of the Lionfish (*Pterois volitans*) in the Caribbean and its collateral effects on the biodiversity as an invasive species.	Due to word limits placed on chapters it is not possible to provide greater detail on particular diseases that might be impacting coral reefs either in the Atlantic Ocean or elsewhere. Linkages between lionfish invasions and overfishing are not present in the peer review literature, rather its expansion has been associated with the species being a generalist predator, a habitat generalist, highly fecund, capable of reaching maturity at young ages and have an effective defence mechanism (poisonous spines). A sentence mentioning impacts associated with lionfish has been included.
Trinidad and Tobago			
aa	5. Outlook	Should mention studies such as the global assessment by Beyer, Hawthorne L., et al. "Risk-sensitive planning for conserving coral reefs	Additional text highlighting risk envelope modelling efforts has

		under rapid climate change." *Conservation Letters* 11.6 (2018): e12587. Where they model risk likelihood for coral reefs globally based on local threat, historical disturbance and climate change predictions. They've identified reefs of low – high risk in different regions. More specifically they "identify coral reef locations globally that, in the absence of other impacts, are likely to have a heightened chance of surviving projected climate changes relative to other reefs"	been added to the text.

#	Chapter 7F: Cold-water corals		
	Section	**Comment**	**Responses**
		Japan	
94	P268 1. Introduction and summary of the First World Ocean Assessment (WOA I)	Cold-water coral ecosystems provide essential services for human communities and well-being (see also Section 3). Demonstrated services include the discovery of novel marine genetic resources (Chapter 26 of the present Assessment), carbon sequestration, and significant aesthetic value (see Thurber and others, 2014, for a review). Should be changed to Cold-water coral ecosystems provide well-being for human communities (see also Section 3). Demonstrated well-beings include the discovery of novel marine genetic resources (Chapter 26 of the present Assessment), carbon sequestration, and significant aesthetic value (see Thurber and others, 2014, for a	As identified in comments made in response to the first review by member States, the list of ecosystem services and the references that follow justify the statement about the relevance of cold-water corals to human communities and well-being. The change suggested therefore has not been made.

		review). (Justification) Although cold-water coral ecosystem might be able to provide some essential services for human communities, other ecosystems have provided such “essential” services more than CWC ecosystem. Therefore, the description should be moderate excluding such exaggerated expression.	

#	Chapter 7G: Estuaries and deltas		
	Section	**Comment**	**Responses**
		Colombia	
95	**Keynote points**	Consider including here the impact of dams and anthropogenic activities in catchments of water by rivers upstream as well, as these were discussed and developed in the chapter. Also, it is relevant to consider that these exert pressures on the resources and health of estuaries and deltas, but also on their associated ecosystems.	It has been added.
96	**1. Introduction**	In the third paragraph of the Introduction, it is suggested to indicate that the chapter also mentions the importance of estuaries and deltas as environments that host various marine and coastal ecosystems.	It has been added.
97	**2.1.1. Water and sediments**	In accordance with the idea presented in lines eight (8) and nine (9) of the paragraph, it is suggested to omit the word "other" (“…and smother other benthic organisms”) and rather to speak directly about benthic organisms, like this: “(…) whereas high levels of sedimentation can shade primary producers such as seagrasses and smother benthic organisms.”	It has been modified.
98	**2.1.5. Invasive species**	Although the topic of invasive species is discussed in Chapter 25, it is suggested that in the development of this section mention the threat posed by invasive species, because they can directly influence the decline of resources and the health of estuaries and deltas, affecting their ecology and balance, posing significant dangers to the	It has been added.

		biodiversity of both systems.	

#	Chapter 7I Seagrass Meadows		
	Section	**Comment**	**Responses**
Argentina			
99	Page 296	**Precautionary principle.** Argentina suggests replacing it by precautionary approach in line with the Rio Declaration. In particular, in the following references: "Proposed development and other anthropogenic changes should be treated using the precautionary **APPROACH**".	Accepted.

#	Chapter 7J: Mangroves		
	Section	**Comment**	**Responses**
Colombia			
100	**Keynote points**	Consider including here that mangroves, as a blue carbon ecosystem, it play a key role in mitigating climate change impacts, which was discussed in the development of this chapter, because they are very effective “blue carbon” sinks, as they sequester carbon dioxide (CO2) due to their high levels of primary production and low rates of decomposition due to the anoxic conditions in which they develop.	Rephrased as: Despite their ecological and socioeconomic importance, especially as carbon sinks, mangrove forest areas have been decreasing annually.
101	**1. Introduction**	In the third paragraph of the Introduction, on line three (3), it is also suggested to include that the largest mangrove cover worldwide is in Asia (Like this: ...highest diversity and the largest extent of mangroves in Asia)	Accepted.
102	**2. Documented change in state of mangroves (between 2010**	In the fourth paragraph, on line three (3), consider including the reference of Yáñez-Arancibia et al. (2014) (DOI: https://doi.org/10.21829/myb.2014.200147). They documented evidence that indicates that mangroves in the Gulf of Mexico show a	Much as we want to accommodate this information, we are constraint by word limits.

	and 2020)	consistent pattern of geographical distribution, colonizing all over the northern coast of the Gulf, including the Atlantic coast of Florida Peninsula, in response to climate change and its effects on the coastal zone.	
103	**2.1.1. Reduction in mangrove carbon storage (mitigation of climate change)**	Specifically, the name of the section "Reduction in mangrove carbon storage" does not describe what is being developed in the paragraph. Therefore, it is suggested to rename the section according to the information that is being presented. Something like: "Carbon sequestration in mangrove" or "Carbon stocks in mangrove"	Accepted. Section renamed to Carbon Sequestration in Mangroves.

#	Chapter 7L: Submarine canyons		
	Section	**Comment**	**Responses**
Australia			
104	Introduction: Page 310	Figure 1 is difficult to read, please enlarge.	Done but only a bit.
105	2.2.3 Food Supply	No mention of upwelling of nutrient waters into canyons as a food source for benthic and pelagic life, and potential change under climate change. Consider also connectivity to terrestrial supply (via rivers) in some settings is under change.	Mentioned in section 2.1 but not discussed in detail due to word limits
106	2.4.2 Geomorphic Heterogeneity	Consider citing Huang and others (2018) Progress in Oceanography https://doi.org/10.1016/j.pocean.2017.11.007 as an example from Australian continent of canyon geodiversity	Added.

#	Chapter 7M: High-latitude ice		
	Section	**Comment**	**Responses**
		Argentina	
107	**Page 359, line 29.**	ARGENTINA insists on the problem of the reference to "Falklands Plateau", which constitutes a **wrong toponymy**. This expression should be replaced by "Falklands/Malvinas Plateau". Additionally, in accordance to Editorial Directive ST/CS/SER.A/42, this reference should be accompanied by the standard disclaimer set forth in administrative instruction ST/AI/189/Add.25/Rev.1 of 20 January 1997 by a note or footnote reading: "A dispute exists between the Governments of Argentina and the United kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas)."	It was agreed to use the following wording to conform with the naming conventions generally used for the Falklands Islands (Malvinas). Therefore, the sentence has been amended as follow: "Hydrocarbon exploration has started on the plateau surrounding the Falklands Islands (Malvinas)".
		Japan	
108	P.353	There should be a word of "United" as follows, ～ several United Nations Sustainable Development Goals (SDGs) ～.	Text amended as suggested.
		Iceland	
109		The recent climate changes are having a different impact on Arctic settlements and biosphere depending on their location and how close they are to receding glaciers. While coastal communities are over most parts of the world suffering the consequences of rising sea level, in the near vicinity of fast retreating glaciers land is rising at an increasing speed. This causes problems for the coastal communities as shoreside infrastructure, such as harbours may in near future not serve their purpose. This is evident f.ex. in Greenland and SE Iceland.	Comment noted.

#	Chapter 7N: Seamounts and pinnacles		
	Section	**Comment**	**Responses**
Australia			
110	Section 4.6: South Pacific Ocean	Research has also focused on characterising seamounts within Australian Marine Parks, e.g. the Gifford Marine Park in the Coral Sea, to ascertain their ecological significance. See: https://www.nespmarine.edu.au/system/files/Nanson_Miller%20et%20al%20An%20eco-narrative%20of%20Gifford%20Marine%20Park%20Milestone%2014_RPv4%202018.pdf.	Reference added.
Korea, Republic of			
111	p. 371, line 21 in the second draft of WOA II (pdf file)	→ The Republic of Korea reminds the Group of Experts that "South Korea" should be corrected to the "Republic of Korea", the official country name.	Corrected.

#	Chapter 7P: Open ocean		
	Section	**Comment**	**Responses**
Australia			
112	4.4 South Atlantic Ocean	Suggest this section could benefit from re-writing to improve clarity.	It has been changed.
113	4.6 North Pacific Ocean	'… starvation of fish-eating birds' - evidence of this?	E.g. Piatt JF, Parrish JK, Renner HM, Schoen SK, Jones TT, Arimitsu ML, et al. (2020) Extreme mortality and reproductive failure of common murres resulting from the northeast Pacific marine heatwave of 2014-2016. PLoS ONE 15(1): e0226087.

			https://doi.org/10.1371/journal.pone.0226087
Brazl			
114	5.3 Socio econ. Conseq., line 3	***Sargassum*** is in Italic and capital S (is a macroalgae taxon genus)	It has been changed.
Colombia			
115	**Ocean warming and changes to the ocean carbon pump**	It is important to mention what has been observed with respect to the weakening of the ocean's circulation, specifically the thermohaline circulation, which has been weakened in recent years due to global warming and its consequences on temperature and climate patterns in countries bordering the Atlantic and the equatorial zone around the globe and in the ecosystem services. Rahmstorf, S., Box, J. E., Feulner, G., Mann, M. E., Robinson, A., Rutherford, S., & Schaffernicht, E. J. (2015). Exceptional twentieth-century slowdown in Atlantic Ocean overturning circulation. *Nature climate change*, *5*(5), 475-480. Rahmstorf, S., Box, J. E., Feulner, G., Mann, M. E., Robinson, A., Rutherford, S., & Schaffernicht, E. J. (2015). Exceptional twentieth-century slowdown in Atlantic Ocean overturning circulation. *Nature climate change*, *5*(5), 475-480.	It has been added.

#	**Chapter 7Q: Ridges, plateaus and trenches**		
	Section	**Comment**	**Responses**
Argentina			
116	**Outlook**	Argentina suggests the follow wording: "The Convention on Biological Diversity (CBD) has worked to promote ~~international agreement on developing~~ the development of representative networks of MPAs and other effective area-based	Rephrased to: The Convention on Biological Diversity (CBD)[6] has promoted the

		conservation measures (OECMs) with a 2020 target of 10 per cent of the total marine area (CBD, 2010). It has also initiated a programme to identify EBSA (CBD, 2009)." CBD has not reached an international agreement to the development of MPAs. However, through the Aichi targets, which are considered a global framework with flexible characteristics, and the EBSAS process, it has promoted the development of these types of initiatives. **Page 417**.	development of representative networks of MPAs and other effective area-based conservation measures (OECMs) with a 2020 target of 10 per cent of the total marine area (CBD, 2010). It has also initiated a programme to identify EBSA (CBD, 2009).
Australia			
117	Section 2.1.1: Ridges: biodiversity and ecosystem function	Consider addition of following text: "Recent seabed mapping in the deep ocean has improved the resolution of large-scale features, as shown by the mapping undertaken in the southern Indian Ocean in the search for missing Malaysian Airlines aircraft MH370. These data revealed an unknown diversity and complexity of seabed morphology that will likely be reflected in biodiversity of benthic communities (Picard and others, 2018) https://doi.org/10.1016/j.margeo.2017.10.014. Further discoveries of deep ocean seabed complexity will be made as mapping continues, particularly through global initiatives such as the GEBCO-Nippon Foundation Seabed 2030 Project."	Added with modification.
Japan			
118	2. Description of the environmental changes (between 2010	"and its marginal seas" needs to be replaced by "the Sea of Japan and the Sea of Okhotsk", the only internationally established name for the sea area concerned. In fact, the United Nations (UN) recognized "Sea of Japan" as the standard geographical term in March 2004, and UN policy states that the standard	Comment 1371 of the first round of comments by States made the Group of Experts review the terminology used to describe the effects of trenches. It was

	and 2020) 2.1.4. Hadal trenches	geographical term be used in official UN publications. It does not make sense to refer to the labelling of a regional sea programme only here while other seas are defined by its established names. The ROK contends that the UN and the International Hydrographic Organization (IHO) have issued resolutions that advocate the name "East Sea" be used together with “Sea of Japan”. However, neither UNCSGN Resolution III/20 nor IHO Technical Resolution A.4.2.6 includes any specific recommendation to use "East Sea" alongside “Sea of Japan”. Further, these resolutions presume that the geographical feature concerned is under the sovereignty of two or more countries, such as in the case of a bay or strait, and does not apply to the high seas such as with the Sea of Japan. Following the ROK's assertion, if even one of the countries bordering the Atlantic or the Pacific were to raise an objection to the names of these oceans, it would lead to the use of multiple names for these oceans, which would clearly be unmanageable. The international community cannot accept such an argument. Furthermore, as stated above the UN has already officially confirmed its policy of requiring the use of Sea of Japan as the standard geographical term in all official UN publications. The IHO publication "Limits of Oceans and Seas" (S-23) also uses the name Japan Sea for the sea area concerned. This demonstrates that there is no UN or IHO resolution recommending the use of "East Sea" together with “Sea of Japan”.					considered that a more generalised description would be more appropriate. This view has been reviewed in the light of comment 118. The conclusion is that the statement that “In the Kuril-Kamchatka Trench, the hadal fauna differs from the abyssal fauna of the Northwest Pacific and its marginal seas” is a better way of describing the situation.”
USA							
		From Page	**From Line**	**To Page**	**To Line**	**Comment**	
119	3. Description of economic	425	23	425	25	<u>US comment on first draft :</u> Recommend striking the bullet,	This comment is for Chap 7S.

	and social changes (between 2010 and 2020)					"Despite its importance, the increasing threats to the Sargasso Sea demonstrate the weakness of the current system of ocean governance in addressing cumulative impacts of human activities on the high seas." This is a policy statement not a scientific fact. Authors: We believe the statement should stay-it is an important conclusion of our assessment. US comment on second draft: We continue to believe this bullet is policy prescriptive as drafted. **Suggested revision: "~~Despite its importance, the I~~ The potential for increasing ~~threats to~~ activity in the Sargasso Sea demonstrates the ~~weakness of the current system of ocean governance in~~ importance of addressing cumulative impacts of human activities on the high seas."**	Rephrased as: The increasing activity in the Sargasso Sea demonstrates the importance of addressing cumulative impacts of human activities on the high seas.

#	Chapter 7R: Hydrothermal vents and cold seeps		
	Section	**Comment**	**Responses**
Colombia			
120	**1.4.1. Exploration and mapping**	In line9 of this section please include the Caribbean (Digby et al 2016) as other recently identified methane seepage area. Digby, A., Puentes, V., & León, J. (2016). Cold seeps associated with structured benthic communities: More accurate	Reference added as suggested.

		identification and evaluation using a new multibeam survey methodology in the offshore Southern Colombian Caribbean. *International Journal of Geosciences*, *7*(5), 761-774.	
121	**4. Key region-specific changes and consequences**	In table 1. Southwestern Caribbean: Oil exploration in course with seep exploration limited (Digby et al 2016)	Added as suggested.

#	Chapter 7S: Sargasso Sea						
	Section	**Comment**					**Responses**
Brazil							
122	1th paragraph , line 8	..."by toxic **micro**algae"...					The "blooms" refer to Sargassum blooms, not harmful algal blooms due to toxic microalgae
USA							
		From Page	**From Line**	**To Page**	**To Line**	**Comment**	
123	4. Key region-specific changes and consequences	431	22	431	25	US comment on first draft: Strike these lines - policy statements and inaccurate: "The outlook for the Sargasso Sea, both in the short and long term, depends upon international decisions and priorities. The importance of the Sargasso Sea is recognized internationally but because it is in the high seas, beyond the jurisdiction and responsibility of any national Government, it enjoys little protection." The area enjoys protection through multiple legal instruments and authorities such as	This is in Section 5. Outlook. Rephrased as: The outlook for the Sargasso Sea, both in the short and long term, depends upon international decisions, priorities, and cooperation. The importance of the Sargasso Sea is recognized internationally, and because it is in the high seas, its protection falls

						IMO, RFMOs, ISA, etc. Authors: No-again this is an important conclusion of our work, and the Sargasso Sea does NOT "enjoy protection" from these organisations – it is within their competence but only NAFO has taken any protection measures. US comment on second draft: Differences in policy are the reasons more action has not been taken in those organizations, not the fact that the Sargasso Sea is in the high seas, as the draft text asserts; hence, this remains a policy discussion and the text must not appear to be policy prescriptive. **Suggested revision:** **"The outlook for the Sargasso Sea, both in the short and long term, depends upon international decisions, ~~and~~ priorities, and cooperation. The importance of the Sargasso Sea is recognized internationally, and its protection falls within the competence of a number of organizations. ~~but because it is in the high seas, beyond the jurisdiction and responsibility of any national Government, it enjoys little protection~~."**	within the competence of a number of organizations.
124	4. Key region-	431	28		30		This is in Section 5. Outlook.

	specific changes and consequences					US comment on first draft: Strike this statement as speculative and not scientifically proven: "the potentially increased fishing activity over the last three years by some 28 countries shown by automatic identification system data (Sargasso Sea Commission, 2019), and". AIS data is only an indication of a vessel being present in an area, not that the vessels are engaged in an activity or specifically in fishing activity. Authors: No-this is a recognised method for observing fishing activity. Fishing activity was estimated from AIS data by Ocean Mind for the Sargasso Sea Commission using vessel behaviour analysis, a method which has been developed over a number of years. US comment on second draft: Point taken, but the text as drafted asserts that AIS shows fishing activity, when fishing activity is rather estimated using AIS. **Suggested revision: "the potential~~ly~~ for increased fishing activity over the last three years by some 28 countries as estimated using ~~shown by~~ automatic identification system data (Sargasso Sea Commission, 2019), and"**	Changed as suggested. ...the potential for increased fishing activity over the last three years by some 28 countries as estimated using automatic identification system data (Sargasso Sea Commission, 2019),
125	4. Key region-specific	431	31	431	35	US comment on first draft : Strike this	This is in Section 5. Outlook.

	changes and consequences					sentence - policy judgement not scientific fact. "The ongoing negotiations on the BBNJ process are of crucial importance for high seas ecosystems like the Sargasso Sea and its experience demonstrates how difficult it is for existing sectoral bodies to govern an ecosystem in a holistic manner so as to protect it from a range of cumulative impacts and threats." Authors: Not deleted. Again, we stress that we are engaged on an assessment. The conclusion is both true and important. US comment on second draft: The BBNJ process is a policy forum, and the way this text is framed ventures into that policy discussion. If the text cannot be deleted, we propose some revisions. **Suggested revision: "~~The ongoing negotiations on the BBNJ process are of crucial importance for high seas ecosystems like the~~ The Sargasso Sea ~~and its experience~~ demonstrates ~~how difficult it is~~ the challenges faced by ~~for~~ existing sectoral bodies to govern ~~an~~ high seas ecosystems in a holistic manner ~~so as to protect it from a range of cumulative impacts and threats~~."**	Sentence rephrased as suggested. The Sargasso Sea demonstrates the challenges faced by existing sectoral bodies to govern high seas ecosystem in a holistic manner.

#	Chapter 8B: Human health as affected by the ocean		
	Section	**Comment**	**Responses**
		Colombia	
126	**Keynote points**	To include risks associated to threaten related to Coastal erosion which influences people life quality	The links between coastal erosion and human health are not sufficiently direct to merit inclusion in the keynote points.
127	**General aspects of the relationship between human health and the ocean**	In the table 1, is pertinent to highlight the danger on the microbiota of marine ecosystems by the effect of emerging pollutants such as antibiotics and disinfectants, which could reduce the populations of beneficial microorganisms or promote resistance mechanisms in potentially pathogens micro-organisms present in these ecosystems. Likewise, the transfer of virulence genes from pathogenic microorganisms present in wastewater to the autochthonous microbiota of marine ecosystems. These factors can potentiate the risks associated with emerging and re-emerging diseases.	The general description of the five key scientific challenges in improving our understanding of the linkages between the ocean and human health cover these points. Limits on the numbers of words in the Assessment mean that it is not possible to spell out all aspects.

#	Chapter 8C: Maritime industries (incorporates elements from Chapters 8A, 18, 23, 24)		
	Section	**Comment**	**Responses**
		Australia	
128	Keynote points: page 450, line 17.	For economies distant from markets, and with no land borders, the volume of trade transported by ships is likely to well exceed 90 per cent. For example, over 99 per cent of Australia's imports and exports by volume and over 79 per cent by value are carried by ships. It is worth highlighting the significant dependence of certain countries, such as Australia, on shipping for international trade.	World Ocean Assessment II is a **global** assessment. It is not therefore appropriate to highlight in the keynote points the situations of individual countries. In the second draft of World Ocean

		The keynote point notes that the shipping sector is recovering from the economic crisis of 2008-2011. It is also worth discussing the recent short term impacts of the COVID-19 pandemic in disrupting supply chains and reducing global container volume demand, as well as the long term impacts on the shipping industry as the global economy potentially heads into a deep recession.	Assessment II, material was added (especially in this chapter) on the effects of the COVID-19 pandemic, including a keynote point. There are 15 references to COVID-19 in this chapter.
129	Section 4.2: page 455, lines 26-27.	The analysis of the introduction of the IMO Sulphur 2020 Rule from 1 January 2020 is oversimplified. The price of compliant low sulphur fuel oil has more than halved due to refineries increasing production of low sulphur fuel oil to meet demand and following the drop in crude oil prices due to oversupply during the coronavirus pandemic. The price differential between high and low sulphur fuel oil has been significantly reduced.	As this Chapter makes clear, the main discussion of the effects of the requirements for reducing sulphur emissions is in Chapter 11. This section is intended to be a very short reference to the problem. Nevertheless, the sentence has been amended to make clear that low-sulphur fuel does not necessarily have a higher price.
130	Section 4.6: page 459, lines 13-16.	It may be worth mentioning that the International Convention for the Prevention of Pollution from Ships (MARPOL) bans the use and carriage of heavy fuel oil for ships operating in Antarctic waters.	The main discussion of the impacts of pollution from shipping is in Chapter 11.
Colombia			
131	**Wildlife watching**	In some marine areas, whale watching must be more controlled; whale chasing practices create could stress for them. According to the Colombian regulations of the General Maritime Directorate (Spanish acronym DIMAR), whale watching must be done at a minimum of 200 meters.	The main discussion of the environmental impact of whale-watching is in Chapter 6.2. The discussion in this chapter is concerned with the economics.
132	**Key knowledge and capacity-building gaps**	It is important to include a comment on the lack of global information on social and economic aspects and cultural perception with ethnic communities about coastal and marine tourism.	The need for better information about coastal communities generally is dealt with in the first paragraph of this section. A reference to indigenous peoples has been added.

Japan			
133	***7.1. Situation as shown in the First World Ocean Assessment (WOA I)***	P479 Line “especial” should be “especially”	Amended.
Iceland			
134		In the second WOA II draft there are paragraphs on gender and fisheries: On page 475: „In 2017, some 135 million people were involved in capture fisheries and marine aquaculture: Employment in capture fisheries (as opposed to subsistence fishing) amounts to about 40.4 million, and employment in marine aquaculture is about 15.6 million. In addition, there is a slightly smaller workforce engaged in post-harvest processing. About 13 per cent of this employed workforce are women.“ The best estimate of the proportion of seafarers who are women remains at about 2 per cent, mainly in the cruise-ship sector (ITF, 2019) The Maritime industry is extremely gender biased. The theme of IMO in the year 2019 was ”Empowering Women in the Maritime industry.” On page 481 it is stated that “The best estimate of the proportion of seafarers who are women remains at about 2 per cent, mainly in the cruise-ship sector (ITF, 2019).” In Iceland´s view there is a strong gender element to the exploitation of marine resources. According to the World bank, Small Scale fisheries employ more than 90 per cent of the world’s 120 million people involved in capture fisheries, of which about half, 50% are women, mainly in developing countries. It is the only type of fishery where there is some equality. Despite a significant contribution to global catchment, SSFs are marginalized, with increasing pressure from both industrialized (and often subsidized) fleets and other ocean	Noted.

		uses. Climate changes were expected to impact SSF participants adversely, and therefore have a greater impact on women and their livelihood. In Iceland, prior to industrialization women where around 1/3 fishermen on open boats. With industrialization of the fishing fleet women at sea are now only a few. Around 0,3% of those who are qualified ships engineers are women and 1,2% of those qualified as Ship operators, captains, helmsmen etc. 6-8% of seafarers in total are women. However, gender norms and values are not fixed and can evolve over time, can vary substantially from place to place, and are subject to change. As one of the means to fulfil SDG 5, Iceland has recently launched a project with the aim of increasing the participation of women at sea. It is a clear quality goal as fishermen, as well as other seafarer in freight or research, earn manifold that of skilled labour on land, even if preforming the same job.	
Korea, Republic of			
135	p. 486 Figure 5 of the second draft of WOA II (pdf file) / Response to # 1515 Rep. of Korea comment	→ The Republic of Korea reminds the Group of Experts that "South Korea" should be corrected to the "Republic of Korea", the official country name.	The Group of Experts is well aware of the need to make this change. It requires the obtaining of a better file for the figure, so that the amendment can be made. It was not practical to do this before the due date to send out the second draft.
Philippines			
136	**3.Capture fisheries, shellfish harvesting and aquacult**	On the third paragraph, the Philippines proposes to use "an estimated" in lieu of "some," such that: "In 2017, <u>an estimated</u> 135 million people were involved in capture fisheries and marine aquaculture…"	Amended.

	ure		

#	Chapter 9: Pressures from changes in climate and atmosphere		
	Section	**Comment**	**Responses**
		Australia	
137	2.2 Sea level rise and cities	This could be a potential location to mention land subsidence and how this interacts with sea level rise.	WOA2 has a limitation in the number of words.
138	Whole Chapter	This chapter seems the logical place to include tsunami hazard as it deals with hazard from geophysical processes. However it is entirely climate change related at present. The title of the chapter could be changed to be more encompassing and an additional section to address tsunami hazard.	Ocean hazards are analysed in another chapter.
		Colombia	
139	**Keynote points**	In the Keynote points, the expression "Climate change is creating more acidic ..."we suggest to modify by "The accelerated increase of anthropogenic carbon dioxide (CO2) in the atmosphere is creating an increase in the acidity and deoxygenation of the ocean.	Done, with one sentence modified to improve the grammar to “The accelerated increase of anthropogenic carbon dioxide (CO_2) in the atmosphere is creating an increase in the acidification and deoxygenation of the ocean”.
140	**2. Climate pressures: extreme climate events and pressures from changes in ocean physical and**	According to Oliver et al., 2019 there is a scenario of MHW increasing in Antarctica, there should be a representation in the map considering that this ecosystem is highly endangered due to climate extreme climate events. “Projected Marine Heatwaves in the 21st Century and the Potential for Ecological Impact” Oliver et al., 2019	The chapter includes the map of the Special Report on Oceans and Cryosphere of the IPCC (2019).

	chemical properties. 2.1. Extreme climate events		
141	**2. Climate pressures: extreme climate events and pressures from changes in ocean physical and chemical properties. 2.1. Extreme climate events**	ENSO phenomena is not the only source of climate variability in the Pacific and considering climate change scenarios, the Pacific Decadal Oscillation has to be observed. Physically, global warming (cooling) enhances (weakens) ocean stratification, increases (decreases) the Rossby wave speed, and in turn shortens (lengthens) the PDO period (Zhang and Delworth 2016), if the PDO increases its frequency, there would be an impact in ENSO strengthening or weakening. Zhang and Delworth 2016. Simulated Response of the Pacific Decadal Oscillation to Climate Change	WOA2 has a limitation in the number of words.
142	**2. Climate pressures: extreme climate events and pressures from changes in ocean physical and chemical**	There is evidence that wind anomalies increase zonal wind vertical shear during summertime El Niño events, which inhibits tropical cyclogenesis in much of the Atlantic basin (Shaman et al., 2009), taking this into account, there should be a connection between the impact of climate change, ENSO and hurricane activity, not only showing it would strengthen (or weaken) but in frequency. Shaman et al., 2009. The Dynamics of the ENSO–Atlantic Hurricane Teleconnection: ENSO-Related Changes to the North African–Asian Jet Affect Atlantic Basin Tropical Cyclogenesis	WOA2 has a limitation in the number of words.

	properties. 2.1. Extreme climate events		
143	**2. Climate pressures: extreme climate events and pressures from changes in ocean physical and chemical properties. 2.1. Extreme climate events**	Add references: "It is often measured by the surface pressure anomaly difference between Tahiti, French Polynesia, and Darwin, Australia, and/or the sea surface temperatures in the central and eastern equatorial Pacific." Pg 501 Add references: "Based on 1-minute maximum sustained wind speed, these cyclonic disturbances are categorized into tropical depressions (≤ 17 m s−1), tropical storms (18–32 m s−1) and tropical cyclones (≥ 33 m s−1, category 1 to category 5)". Pg 501	References added.
144	**2.4. Pressures from changes in ocean chemistry. Ocean acidification.**	The document suggests that oceans carbonate chemistry is well known. However, at the global level, the coastal carbonate chemistry has a large information gap.	The chapter does not suggest that coastal carbonate chemistry is well known.
145	**2.4. Pressures from changes in ocean chemistry. Ocean**	The document presents seagrasses as net winners compared to OA. Nevertheless, although the OA represents a benefit by increasing their photosynthetic activity, some indirect effects could lead to loss of ecosystem service in seagrass beds (Zunino, et al. 2019). Between indirect effects are an increase of higher grazing pressure by herbivorous fish; reduction of epiphytic	The document states that increased carbon availability <u>can</u> increase the standing stock of seagrasses. Strict word limits on this section do not allow us to expand it to cover the range of effects reviewed by Zunino

	acidification.	coralline algae that live on grass blades, changing the phenolic compounds chemistry, which act as natural deterrents (Zunino, et al. 2019); and also, because coralline algae provide control of the abundance of algae and diatom communities, their reduction can inhibit the availability of light for seagrasses. Zunino, S., Melaku, D., Zupo, V., Solidoro, C. 2019. Direct and indirect impacts of marine acidification on theecosystem services provided by coralligenous reefs andseagrass systems Global Ecology and Conservation 18.	including lower phenolic defense compound levels first recorded by Tom Arnold et al 2012, and fewer coralline algae recorded by Martins et al. 2008. Fortunately, the section on ocean warming also mentions seagrasses and covers the fact that thermal stress can threaten them.
146	**2.4. Pressures from changes in ocean chemistry. Ocean acidification.**	The actions proposed to reduce the impacts of ocean acidification must be led by the reduction of carbon dioxide emissions.	Agreed: sentence modified to "Proposed actions to lessen the impacts of ocean acidification and to build resilience are primarily to reduce CO_2 emission but also include: reduction of pollution and other stressors (such as overfishing and habitat damage); seaweed cultivation and seagrass restoration; water treatment, (e.g. for high-value aquaculture); adaptation of human activities such as aquaculture; and repair damaged ecosystems (Cooley and others, 2016) for example through rewilding the ocean.
147	**2.4. Pressures from changes in ocean chemistry**	We recommend to take into account the impact of acidification on the calcifying phytoplankton (mainly represented by the Coccolithophores), which is one of the main producers in the ocean.	There is conflicting evidence about the effects of OA on coccolithophores in both the palaeo-record, satellite data, phytoplankton sampling and flask/mesocosm experiments. Nevertheless we have modified a sentence to read "In addition to negative impacts on

			calcifying phyto- and zooplankton, acidification can lower the nutritional value of seafood".
148	**3. Capacity building: Global Ocean Acidification Observing Network (GOA-ON) and Global Ocean Oxygen Network (GO2NE)**	In 2019, the Latin America and Caribbean Marine - Coastal stressors Research Network (REMARCO) was created, as a result of the collaboration of countries in Latin America and the Caribbean, participants in technical cooperation projects, financed by the International Atomic Energy Agency (IAEA). Currently, REMARCO is made up of 18 countries participating in the IAEA-funded regional project RLA/7/025 (2020 - 2023), whose objective in the ocean acidification component is to contribute to the report on indicator 14.3.1 of the SDGs 14 in Latin America and Caribbean.	Strict word limits on this section do not allow us to expand it to cover the regional specifics of REMARCO.

#	**Chapter 10: Nutrient inputs**		
	Section	**Comment**	**Responses**
		Australia	
149	Section 4.8: Great Barrier Reef: Page 506.	The paragraph on the Great Barrier Reef uses outdated references. Suggest referring, in the first instance, to the 2019 Outlook Report. Sections 3.3.1, 6.5.1 and 6.5.2 specifically discuss nutrients and land-based run-off. Section 3.6.2 specifically discusses COTS with a range of references to support current understanding. A scientific consensus has not been reached on the potential link between nutrients and COTs outbreaks. Suggest that a more appropriate statement would be:	This section has been revised to address this. Added the 2019 Outlook Report as reference.

		"Higher nutrients also increase the growth and survival of larvae of the crown-of-thorns starfish (Acanthaster cf. solaris), and could potentially exacerbate outbreaks of this coral-eating pest (Fabricius et al. 2010, Wolfe et al. 2017)" • Fabricius, K.E., Okaji, K. and De'Ath, G. 2010, Three lines of evidence to link outbreaks of the crown-of-thorns seastar Acanthaster planci to the release of larval food limitation, Coral Reefs 29(3): 593-605. • Wolfe, K., Graba-Landry, A., Dworjanyn, S.A. and Byrne, M. 2017, Superstars: assessing nutrient thresholds for enhanced larval success of Acanthaster planci, a review of the evidence, Marine Pollution Bulletin 116(1): 307-314. Some suggested references which could be of relevance to this assessment include: 3.4.1 specifically discuss mode, lines 32-46 ction on Trichodesmium and eutrophication etc – the reference to ll in 1992 is very out of date as well as the key sentence which ould be replaced with more contemporary findings see here ection "3.6.4 Other outbreaks" of the Outlook Report 2019 does t contain commentary on whether or not areas of the GBR are trophic. The section does provide some additional, more recent, erences regarding *Trichodesmium* monitoring etc. It notes (i) nited broadscale monitoring of this algae, and (ii) long-term dual increase observed at one monitoring site.	
150	Section 4.8: Great Barrier Reef: Page 506, lines 36-50.	• Likely link between eutrophication and bleaching is supported by evidence, however this is not the "main" reason reefs have not recovered. Current text refers to very old references (Bell) and the summarised findings are not contemporary of accurate. Please replace current	Text revised and edited to address this.

		text with the following tracked change version: River-borne inputs of dissolved inorganic P (P-PO4) can promote the growth of Trichodesmium spp.. While limited broadscale monitoring of Trichodsmium spp. Occurs across the Great Barrier Reeef, long-term data at one site near the Yongala Wreck since 2010 indicates a long-term gradual increase in its abundance (ref 773 from the 2019 Outlook Report). The nitrogen-fixing ability of Trichodesmium suggests that increasing 39 levels of P-PO4 alone may be driving increases in phytoplankton biomass, and there is some evidence that these trends are a factor in the decreasing condition of fringing reefs in the inner GBR lagoon (reference 467 from the 2019 Outlook Report). Nutrients in the water column from natural upwelling and land-based runoff are just one of many factors which combine to provide positive outbreak conditions for the coral predator crown-or-thorns starfish (*Acanthaster* cf. *solaris*) (reference Great Barrier Reef Outlook Report 2019). In 2020 pressures from an ongoing outbreak of crown-of-thorns starfish was amplified by a third mass bleaching in the last fiver years. While the full impact of this event has not been quantified, an estimated 30 per cent of shallow water coral cover was lost following the 2016 mass bleaching event, with further declines across the northern two thirds of the Reef in 2017 (References 90-91 from the Outlook Report 2019).	
151	3.2 Situation recorded in the First World Ocean Assessment (WOA I)	The dot point relating to the Great Barrier Reef should refer to the concern regarding pesticides associated with intensive agriculture in *north-east* Australia (not north-west as currently appears).	This comment relates to Chapter 11, where a correction has been made.
152	GBRMPA:	Page 519, lines 31-32	See response to comment 151.

	Synthesis & Reporting	• "north-west" incorrect as the Great Barrier Reef is on the north-east coast of Australia *(unless WOA I made this statement in relation to Ningaloo or other Western Australian reefs and not the GBR, in which case the attribution of reef name is incorrect in the dot point)* Check this same error does not occur anywhere else in the assessment too.	
Colombia			
153	**4. Patterns and trends within regions- Section 4**	We recommend to use a map to represent the data in table 1 about LMEs, using colors to differentiate	We appreciate your suggestion, but the writing team feels differently about the way to present this information. Here, the table could provide enough information to support the text.
154	**5. Outlook**	The outlook could have included some issues, as for example: 1. To reduce the use of products with a high N and P content, innovation needs to be encouraged to changing them. 2. Countries such as Colombia in South America need to implement wastewater treatment systems in many coastal communities to reduce direct discharges to natural water sources. 3. Countries should acquire technical capacity to identify and control sources of nutrient supply, such as agricultural runoff or groundwater. Nutrient monitoring systems in marine and coastal ecosystems should be strengthened. The information could be useful to determine when the ecosystem is nutrient overload and to generate early warnings.	This section is dealing with likely future states, given current trends and capacity-building gaps. Details are not given for specific issues and specific nations here. To do so would be beyond the scope of this chapter – and way beyond the budgetary limit on the number of words.

#	Chapter 11: Liquid and atmospheric inputs from land, ships and offshore installations		
	Section	**Comment**	**Responses**
		Australia	
155	7.3 Description of the environmental changes (between 2010 and 2020)	‘The adverse effects of air pollution caused by shipping are an issue of interest to the International Maritime Organization (IMO) which, on the basis of Annex IV’ Annex VI covers air pollution ‘The MARPOL Convention aims progressively to restrict emissions by reducing the sulphur content in fuel, by allowing the use of exhaust gases cleaning systems as an alternative compliance to low sulphur requirements (by, for example, the use of scrubbers) to address SOx reduction’ - MARPOL permits the use of an approved EGCS <u>as an alternative to compliant fuel oil</u> ‘(7 ships in 2010, 256 ships 2015 and more than 4400 in 2020)’ - Suggest removing this or providing further clarification as to why the increase in 2020 as per comment above ‘there is **some** concern as to how the **cumulative** discharge of ~~large volumes (typically XXX~~) wash water may affect the marine environment in the long-term.’ - The concern is around long-term impacts from cumulative discharges ‘For this reason, some ports and countries have already prohibited such discharges in their waters (Turner and others, 2017). Many European ports, such as Rotterdam, and ports in California and Singapore have already prohibited discharge of open loop scrubber wash water into their waters. Recently, China and Egypt also proposed such a ban in Chinese waters and the Suez Canal respectively.’ -This needs to be amended to	Comments were included as suggested. Changed wording. Removed. See longer comment below.

		accurately reflect the actual situation. E.g. that some ports and countries have taken a precautionary approach and prohibited this discharge whilst further research into the long-term impacts is undertaken	Changed wording.
		‘and also application of different restrictions depending on the age and size of a particular vessel, with the highest restrictions on large new or remade retrofitted ships (IMO, 2019). ‘ - It’s unclear what this is referring to? Seems to be EEDI? Suggest clarifying	Removed.
		‘In the ~~so-called~~ **IMO-designated** Emission Control Areas’	
		‘Presently there are four ECAs,’ - Suggest noting upfront that ECAs can be designated for SOX and PM and/or NOx	Changed according to suggestion.
		‘As of 2021, the Baltic Sea and the North Sea will be what are known as ECAs’ - It would be more appropriate to state that As of 2021 will also become ECA’s for NOx	Changed according to suggestion.
		‘following a successful joint application by OSPAR and HELCOM’ –suggest confirming this – may have been separate proposals with the North Sea one submitted by some of the OSPAR countries and the Baltic from the HELCOM countries.	Addressed. Removed.
		‘Similarly, the IMO Polar Code[2] promotes identification of these compounds on the basis of routine operations and navigational and shipping accident reports’ - Not clear what this means or how this relates to the preceding text. Suggest clarifying.	Changed wording.

[2] See International Maritime Organization, document MEPC 68/21/Add.1, annex 10.

		‘As a consequence of new Heavy Fuel Oil rules, more alternative fuel oils have entered the market, and more research is needed to determine the potential toxicity of these new fuels.’ - It is unclear what heavy fuel oil rules we are talking about here? The low sulphur requirements? HFO in Polar regions? Suggest clarifying this Propose alternative text: “The adverse effects of air pollution caused by shipping are an issue of interest to the International Maritime Organization (IMO) which, on the basis of Annex IV of the International Convention for the Prevention of Pollution from Ships (MARPOL Convention),[1] endeavours to reduce emissions through international agreements. The MARPOL Convention aims progressively to restrict emissions by reducing the sulphur content in fuel, by allowing the use of exhaust gases cleaning systems as an alternative compliance to low sulphur requirements (~~by, for example, the use of~~ ie scrubbers) to address SOx reduction, as well as NOx emissions by more stringent ship engine standards. Installations of scrubber systems ~~are increasing~~ have increased in recent years to meet the 2020 global sulphur limit, as an alternative to low sulphur fuel (7 ships in 2010, 256 ships 2015 and more than 4400 in 2020). The discharge of these wash waters is currently under close consideration at the IMO due to concerns associated with the increased use of EGCS and the potential long-term impacts of cumulative wash water discharges on certain sensitive sea areas. Whilst no evidence has been put forward to date to show that that discharges from EGCS present an unacceptable long-term risk to the environment, a number of countries and overseas	Changed wording.

[1] United Nations, *Treaty Series*, vol. 1340, No. 22484.

		ports have taken a precautionary approach and prohibited these discharges in certain waters under their jurisdiction. ~~and there is concern as to how the discharge of large volumes (typically 500 m^3h^{-1} from a 12 MW ship) of wash water may affect the marine environment. For this reason, some ports and countries have already prohibited such discharges in their waters (Turner and others, 2017).~~ ~~Many~~ European ports, such as Rotterdam, and ports in California and Singapore have already prohibited discharge of open loop scrubber wash water into their waters. Recently, China and Egypt also proposed such a ban in Chinese waters and the Suez Canal respectively.	There is an increasing number of evidence that the discharge of scrubber wash water poses a threat to the marine environment. Even though the number of studies are yet limited (mainly due to the fact that the scrubbers have not been around for so long, so assessments of long-term impact in situ is simply not possible yet). However, there are a lot of knowledge about the negative effects of the constituents of scrubber water (primarily metals and PAHs). The peer-reviewed published papers on scrubber ecotoxicity also indicate synergetic effects, increasing the toxicity of the scrubber water compared to the response to of the individual substances. There are no single peer-reviewed published article that scrubber water would not pose a threat to the marine environment. The few reports that claim that there is no concern are often commissioned reports by the industry, and e.g. in modelling efforts they chose to not look at entire loadings of pollutants in a geographic area, which will not adequately reflect the situation in

			situ.
156	Section 3: Persistent organic pollutants (including run-off from the use of agricultural pesticides)	More emphasis could be placed on the potential impact on whales (and other marine mammals) at the top of the food chain, given the accumulative nature of these chemicals. There is quite a lot of literature on this now.	Although some information on the potential impact of POPs on marine mammals already existed in the chapter, additional information has been included.
157	Section 3.2: Situation recorded in the First World Ocean Assessment (WOA I): Page 519, lines 31-32.	The reference to 'north-west' is incorrect as the Great Barrier Reef is on the north-east coast of Australia *(unless WOA I made this statement in relation to Ningaloo or other Western Australian reefs and not the GBR, in which case the attribution of reef name is incorrect in the dot point)*.	The correction has been made.
158	Section 7.3: Description of the environmental changes: Page 544, lines 23-25.	Besides the introduction of the IMO Sulphur 2020 Rule from 1 January 2020, it would also be worth mentioning that the IMO has banned the carriage of high sulphur fuel oil on board ships for propulsion purposes from 1 March 2020. There are also unilaterally applied emission control zones along the coast lines of the United States and China.	Reference was included.

Colombia			
159	**2. Situation recorded in the First Global Assessment of the Oceans (WOA I)**	We suggest to list in a table the substances according to their toxicity and the areas with the greatest persistence and tendency to bioaccumulation in the ocean.	This information was already included on WOA I. There is therefore no need to repeat the information in WOA II.
160	**3. Persistent organic pollutants (including run-off from the use of agricultural pesticides)**	The risk must be evaluated against the value of the regulatory ecosystem services provided in the atmospheric, ocean and continent relationships	The risks obviously must be evaluated against the value of the ecosystem services, but for hazardous substances such as persistent ganic pollutants (which are toxic, persistent and bioaccumulative) the risks to the ecosystems which they contaminate are clear.
161	**4.3. Description of environmental changes (between 2010 and 2020) metals**	We suggest to include algae as indicators of pollution by heavy metals in coastal waters, due to their ability to accumulate this elements.	It is already included when biota was mentioned.
162	**Keynote points**	Interpret the analysis of systemic connections between the atmosphere, ocean and continent, are general systems theory To achieve a synergy between flows and ecosystem services, it is proposed to consider the fundamentals of the general theory of systems, understanding the connections between the atmosphere, ocean and continent	See the response to Comment 160.

		EU	
163	**On Comment 1735 by the EU**	We would recommend you consider keeping the text, and all the related references proposed by the EU in Chapter 11 between paragraph 28 and 30 ***23*** *January 2020, the global limit for sulphur content in the fuel oils used by international shipping has been* ***24*** *reduced from 3.5 per cent (m/m) to 0.5 per cent. In the so-called Emission Control Areas* ***25*** *(ECA) the restrictions are more stringent, and since 2015 have been limited reduced to 0.1 per cent.* ***26*** *Presently there are four ECAs globally, in the Baltic Sea and North Sea areas (SOx and PM only until 2021), and the* ***27*** *North America and United States Caribbean Sea areas (SOx, NOx and PM). As of 2021, the* ***28*** *Baltic Sea and the North Sea will be what are known as NECAs, with stricter NOx emissions,* ***29*** *following a successful joint application by OSPAR and HELCOM. The implementation of the North Sea and Baltic Sea SOx ECA led to a significant reduction of sulphur dioxide concentrations in bordering port cities and coastal regions for the benefit of the health of coastal citizens. The requirement was also set to reduce acidification resulting from SOx deposition in the sea* ***reference4****.* *To this end, in its 2018 Report* ***reference5*** *on the implementation of Directive (EU) 2016/806, the European Commission assessed progress in reducing emissions from ships (SOx, NOx and PM) and the potential for additional reduction including by further strengthening current legislation. The report illustrated the successful introduction in 2015 of the SOx-ECA requirement in waters of Northern Europe with significant reduction of SOx concentration in the area. The report praised the focused and coordinated EU action on enforcement (from inspections to the penalties systems in the Members States) which resulted in high compliance rates by ships. The economic level playing field was preserved and the anticipated and feared distortion of competition, modal shift and other adverse impacts on shipping*	With all respect and acknowledging the successful work on cutting SOx and NOx emissions by shipping in the EU, the proposed additions are too lengthy and detailed on e.g. human health and cause an imbalance in the description of the global picture. The following information have been extracted to be included in Chapter 11: "The implementation of the North Sea and Baltic Sea SOx ECA led to a significant reduction of sulphur dioxide concentrations in bordering port cities and coastal regions for the benefit of the health of coastal citizens (EC, 2018). The requirement was also set to reduce acidification resulting from SOx deposition in the sea (EEA, 2013). The implementation of the Baltic Sea NOx ECA is estimated to reduce nitrogen deposition in the sea by about 40 per cent (Karl and others, 2019)."

			trades were not recorded. Ahead preparation also through supporting mitigation and funding measures and innovation were instrumental to facilitate an EU wide compliance culture. The report also clearly recommends further actions in addressing shipping emissions. *In this context, in 2018 European Commission published a cost-benefit study* ***reference6*** *of a possible designation of all EU waters as ECAs to address both SOx and NOx emissions. The study shows that the designation of ECAs in all EU waters, including in the Mediterranean Sea, could by 2030 cut emissions of SOx and NOx from international shipping by 80 and 20 percent, respectively, compared to current legislation. After 2030, SOx and NOx emissions are expected to further increase without additional measures, and NOx emissions will exceed emissions from all land-based emissions in the EU-28. Ship contribute to around 6-10 % to ambient PM2.5 concentrations in EU countries bordering the Mediterranean Sea. The creation of an ECA in the Mediterranean Sea would improve air quality by lowering ambient PM2.5 by 1-2 µg/m3 and would consequently prevent more than 4,000 cases of premature death annually by 2030 and up to 11,000 annual cases by 2050. As a result of achieved emission reductions, monetised health benefits outweigh costs to the shipping sector by a wide margin (on average a factor of 7 in 2030 and a factor of 12 in 2050) when taking also into account the co-benefits of upcoming climate policies. The cost to benefit ratios assessed for different scenaria in 2030 and 2050 were lower or similar to those of reduction of air pollution from land sources.* *For the above reasons, the establishment of a Med SOx ECA has been discussed in the context of the Barcelona Convention. At the 21st session of the Conference of Parties* ***reference7****, Contracting States agreed to continue the preparation of a proposal view of a formal request to be presented in 2022 to the International Maritime Organisation and to be formally adopted in accordance with the requirements of MARPOL Annex VI. The agreement*	

		reached is conditional to the outcome of further studies also assessing additional socio-economic impacts on the Mediterranean States, and on the possibility by the Contracting Parties to adopt measures to alleviate those impacts and be finalised at COP22. The implementation of ***30*** *the Baltic Sea NECA is estimated to reduce nitrogen oxides pollution to air by 70-80 as well as nitrogen compounds deposition in the sea by about 40 per 31 cent addressing eutrophication in the area (Karl and others, 2019).* Reference 4: https://www.eea.europa.eu/publications/the-impact-of-international-shipping ; https://www.eea.europa.eu/highlights/europes-seas-face-uncertain-future Reference 5: COM(2018)188 is the European Commission a report on the implementation and compliance with Directive (EU) 2016/802 which is transposing MARPOL Annex VI requirements into EU law. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0188 Reference 6: (*"The potential for cost effective air emission reductions from international shipping through designation of further Emission Control Areas in EU waters with focus on the Mediterranean Sea"*). https://www.iiasa.ac.at/web/home/research/researchPrograms/air/Shipping_emissions_reductions_main.pdf. Research study funded by the European Commission- Reference 7: Decision of 21st Meeting of the Contracting Parties to the Barcelona Convention (COP21, 2-5 December 2019, Naples, Italy) - IG.24/8: Road Map for a Proposal for the Possible Designation of the Mediterranean Sea, as a whole, as an Emission Control Area for Sulphur Oxides Pursuant to MARPOL Annex VI, within the Framework of the Barcelona Convention.	
164	**8 Comment 1736 by the EU**	Of the references above we would like to ask to reconsider including a reference to the IIASA study above (see our takes on the above comment 1735, reference number 6). In this context, we would stress that it is a very recent and valuable study addressing the effect of air pollution on health and there are not so many recent similar assessments globally. The relevance of reference on the topic is also flagged by the representative of the Republic of Korea in their comment 1441 where much older reference have been suggested for consideration and retained.	Text added: "Despite these improvements, a modelling study of the longer-term perspective shows that without additional measures, the current IMO and EU regulations will cut SO2 emissions of international shipping up to 2030, but then emissions will grow again. The pattern is even more pronounced for NOx emissions; after 2030 the

			emissions from international shipping will exceed those from land-based sources in the EU, if no further control is applied (IIASA, 2018)"
165		In Chapter 11, a new reference should be added in relation to IMO's developments pertaining work on the Reduction of GHG Emissions from Ships https://theicct.org/news/fourth-imo-ghg-study-finalreport-pr-20200804	Propose that this should be included in chapter on climate change instead as CO_2 emissions from shipping is not addressed in Chapter 11.
Japan			
166	5. Radioactive Substances 5.2 Situation recorded in the First World Ocean Assessment (WOA I) Page 559	For the purposes of accuracy, the sentence "The nuclear accidents at Chernobyl and Fukushima resulted in large inputs of radioactive material to the ocean but were of limited concern by 2014; the input at Fukushima was limited to immediately after the accident." should be replaced by "The nuclear accidents at Chernobyl and Fukushima resulted in large inputs of radioactive material to the ocean, while increments of the input at Fukushima was limited immediately after the accident."	The proposed text is ungrammatical, but an amendment has been made to meet the apparent intention of the comment.
167	5. Radioactive Substances 5.3. Description of the environmental changes (between 2010 and 2020) "Nuclear Incidents" Page 563	For the sentence "There have been no significant major nuclear incidents2011.", "since" should be added before "2011".	Corrected.
168	5.Radioactive	Page 560, Lines 21-23	Amended and updated.

	Substances 5.3.Description of the environmental changes (between 2010 and 2020)	Japan had requested to delete “new” because it is not appropriate for the Rokkasho Reprocessing Plant (RRP) and the Group of Experts approved the deletion. However, “new” remains in the second draft, so Japan requests to delete the “new” again. In addition, the official name of the reprocessing plant should be used for this sentence, so we request to change the sentence “a nuclear reprocessing plant” to “the Rokkasho Reprocessing Plant”. Since the word “now” seems to be unnecessary in this sentence, we also request you to delete the word. In addition, JNFL officially rescheduled the completion of RRP to the first half of fiscal year 2022, on 21 August, so we also request to modify the description from “by October 2021” to “by October 2022”. Therefore, we would suggest that the description is modified as follows. In Japan, the Rokkasho Reprocessing Plant is expected to come into operation by October 2022 (JNFL, 2020).	
Morocco			
169	Comment 1747 in the 1st draft made by Morocco	Comment 1747* introduced by Morocco (and which is indicated as being taken on board by the experts in the “Compilation of final responses to States”) is not reflected in the text. It is missing from current page 557 (section 4.4.3). Instead, it has been replaced by another comment from Morocco, which was not intended for this section and was submitted in response to another section. We would kindly request that this be taken into account.	The comment was taken into account in section 4.4.3 as requested.
170	Comment 1748 in the 1st draft made by Morocco	- Comment 1748* introduced by Morocco (and which is indicated as being taken on board by the experts) has been added in a different section. It is currently reflected in page 557 (section 4.4.3) whereas it has been submitted by Morocco as a response to the reference in current page 563 (section 5.3). In section 5.3, Morocco has indicated	The comment was moved to section 5.3. as requested.

		that the phosphate industry in Morocco has set up a system of improved management of phosphogypsum discharges through an investment of 120 M$ dedicated to the improvement of phosphogypsum discharges in order to obtain discharges that comply with international standards, in particular through marine outfalls of lengths varying from 1.8 to 2.6 km, equipped with diffusion systems all along their ends. Finally, given the information provided, we believe Morocco should not continue to be referred to in this section.	
Singapore			
171	Page 569 7.3 Description of the environmental changes (between 2010 and 2020)	**Excerpt from Second** Draft - "The adverse effects of air pollution caused by shipping are an issue of interest to the International Maritime Organization (IMO) which, on the basis of Annex IV VI of the International Convention for the Prevention of Pollution from Ships (MARPOL Convention), endeavours to reduce emissions through international agreements." **Comment** - Singapore proposes the amendment that is tracked in blue. Annex VI of MARPOL covers the prevention of air pollution from ships, while Annex IV is on the prevention of pollution by sewage from ships.	Amendment made.

#	Chapter 12: Solid waste		
	Section	Comment	Responses
Colombia			
172	**1.1. Introduction**	Chapter 12, page 589, different terms are mentioned about the sizes of marine litter, especially plastics. We recommend to include the definitions of GESAMP (2019) on the classification of marine litter according to its size (mega, macro, meso, micro, nano) in the introduction.	We propose " from mega litter (> 1m), to macro (>25mm), meso (>5mm), micro (> 1µm) and nano (<1µm) " to replace "from ocean-going boat hulls many metres in length to particles a few nanometers in length", with the reference already cited in the same sentence.
173	**1.2. Situation**	Page 590. Review the Microplastics definition in this section is:	This is the form that the editor

	recorded in the First World Ocean Assessment (WOA I)	"are polymer particles of less than 5 mm (upper limit) and larger than 1 micron, as defined by GESAMP (2019)". The GESAMP (2019) document recommends using <5mm.	suggested for this document and the meaning is the same.
174	**1.3. Description of the environmental changes (between 2010 and 2020)**	In figure 1 (Page 591)., we recommend to includ the word "SOLID" in the box "WASTE & WASTEWATER MANAGEMENT", you can write as "SOLID WASTE & SEWAGE MANAGEMENT" Page 592. Figure 2 is not cited in the paragraphs of this section. Please include it in the appropriate place in the description. Additionally, sources such as plastic producers, agriculture, solid waste, and wastewater that are not connected to via direct inputs (blue), should be removed from the figure. Similarly for via atmosphere (red)	Regarding Figure 1 this is a UNEP figure and therefore cannot be changed. The reference to figure 2 has been added in the first sentence of the paragraph above the figure.
175	**1.7. Relevance to the United Nations Sustainable Development Goals (SDGs)190 and other frameworks**	Actions at the South American level are not mentioned, we suggest to include some examples, such as advances in circular economy policies and regulations on extended producer and post-consumer responsibility. In addition, regional programs such as the South American Pacific "científicos de la Basura" (Litter Scientists) and the Latin American and Caribbean Coastal Marine Stressor Research Network -REMARCO have generated important information on marine litter for the management of environmental authorities, and promoting solutions local and national solutions.	These examples are not policies or measures, but rather networks of scientists interested in specific subjects, and not therefore relevant here South America is involved in some of the initiatives, that are mentioned: for example, G20 (including Brazil, Mexico and Argentina), in 2018, was under the presidency of Argentina and promoted circular economy.
176	**1.9. Key remaining knowledge and capacity-building gaps**	Page 608.We suggest to include in Table 4 the research, knowledge and monitoring networks between different countries	This was not included because the table is dealing with capacity-building gaps.

Japan			
177	2. Dumping at sea (including garbage from ships and sewage sludge) 2.1 Introduction (Page.609)	Please add "(i)" on the sentence below: "Dumping is any deliberate disposal of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea, according to Article 1, para. 5 (a) (i), of the United Nations Convention on the Law of the Sea (UNCLOS),.."	Added.

#	Chapter 13: Erosion and sedimentation		
	Section	**Comment**	**Responses**
Australia			
178	Section 2.2: Changes in pressure: Page 599.	Could be clearer linking of the four examples at end of this section to the core argument of increasing anthropogenic pressure.	The section has been written with limit in the number of words set by the Group of Experts.
179	Section 2.3: Changes in state: Page 599, line 19-20.	Check wording, sentence structure.	Revised.
180	Section 4.3: Indian Ocean …	Suggest adding reference to population density along these coasts, as presented for other regions.	Revised; references added.
181	Section 4.5: South Pacific	As above	Revised; references added.

Colombia			
182	**Changes in state of coastal erosion and sedimentation**	What is known of the cliff coasts? if nothing is known, it should be mentioned.	Discussion added.
183	**Keynote points**	Clarify the differences in coastal erosion between shores with beaches and cliffs.	Information added.
184	**Introduction**	Although the chapter talks about changes in erosion and sedimentation, no information about the cliffs is reported. There is also no mention of large-scale studies of hazard, vulnerability and risk from coastal erosion.	With the limit in the number of words used for the chapter, impacts of coastal erosion and change in sedimentation are discussed in the section 2.4.
185	**… Changes to (Colombia or tropical eastern Pacific)**	Studies have been carried out where different aspects are taken into account in the causes and impacts of coastal erosion in the area: Ricaurte-Villota and others (2018) http://www.invemar.org.co/publicaciones#; Horts and others (2017) https://link.springer.com/article/10.1007/s11852-018-0609-x and TCNCC (Tercera Comunicación Nacional de Cambio Climático – Colombia), Technical report (Chapter 4) http://www.cambioclimatico.gov.co/resultados	A reference has been added and referred in the text. Some references are written in Spanish and it is not possible for the writing team to study them.

#	Chapter 14: Coastal and marine infrastructure		
	Section	**Comment**	**Responses**
Australia			
186	Keynote points: lines 17 – 19.	Re dot point reading '*Coastal and marine infrastructure development in general has created new opportunities for coastal dwellers and supported sustainable socioeconomic coastal development'*, if that statement is intended to convey that such development is generally **ecologically** sustainable (as well as economically and socially sustainable), we would question that. If it not intended to convey that, we suggest re-drafting to	The text has been revised according to the suggestion.

		make that clearer.	
187	Section 2.3: Other adaptations affecting coastal populations as a result of sea level rise: lines 29 – 31.	Sentence reading '*Adaptation strategies …. the risks to individuals, communities and societies …*', we suggest adding '***ecosystems***,'.	Revised.
188	Section 2.6: Changes in submarine cables and submarine pipelines: Page 611, line 21.	The average installation rate of communications cables is listed as "70,00 km per year". Is this 7,000 or 70,000?	70,000 km per year.
189	Section 3: Consequences of the change on human communities, economies and well-being	Paragraph beginning '*In general, coastal infrastructure development increases the resilience of the coasts …*', if that is intended to convey that **ecological** resilience is generally increased, we disagree. If it is not intended to convey that, we suggest redrafting to make that clear.	The text has been revised.
Colombia			
190	**South Atlantic Ocean and Wider Caribbean**	The implementation of strategies based on nature to counteract coastal erosion processes.	Discussion and a reference have been added to the text.

#	Chapter 15: Capture fisheries		
	Section	**Comment**	**Responses**
Australia			
191	Section 1: Introduction: Page 621.	'*Many regional fisheries management organizations or arrangements (RFMO/As) covering the high seas were not fully effective in assessing stocks, enforcing quotas, or providing observer coverage to account for catches, bycatches or discards (Cullis-11 Suzuki and Pauly, 2010; Crespo and Dunn, 2017; ICES, 2018a).*' We consider some terms are improperly used here and the statements are out of context: • We are not aware of any RFMOs that cannot enforce a *quota*. A quota is relatively easy to enforce. If the authors meant to say *catch limits*, referring to the 'global' limit in the RFMO, then we would agree. • We are unclear what is meant by 'not fully effective in assessing stocks'. Many RFMOs do have regular stock assessments. In some cases a full assessment is not possible (or indeed, required) and low data methods may need to be used (low data can be because of low effort, such as the case in SPRFMO; or because of a lack of monitoring as is the case in IOTC neritics). • Observers provide verification but there are other ways to obtain and verify this data.	We agree with the reviewer. We have replaced "quota" with "catch limit." We agree with the reviewer. As we reported, independent of whether assessment is possible or even required, many RFMOs are not fully effective in assessing stocks. We agree with the reviewer, and we have rephrased as follows: "or providing the means or resources to account for catches, bycatches or discards such as adequate observer coverage."
192	Section 1: Introduction: Page 622.	'*Management reforms, such as rights-based approaches, have the potential to yield significant increases in annual catches (2–16 MT) and 2 profits (31–53 billion dollars) (Costello and others, 2016).*'	

		This statement seems out of context – management reforms lead to improved sustainability and improved profitability, but do not in and of themselves 'yield significant increases in annual catches.' – this is not necessarily the goal. Likewise, rights-based approach do not have this direct effect.	The text quoted by the reviewer was taken from an earlier (July 2020) draft of the chapter. This text had been modified during the previous revision in a way that responds to the reviewer's concern.
193	Section 11: Key capacity-building gaps: Page 629.	As flagged above, the content in this section seems unfounded. We suggest that – if this is the conclusion the authors seek to draw – further citations and/or evidence is provided. Otherwise, we suggest a more reliable conclusion should be drawn.	This section reprises discussions and conclusions made earlier in the chapter.
Colombia			
194	**1. Introduction**	The pollution, the destruction of coastal habitats and the coastal erosion are factors that influence the distribution and abundance of fish, many times generated by climate change	These issues are taken up elsewhere in the WOA2.
195	**2.1. National jurisdictions**	It is suggested to address the issue of conflict resolution (through responsible Governance), generated between the SSF and the fishing activity, for carrying out activities in protected areas and that are fishing grounds.	We appreciate the reviewer's comments, but the scope of this chapter did not comprise cross-sectoral management questions such as the resolution of conflicting uses.
196	**4. Levels of bycatch and side effects**	For this, FAO recommends that States and RFMOs / AROPs should ensure the availability of a range of instruments for managing bycatch and reducing discards. This instruments include, among others: (i) input controls and the production; (ii) improving the design and the use of fishing gear and bycatch reduction device for mitigation of impacts; (iii) spatial and temporal measurements; (iv) bycatch limits and / or quotas; (v) the prohibition of discards, where applicable, if it is not possible to release them alive and can be used in accordance with the Code of Conduct for Responsible Fishing an the International Guidelines on Bycatch Management and Reduction of Discards	We agree with the reviewer, and we cite ICES (2019), covering the points raised by the reviewer.
197	**5. Post-harvest**		We have referred in the text to

	fish losses	Do not ignore the self-consumption of catches in both industrial and artisanal fisheries. These catches are not counted or taken into account in the fishing statistics	efforts by scientists to reconstruct catches to account for previously non-reported catches in official statistics.
198	**8. Illegal, Unreported or Unregulated (IUU) fishing**	In coastal fisheries, the transshipment of fishery products, illegal sale and the non-reporting of incidental catches of prohibited species is carried out.	We agree with the reviewer. These issues are addressed in the cited literature, which was referenced in the text of the chapter.
Iceland			
199		There is improvement in the document from the first draft, and account has clearly been taken of many of Iceland's comments. This is to be commended. However, fundamental problems with Chapter 15 can not be overlooked. Iceland's general comments on the first draft regarding Chapter included the following: "It has major oversights that must be corrected, which will require significant re-writing of the whole chapter. Minor amendments in a few places will not suffice to bring the quality of the draft to an acceptable level." Iceland notes that other States reached similar conclusions, with the United States e.g. recommending in its comments that "that the authors review the whole chapter". Unfortunately, the Chapter was not re-written, but rather some amendments have been made to it which do not change the fact that it mostly overlooks the fact that two-thirds of fisheries are being sustainably managed. The Chapter consequently completely overlooks the fact that for the vast majority of fisheries the priority is to maintain and strengthen further the existing well-functioning fisheries management. This then further leads to the fact that the problem of overfishing is not put in the context of the need to expand well-functioning fisheries management to cover more fisheries.	We thank the reviewer for the comment that the draft has been improved. In the process of revising this chapter in June-July 2020, we considered comments and

		It may be too late in the process to expect fundamental re-writing of Chapter 15. This is unfortunate, as without such an overhaul the low quality of this Chapter will inevitably undermine the credibility of the whole WOA report. For clarity, the following is the general comment that Iceland made to Chapter 15 in the first draft, which unfortunately still largely apply even though some of the more specific comments have been addressed: "Chapter 15, on fisheries, starting on page 619, is unfortunately currently of very low quality. It has major oversights that must be corrected, which will require significant re-writing of the whole chapter. Minor amendments in a few places will not suffice to bring the quality of the draft to an acceptable level. FAO reports that are correctly quoted in the chapter state that 33.1% of fish stocks are overfished, which leaves 66.9% of fish stocks as not overfished. It is of course necessary to highlight the issue of a third of fish stocks being overfished, as this is of serious concern. However, the authors of the chapter seem to have overlooked the fact that 66.9 is a greatly higher number than 33.1. Overlooking the 33.1% would have been wrong, and Iceland welcomes the fact that the draft Second WOA report does not overlook this part of the world's fisheries. However, Iceland finds it inexplicable that the draft report ignores the 2/3 majority of fish stocks that are not overfished. This oversight colours the whole chapter, from the fact that there is no mention of the vast majority of fish stocks being sustainably harvested in the "keynote points" at the start of the chapter to the fact that the "outlook" and "gaps" parts toward the end of the chapter do not mention the fact that for the vast majority of fish stocks the overriding priority is to maintain fishing at sustainable levels. For some reason, there is no mention of this important priority, which one would have expected to be a prominent feature in a chapter on global fisheries. There are several important issues related to the issue of maintaining	recommendations from all interested States, including those from this reviewer. Because the reviewer has copied comments from the earlier round of reviews, we refer the reviewer to our specific responses to those comments (not copied again here) made in the earlier round.

		fisheries at sustainable levels, including ways to safeguard and strengthen further the fisheries management that is working efficiently. These genuinely major issues are simply not to be found in this chapter on fisheries. The issues of overfishing are thereby also not put in the context of the need to extend the well-functioning management regimes to cover the overfished stocks. Again, overlooking the fact that many stocks are in need of management action to halt overfishing and to rebuild stocks would have been a clear oversight. Likewise, the current situation of overlooking the fact that there is no need for halting overfishing or rebuilding stocks for 2/3 of fish stocks defies explanation. Iceland trusts that this whole chapter will be re-written to ensure that there is proper balance where it is clearly stated that a majority of fish stocks are being fished within sustainable levels that must be maintained, while a third of fish stocks constitute a problem that must be addressed. Maintaining the current approach to this chapter would undermine the credibility of the whole WOA report. The re-written chapter should properly address the various well-functioning fisheries management measures implemented at the national level and through regional cooperation, such as in RFMOs." In this context, and as further demonstration of the lack of quality in Chapter 15 that remains in the second draft, it is perhaps also worthwhile to reiterate comments that Iceland made regarding the identification of "significant gaps" in the Chapter's section 1 (on page 655 of the second draft). This is in relation to identifying as "significant gaps" issues that have not actually arisen, but may potentially arise at some point in the future, and present it as "significant gaps" that these have not been fully and exhaustively addressed. The fact is that both examples are issues that have to a very large extent already been addressed, despite being potential future issues rather than current issues, but they are nevertheless considered by the authors as "significant gaps". Iceland's original comments, which unfortunately still apply to the	The current text of the chapter (as of July 2020) is very clear on the proportions for each category of fishery and the long-term trend. Please refer to Figure 1, its caption, the accompanying text, and the associated references. (Please note that this text was revised explicitly to accommodate the comments of this reviewer made during the previous round of reviews.)

		second draft, reads as follows: "On page 621, starting on line 13, there is a list of gaps "in establishing and reaching consensus on management practices for sustaining healthy fish stocks". This list includes the following: … "limited progress in the conservation of fish stocks in the Central Arctic Ocean (a temporary 16 year moratorium on unregulated fishing awaited entry into force)". The fact is that there are no commercial fisheries in the high seas of the Central Arctic Ocean, but relevant States have nevertheless come together to conclude an agreement to proactively address the potential issue of future fisheries there. This is foresight that should be applauded that is for some reason here presented as a gap and a problem that needs to be addressed. "absence of management of prospective fisheries in the mesopelagic zone, where regulation was either nascent or non existent". The main reason why there is limited regulation of mesopelagic fishing is the fact that there is very little such fishing. The legal framework and enforcement mechanisms for formulating and applying relevant conservation and management measures is widely in place at both the national level and for the high seas (i.e. this is within the existing legal mandate of Generic RFMOs). To present it as a significant gap that an issue that has not yet arisen has not yet been fully addressed is stretching things to an extent that is unbecoming of a WOA report. Yet again it should be stressed that it would be inappropriate to overlook genuine problems. However, it is not only also inappropriate to overlook things that are being done well (in particular when these constitute the vast majority of cases) but also inappropriate to present issues as problems when they simply are not problems. This list of "gaps" is therefore difficult to understand and Iceland suggests that revising it significantly be a part of the re-writing that is clearly needed for this entire chapter on fisheries."	
Mexico			
200	General	This chapter could benefit from including information from the	Unfortunately, there is insufficient

		CITES Trade Data Base, UNEP-WCMC: https://trade.cites.org/ . This would complement the information regarding international trade of some species of interest and could show some trends.	room to accommodate yet new sources of data in this chapter.
201	General	Even if this chapter is more focused on Capture Fisheries and Harvesting of Wild Marine Invertebrates, it does mention information regarding general fisheries. In this context, it could also be interesting to include information regarding capture of marine ornamental fish.	Unfortunately, there is insufficient room to accommodate yet new sources of data in this chapter.
202	Section 2.2	Section 2.2. on High-seas fisheries, could benefit from information from the CITES Trade Data Base: https://trade.cites.org/, specifically regarding some shark species.	Unfortunately, there is insufficient room to accommodate yet new sources of data in this chapter.
203	Section 3	Section 3. on Invertebrate landings, could also benefit from information from the CITES Trade Data Base: https://trade.cites.org/, specifically regarding some sea cucumbers species. This section could also include information regarding fishing of some precious coral species (order *Antipatharia* and family *Coralliidae*) and on Queen conch (*Strombus gigas*), information also available in the CITES Trade Data Base.	Unfortunately, there is insufficient room to accommodate yet new sources of data in this chapter.

#	Chapter 16: Aquaculture		
	Section	**Comment**	**Responses**
Colombia			
204	**Key Note Points People and nutrition**	Include aquaculture production from the last FAO report: http://www.fao.org/state-of-fisheries-aquaculture World aquaculture production attained another all-time record high of 114.5 million tons in live weight in 2018 with a total farm gate sale value of USD 263.6 billion (the price of the product available at the farm, excluding any separately billed transport or delivery charge).	We suggest sticking to 2017 figures, throughout the document, although we have 2018 figures available now.
205	**Biosecurity**		Addressed.

		It would be desirable that pathogens are classified in virus, bacteria and parasites and also intend to establish an order naming first invertebrates and then fish. It would also be good to list other emerging pathogens such as Tilapia Lake Virus that is causing important impacts. Please see https://www.nature.com/articles/s41467-020-15735-6 Where it is reviewed the effect of global warming and the AMR in aquaculture world wide	
206	**Aquaculture and society**	It would be good to include information regarding certifications and sustainability assurance.	Major reviews covering the suggested subject has been cited and referenced in the chapter.
207	**Key remaining knowledge gaps**	It would be good to mention the importance to study animal physiology and the use of novel molecular techniques such as transcriptomics, metabolomics, genomics and microbiome analysis	Addressed.
Philippines			
208	**1.4 Biosecurity**	The Philippines wishes to propose in the second paragraph: "…Countries must monitor other emerging diseases, such as *Enterocytozoon hepatopenaei* in shrimps and Tilapia Lake virus in tilapia, which have the potential to severely impact the sector if not addressed in a timely manner (FAO, 2017a)	Addressed.
209	**1.5. Technology**	The Philippines wishes to correct the typographical error in the last sentence of the first paragraph: "Potential negative environmental and socio-economic impacts should always be considered along with potential for developing native species culture, when deciding to introduce a species for culture (Wurmann, 2019)" While noting the writing team's comments, the Philippines	Addressed. Yellow highlighted suggestion is true but in my opinion too detailed for the chapter as we did not include such details relevant to other aspects. So I suggest leaving it.

		reiterates its comments: On Lines 34 to 36 on adoption of genetic improvement programmes, the Philippines recommends the following edits: "Adoption of genetic improvement programmes **based on conventional and/or the advanced molecular marker-assisted selection schemes** is very slow, even for some major aquaculture species. Such programmes are expensive to initiate but there is evidence that public–private partnerships can be effective in building and sustaining long-term programmes (FAO, 2019). **Recent technologies, such as genomics and genome editing, offer approaches that aim to genetically improve performance traits and/or address disease problems in aquaculture animals. However, such techniques in farmed aquatic species are still subject to public acceptance and strict regulatory protocols (Gratacap et al. 2019).**" This is based on the work of Gratacap RL, Wargelius A, Edvardsen RB and Houston RD (2019. Potential of genome editing to improve aquaculture breeding and production. Trends in Genetics 35(9):672- 684. DOI: https://doi.org/10.1016/j.tig.2019.06.006),	

#	**Chapter 19: Seabed mining**		
	Section	**Comment**	**Responses**
Australia			
210	Strategic Policy – Resources Division	Query what a *'global trading clearance center'* entails DFAT have noted that this is an addition since the previous draft and are chasing down the source of the input. Strategic policy team and interested to know what this means for Australia as a member organisation and as a potential participant in DSM	The comment is not clear.

		activities prior to agreement.	
Colombia			
211	**1.2. Drivers, challenges and opportunities for seabed mining**	End of paragraph 2: It is implied that since not much of the things that pollute in regular mining are going to be needed, lesser impacts should be expected. Since not much of how this industry is going to be develop is known, I do not consider this to be a sound assumption. Even more when our knowledge of the ecosystem is poor.	Accepted; sentence rephrased using "could" instead of would.
212	**2.1.1. Aggregate, sand and gravel update**	Not much consideration is given to coastal erosion as a consequence of the extraction of marine aggregates, or its contribution to the sand deficit along the shores.	The impact of the extraction of marine aggregates on coastal erosion was discussed in WOAI (Chapter 23 (Offshore mining industries)), with reference to one of the case studies. There is little further to add within the word-limit constraints of WOA II. Chapter 13 of WOAII discusses coastal erosion and causes in detail.
213	**3.1. Advances in knowledge and environmental impacts**	The only mention of activities causing impacts is that of the sediment or water plumes but, physical impact by the vehicles circulating on the bottom could be large also.	The impact of vehicles is expected to be less than sediment plumes.
Japan			
214	4.Economic and social impacts 4.1.1.Economics of deep seabed mining for polymetallic	Both the payment of administrative expenses and compensation to those states affected from DSM are obligations of UNCLOS and the 1994 Agreement. Therefore, in light of the technical reason, the text should be amended as follows:	The text has been clarified.

	nodules (Page.698)	"While the potential revenue from the sales of metals is sufficient financially to justify the rather large investments and operating costs associated with DSM, the funds must first cover all administrative expenses at the ISA~~.~~, ~~The revenue must also meet the obligations under part 11 of UNCLOS. D~~developing countries may also need to be compensated if impacts from DSM on metals prices affect those countries, in accordance with UNCLOS and the Agreement relating to the implementation of Part XI of the UNCLOS 1982."	
215	4.Economic and social impacts 4.1.1.Economics of deep seabed mining for polymetallic nodules (Page.698)	Whether the received fund is substantial or not is a matter of subjective judgement, and objective expression is preferred. Therefore the text should be amended as follows: "Initial investigations of the economics of the system show promise that all stakeholders can receive a certain ~~substantial~~ funds."	Agreed, sentence has been rephrased.
216	4.Economic and social impacts 4.2. Social impacts (Page.700)	Modality of compensation to those affected from deep sea mining should be discussed at ISA in accordance with Section 7, paragraph 1, Annex of the Agreement relating to the implementation of Part XI of the UNCLOS 1982 (Please refer to Section 7, paragraph 2 of the Agreement which defines Article 151, paragraph 10, of the Convention shall be implemented by means of measure of economic assistance referred to in paragraph 1.) This report should not prejudice to such discussion and decision-making at ISA. Therefore, the text should be amended as follows: "It should be recognized that, while a new source of metal supply might be beneficial, there could be negative consequences, such as for countries whose economy relies	Comment noted. Reference to Section 7, paragraph 1, Annex to the Agreement has been added.

		heavily on the export of metals obtained from terrestrial mining, and, in accordance with Section 7, paragraph 1, Annex of the Agreement relating to the implementation of Part XI of the UNCLOS 1982 (Please refer to Section 7, paragraph 2 of the Agreement ~~Article 151, paragraph 10, of the United Nations Convention on the Law of the Sea~~, those consequences need to be studied and addressed~~, for example via monetary compensation~~."	
New Zealand			
217	2.1.4. Iron sands update	Iron sand is a sand containing grains of iron oxides (usually magnetite), typically found along coastal areas; the sand is mined for the iron to be used in the steel industry. WOA I presented a case study of iron sands, which occur off New Zealand at water depths of 20 to 42 m. A mining permit was granted to Trans-Tasman Resources Limited (TTR) in May 2014 for up to 50 million tonnes of ore per year for 20 years, which would be mined over an area of 66 km2. As reported in WOA I, the decision-making committee (DMC) of the New Zealand Environmental Protection Agency (EPA) in June 2014 did not grant an environmental permit to mine, based on inadequate environmental data. However, an environmental permit to mine up to 50 million tonnes a year of iron sands for 35 years was granted by the DMC in August 2018 based on a revised application. That decision was subsequently appealed by environmental and fishing groups and the New Zealand High Court ruled in August 2018 that no mining would take place and sent it back to the DMC for further consideration based on the Court's criteria concerning correct legal tests for adaptive management. TTR appealed the High Court's ruling to the Court of Appeals, and has now appealed it to the Supreme Court, where the case currently resides.	A good update and noted. All material cannot be incorporated due to word count limitation.

		TTR also holds an exploration permit adjacent to their mining permit and two additional companies have been granted exploration permits for iron sands in New Zealand's maritime zones. Ironsands Offshore Mining Limited (IOM) has an iron sands exploration permit off the coast of New Plymouth, the same general region as the mining permit granted to TTR. This exploration permit occurs within a marine mammal sanctuary with a small overlap over an area where seabed mining is prohibited but exploration activities may be conducted. Pacific Offshore Mining (POM) has an exploration permit for iron-titanium sands (ilmenite) off the Bay of Plenty, east of the North Island. Both IOM and POM are subsidiary companies of CASS Offshore Minerals Limited.	

#	Chapter 20: Hydrocarbon exploration and extraction		
	Section	**Comment**	**Responses**
Colombia			
218	**3.2. Environmental impacts**	It is important to include case studies where the impacts on biological communities in the short and long term are visualized. Although the activities and the pressures derived from them are mentioned, the actual impacts are mentioned only tangentially. These impacts should be explained in terms of populations and communities according to the scale, depth, time and location of the project's area of influence. A summary table of these cases would be especially useful.	Comment noted but cannot be addressed in time and space available.
219	**4.1. Importance of**	Although monitoring is highly relevant, it should be noted that the construction of the environmental baseline of deep areas is still in	Agreed.

	long-term environmental monitoring and mitigation	the making. Therefore, greater efforts should be made by governments to obtain it before the development of offshore exploration and exploitation projects. This baseline is also important because it helps to define the relevant aspects to monitor in the future.	

#	Chapter 21: Anthropogenic noise		
	Section	**Comment**	**Responses**
Argentina			
220	Page 738:	**Precautionary principle.** Argentina suggests replacing it by precautionary approach in line with the Rio Declaration. In particular, in the following references: "At this stage, many regulations that are based on insufficient data have adopted the precautionary **APPROACH**".	Amended as suggested.
Australia			
221	Keynote points (lines 6 – 8)	While noise does not persist in the marine environment once the source is removed, that is not to say that the impacts do not persist (e.g. physiological damage or mortality). Suggest this is a distinction worth making.	Additional text added as suggested.
222	Section 1: Introduction: Page 686, para 1.	Perhaps worth re-emphasising here (paragraph 1) that this topic was the subject of the 19th Meeting of the UN Open-ended Informal Consultative Process on Oceans and the Law of the Sea. https://undocs.org/A/73/124 https://www.un.org/Depts/los/consultative_process/icp19_report.pdf.	Additional text added as suggested.
223	Section 1: Introduction; Section 2: Description of the	Suggest mentioning early studies show that warmer and more acidic oceans due to climate change reduce sound absorption, amplifying underwater noise.	The early work that has been done exploring the potential changes in noise propagation that might occur as a result of changing ocean conditions associated with climate change identify that changes depend

	environmental status		significantly on local conditions and changes in shelf/shallow regions are likely to be considerably different to off-shelf oceanic regions. They are further likely to be influenced by changes in the soundscape of regions as species redistribute and ocean use changes. See for example, Lynch, et al. "Impacts of ocean warming on acoustic propagation over continental shelf and slope regions." *Oceanography*, vol. 31, no. 2, 2018, pp. 174–181. www.jstor.org/stable/26542663. Providing a generalised statement that sound absorption universally will reduce is not appropriate, particularly given the limited research conducted (to date) that has explored these potential changes. Note that section 5 identifies the EOV being developed by the GOOS Biology and Ecosystems Panel will contribute to ascertaining changes in noise generation and propagation through time and under changing ocean conditions.
224	Section 2: Description of the environmental status: Page 688, lines 43-	Marine traffic as a contributor to ocean noise: It would be worthwhile to reference the International Maritime Organization (IMO) *Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life* adopted in 2014. These non-mandatory Guidelines	These guidelines have been detailed in section 5 and there is no need to repeat them across sections of the chapter.

	50; page 689, lines 1-5.	provide general advice about reduction of underwater noise to designers, shipbuilders and ship operators. Australia supports the IMO's Marine Environment Protection Committee to review the Guidelines with a view to reduce underwater vessel noise. Commercial shipping traffic follows established routes which transect or are proximal to sensitive marine habitats, for example the Great Barrier Reef in Australia. Measures can and have been taken in localised areas to reduce noise from vessels, however given projected growth in commercial shipping, mitigation strategies at an international level are required to effectively reduce a potentially corresponding increase of underwater vessel noise across the entire ocean basin.	
225	Section 2: Description of the environmental status: page 690, lines 23-40.	Would it be worth noting here some of the limitations and challenges associated with impact studies … e.g. The knowledge we do have is often limited due to experimental conditions or design (unrealistic or unknown sound exposures, artificial tanks, absence of controls) or those focused on a single species which preclude generalisation and extrapolation to other regions, seismic surveys, species, or biological responses. *See section 5 in A critical review of the potential impacts of marine seismic surveys on fish & invertebrates* https://www.sciencedirect.com/science/article/pii/S0025326X16309584.	This is highlighted in section 6 of the chapter as a key knowledge gap. There is therefore no need to repeat the limitations in this section as suggested.
226	Section 2: Description of the environmental status: page 692, line 48.	Request sentence starting on line 48 be amended accordingly: The use of LFA sonar has been restricted **by some States' navies** due to concerns over its impact on divers and marine mammals	The sentence has been amended to "The use of LFA sonar has been restricted by some countries..."
227	Section 4.4: Indian Ocean …	For the drafting team's information and use as applicable, seismic surveys are being undertaken within Australia's exclusive economic zone and continental shelf for the exploration of oil and gas, specifically	A sentence noting this with a relevant citation has been added to section 4.4.

		offshore Western and Northern Australia in the Indian Ocean.	
228	Section 4.7: Southern Ocean	Suggest looking, and citing as appropriate, previous working papers submitted by the Scientific Committee on Antarctic Research on Anthropogenic Noise in the Southern Ocean. Additionally, for the drafting team's information and use as applicable, seismic surveys are being undertaken in the Southern Ocean for the purpose of scientific research, for example, Voyage IN2020_V01 R V Investigator to Kerguelen Plateau.	Due to word limits imposed on chapters, these sections are focused on identifying main anthropogenic noise sources in these regions. They cannot provide the detail of all noise sources or all research conducted for each region.
229	Section 5: Outlook: page 697, lines 1-7.	Another key summary point from the 19th UN meeting on Anthropogenic noise was the suggestion that the UN General Assembly in a resolution could characterize anthropogenic underwater noise as a form of transboundary pollution to be mitigated and addressed. During the general exchange of views, delegates also highlighted, *inter alia*, consideration of including ocean noise in the negotiations on the conservation and sustainable use of BBNJ.	Due to word limits imposed on chapters, we are unable to include all recommendations made during the ICP, noting that while discussions may have highlighted the need for noise to be considered as part of BBNJ negotiations, these negotiations are yet to be finalised, so whether noise is formally considered under the output from these negotiations. The text at present identifies that impacts should be identified and mitigated.
Japan			
230	2.Description of the environmental status	"is often the main anthropogenic contributor"should be replaced with "could be the main anthropojenic" Rationale: We find no evidence justifying such conclusion. As emphasized at UN-ICP in 2018, there still exist a number of knowledge gaps to identify what the main contributor is.	Citations identifying that merchant shipping noise is often the main contributor to noise at frequencies below 200 Htz have been included in the text, supporting the statement. The sentence has not been rephrased as there is adequate justification provided in these citations.
231	2.Description of the	"evidence" should be replaced with "a study".	The sentence has been reworded to: "Overall increases in merchant

	environmental status	Rationale: Although a paper is referred, we see no justification to conclude it as "evidence".	shipping are highly correlated with ocean sound pressure levels, increasing approximately 3 dB re 1 μPa^2/Hz per decade over the 10 to 50 Hz band throughout several decades of the late twentieth century (McDonald and others, 2006). It should be noted that these increases are also reported in Frisk 2012 and references contained therein.
232	2. Description of the environmental status	"However, shipping itself causes mortality in marine mammals through ship strike (Cates and others, 2017; see also Chapter 6D)." should be deleted. Rationale: This is not an issue related to anthropogenic underwater noise to be addressed here.	The sentence has been deleted although the reference to the chapter in the assessment has been retained.
233	2. Description of the environmental status	"; Tsujii and others, 2018" should be deleted. Rationale: The report by Tsujii et al. does not provide evidence for shipping noise being the cause of changes in mating behaviour of humpback whales, nor provide any finding on "potential consequences on the survival of populations and communities " of humpback whale as clarified by the authors (see the URL below). http://www.naoe.eng.osaka-u.ac.jp/ssri/ecosystem/img/2018-Oct24_ResPaper.pdf If "; Tsujii and others, 2018" is to be retained, "with potential consequences on the survival of populations and communities across a number of marine taxa." should be delated.	Singing in humpback whales is widely recognised as being associated with the breeding season, with males singing when escorting females. It is therefore considered to play an intersexual function in the species. See for example Smith et al. 2008. Songs of male humpback whales, Megaptera novaeangliae, are involved in intersexual interactions. Animal Behaviour 76: 467-477. Changes in singing as reported by Tsujii et al. 2018 are therefore linked to changes in behaviour during the breeding season. The citation has been

			retained and text modified to "changes in the foraging behaviour and vocalisations during the breeding season of humpback whales".
234	3. Description of the economic and social consequences and/or the other economic or social changes	"may be most directly" should be replaced with "may be directly". Rationale: The term "most" seems ambiguous"	"Directly" has been replaced with "obviously" to clarify the sentence.
235	5. Outlook	"To achieve these goals, one step may be to reduce noise from shipping, the major anthropogenic noise contributor at low frequencies in the open ocean" should be delated. Rationale: We do not see justifications to conclude that shipping be the major contributor to anthropogenic underwater noise as described here.Although a study (Wenz, 1962) is referred here, noting that shipping activities involving technologies and operational patterns have been continuously changing, we cannot make any conclusion based only on such a study.	The citations that were included in section 2 have been added here, providing support for this statement. The following sentences in this section highlight the advances that can be applied to the shipping sector to reduce noise and IMO guidelines that recognise that impacts from shipping can be reduced. It is therefore not appropriate to delete the sentence as suggested.
Mexico			
236	Page 735, lines 1-6	When mentioning the problems of the Gulf of Mexico and the Caribbean, it should include the considerable increase in cruise and tourist boat traffic, as well as the coastal development that strongly impact marine species, especially dolphins, sharks, turtles and seabirds.	A sentence and supporting reference have been added.
237	Page 738,	The document is very complete in relation to the impacts caused by	Loss of biodiversity has not been

	lines 4-18	anthropogenic and coastal activities on some marine species. It is clear that much information is still lacking to have a clear picture of how severe the damage is to marine fauna, but it would be important to emphasize more the importance of the loss of biodiversity due to noise pollution.	directly related to anthropogenic sources of noise, so it would be inappropriate to identify such a link.
238	Page 738, line 46 – Page 739, line 4	Considering the speed at which human activities are taking place in the oceans, it becomes necessary and urgent to take the necessary measures at a global level related to noise pollution, as well as to generate awareness and responsibility regarding the damage that is being caused to marine biodiversity to stop these impacts before it's too late.	Comment noted.

#	**Chapter 22: Marine renewable energy**		
	Section	**Comment**	**Responses**
Australia			
239	Section 1.1: Climate change and the clean energy challenge: page 708, para 1.	Suggest strengthening the statement on page 708 para 1: *Reducing GHG emissions is an important step towards reducing climate change impacts.* The Intergovernmental Panel on Climate Change 2018 Special Report on Global Warming of 1.5°C finds that limiting global warming to 1.5°C would require "**rapid and far-reaching**" transitions in land, energy, industry, buildings, transport, and cities. **Global net human-caused emissions of carbon dioxide (CO2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050.** This means that any remaining emissions would need to be balanced by removing CO2 from the air.	Accepted. The paragraph has been revised as follows: *Under the present status of GHG emissions, it is very likely that the agreed temperature thresholds of 1.5 °C or 2 °C above pre-industrial levels will be exceeded. As clearly highlighted in IPCC Special Report (2018) "… global net human-caused emissions of carbon dioxide (CO_2) would need to fall by about 45 percent from 2010 levels by 2030, reaching 'net zero' around 2050. This means that any remaining emissions would need to be balanced by removing CO_2 from the air". Therefore, reducing GHG emissions is an important step towards climate change*

			mitigation. In this direction, many states are taking measures to increase the development of renewable energy sources such as MRE to meet national clean energy and climate change goals. MRE is also linked to the United Nations' Sustainable Development Goal (SDG) 7, which recognizes affordable renewable energy as a key driver for development.
240	Section 3: Key remaining knowledge and capacity-building gaps: page 717, lines 36-37.	Establishing environmental baselines (e.g. seabed mapping and characterization, sediment composition, shallow/deep geology) and monitoring of biotic elements is necessary to confirm that the relevant activities will not have an adverse impact on biodiversity. Need standards for the analysis of environmental monitoring data for MRE development sites. i.e. Quantifying baseline conditions enables the design of operational monitoring programs that measure change caused by known disturbances. Need to identify the area over which biological effects may occur to inform baseline data collection.	Accepted. The paragraph has been revised as follows: *Establishing environmental baselines (e.g. seabed mapping and characterization, sediment composition, shallow/deep geology) and monitoring of biotic elements is necessary to confirm that the relevant activities will not have an adverse impact on biodiversity. In this context, there is need to define standards for the analysis of environmental monitoring data for MRE development sites and to identify the area over which biological effects may occur to inform baseline data collection. Detecting potential impacts contributes to the development of a mitigation plan from pre-construction to post-installation phases. It is also necessary to set thresholds, determine changes (in abundance, diversity, distribution, and behaviour), and readjust management actions (Foley and others, 2015). The MRE technologies used and the stressors in the marine environment should be considered when designing the monitoring procedures.*

			Predictive models can be a supplementary tool, ideally when combined with in situ observations.
Colombia			
241	**2.2. Regional advances**	The last paragraph on marine biofuel, fails to mention that the production and utilization of these resources, will release CO2	The paragraph has been revised as follows: *The marine biofuel production cycle has two components: the first involves cultivation of marine biomass on a sufficiently large scale and continuously to feed the biofuel production cycle, and the second involves the conversion of marine biomass into biofuels. Giant kelp is considered one of the most prolific organisms on Earth, with growth rates up to 60 cm per day. Efforts are currently underway off the Pacific coast of the United States to develop an open ocean cultivation system for giant kelp, which can then be converted to biocrude (Buck, 2019). Even though energy from biomass remains promising, scaling biofuel production on an industrial level is yet to be achieved. Moreover, regarding the calculation of the carbon intensity of marine biofuels (taking into account, among others, the absorption of carbon dioxide through photosynthesis in the cultivation system and the corresponding emissions during biofuel combustion) further research is needed.*
242	**3. Potential environmental impacts from MRE**	A more comprehensive and broad approach to impacts in needed. Maybe in a hierarchical structure starting with considering operational and installation/construction impacts. Nested in those,	During the first review of Chapter 22 from member states, it was suggested to follow the present structure for section *3. Potential environmental impacts from MRE development*. The authors

	development	physical impacts such as water quality, sediments quality impacts, etc. Also, biological impacts on: plankton, benthos, nekton and so on. Actual and potential impacts should be considered. This, instead of the approach taken in which a few possible communities or activities affected are listed. Noise generated by OW farms is not included as an impact for the fisheries	agreed to adopt that suggestion and changed the text accordingly, for reasons also related to the limitations in the number of words (the present structure is more solid than the original one). Regarding noise generated by OW farms, it is similar or below levels of background noise; see for example: 1. Nedwell JR, Parvin SJ, Edwards B, et al. *Measurement and interpretation of underwater noise during construction and operation of offshore windfarms in UK waters*. Subacoustech Report No. 544R0738 to COWRIE Ltd., 2007, (https://tethys.pnnl.gov/sites/default/files/publications/COWRIE_Underwater_Noise_Windfarm_ Construction.pdf), 2. Cheesman S. Measurements of operational wind turbine noise in UK waters. In: Popper AN, Hawkins A (eds) The Effects of noise on aquatic life II. New York: Springer, 2016, pp. 153–160

#	Chapter 25: Invasive species		
	Section	**Comment**	**Responses**
		Argentina	
243	**Page 768**	Argentina suggests the following wording: "NIS are also implicated in other global policy documents, especially those pertaining to biodiversity given the negative relationship between the two. For example, the Convention on Biological Diversity (CBD) recognizes the threat of ~~NIS~~ **ALIEN SPECIES FOR IN-SITU CONSERVATION** and article 8(h) of the Convention states that, each contracting party shall, as far as possible and as appropriate, prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species. Also, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has recognized the negative impacts of ~~NIS~~ **INVASIVE ALIEN SPECIES** around the world and has started a process for the assessment of these species." NIS is not used in CBD. The wording used in CBD is related to alien species for the in situ conservation. Invasive Alien Species is isued by IPBES in the Invasive Alien Species Thematic Assessment.	Respectfully, we recognize terminology differs in both the scientific and policy/management realms. As currently worded we are simply stating that NIS, as used throughout this Chapter, also are included within the CBD and IPBES fora. For consistency and clarity we fell it most appropriate to continue to refer to NIS colloquially. However, in the case of CBD where the document is quoted, we use the CBD terminology (i.e., those alien species).
		Colombia	
244	**1. Introduction**	Habitat restoration is usually considered as a conservation tool, that when involves the use of NIS can have a detrimental side, but maybe is important makes it clear. That comment can also applies to "research activities"	In the Introduction the mention of NIS in association with habitat restoration and research activities is simply stating that NIS can be moved due to these activities such that when considered in the context of the rest of the paragraph the negative implications are clear.
245	**Introduction**	Another example is the Giant tiger prawn *Penaeus monodon*, which was introduced intentionally to Colombian Caribbean few	Agreed and this has example has been added to the text.

		decades ago and is currently exploited by artisanal fishermen in some locations.	
246	**3. Consequences for human communities, economies and well-being**	Lionfish is also in the Mediterranean Sea now, so that basin can be included in the list.	Agreed. The intent was not to suggest the western Atlantic and Caribbean were the only locations and since this species is poisonous regardless of where it is found the text has been adjusted accordingly.
Japan			
247	4.5. North Pacific Ocean	On page 772, "4.5. North Pacific Ocean", The wording in the end of the text as "the Tohoku earthquake". However, the official name of this earthquake is "the Great East Japan Earthquake". Therefore, this should be corrected. A similar wording was also found on page 803.	Agreed. The more formal name has been used. It appears page 803 belongs to a different WOA2 Chapter.
Mexico			
248	Page 766, lines 6-23	Consider including effects of climate change such as tropical storms or hurricanes as possible sources of introduction of NIS, as well as tsunamis.	The important consideration has been added in connection with the link to climate change in the first sentence of the Introduction.
249	Page 766, lines 10-11	There are two “but” in this sentence “...came into force in September 2017 (IMO, 2019) but the degree to which it has been implemented globally or its effectiveness at reducing marine invasions regionally is not clear but the current…”. We suggest “...came into force in September 2017 (IMO, 2019) but the degree to which it has been implemented globally or its effectiveness at reducing marine invasions regionally is not clear, however the current…”.	Agreed.

250	Page 767, lines 27-28	The sentence says “There are often time lags between when a NIS is introduced to a new location and when the species is detected or impacts noted”. We suggest “There are often time lags between the introduction of a NIS to a new location and the time when the species is detected or impacts noted”.	Respectfully the sentence is grammatically correct (although the suggested would be as well). We feel the use of an additional “the time” is redundant in this context.
Peru			
251	5. Outlook	It is perhaps remarkable to mention the vital role that the International Maritime Organization (IMO) plays in protecting the marine environment, mainly to prevent the spread of invasive species, with the GloBallast and GloFouling initiatives, in partnership with the Global Environment Fund (GEF) and the United Nations Environment Program (UNEP)	These UN initiatives will certainly increase understanding but if meaningful policy and regulations are not developed from these then the gap remains. We feel that commenting on specific programs and partnerships here is out of scope for this Chapter but hope that these provide additional scientific information for the next iteration of WOA.

#	**Chapter 26: Marine genetic resources**		
	Section	**Comment**	**Responses**
Japan			
252	3. Economic and social consequences and/or changes	It is written that the CBD commissioned studies covering the concept and scope of digital sequence information, traceability and databases, and domestic measures, which are now published following an open review period. However, the cited literature of Houssen and others (2020) in the section seems to be a document made in advance of the review period. Besides, this document is focusing on just the concept and scope, but not traceability and databases, and domestic measures. Thus, the cited literature should be corrected.	The reference is replaced with the updated one: Convention on Biological Diversity (CBD) (2020) Digital Sequence Information on Genetic Resources: Concept, Scope and Current Use. Convention on Biological Diversity CBD/DSI/AHTEG/2020/1/3.

Peru			
253	1. Introduction	There is no reference in the Introduction, to the Intergovernmental Conference on an international legally binding instrument under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction (BBNJ). It is only mentioned in Section 3 (Economic and social consequences and/or changes). Maybe it is essential to mention in the introduction a priori.	Considering that BBNJ is one of the most important topics but not necessarily the exclusive issues that Chapter 26 addresses, we leave the Introduction as original.

#	Chapter 27: Marine hydrates		
	Section	**Comment**	**Responses**
EU			
254	We would like to flag the methane issue also referred to by other comments (in comment 2547):	Last August the IMO published their final report of the Fourth IMO Greenhouse Gas Study. Prepared by a global consortium of organizations led by CE Delft and including ICCT researchers, the study finds that total greenhouse gas (GHG) emissions from maritime shipping rose about 10% from 2012 to 2018. Most striking were the increases in short-lived climate pollutants, also known as climate super pollutants, including a 12% increase in black carbon emissions and a 150% increase in methane emissions.	The risks of methane emissions from marine hydrates are discussed in section 3.1.
Japan			
255	(reference part)	One of the reference sources named "Gas Hydrates in the Ulleung Basin, East Sea of Korea" needs to be removed, because the part of the title "East Sea" is inappropriate for international official document. "Sea of Japan" is the only internationally established name for the sea area concerned. In fact, the United Nations (UN) recognized "Sea of Japan" as the standard geographical term in March 2004, and UN policy states that the standard geographical term be used in official UN publications. It does not make sense to refer to the labelling of a regional sea programme only here while	The Regular Process has no control over the titles given by scientists to the scientific papers in which they publish their results. Nevertheless, the information in such papers can be the best scientific information available and thus be vital to give an up-to-date view of what scientists have discovered. However, in this case there is an alternative scientific

		other seas are defined by its established names.	paper which gives comparable information, and this citation will be used.

#	Chapter 28: Cumulative effects (renamed from "cumulative impacts")		
	Section	**Comment**	**Responses**
Australia			
256	GBRMPA: Synthesis & Reporting	Page 773, line 7 The 2019 Great Barrier Reef Outlook Report (and perhaps also (2009, 2014 editions) would be highly appropriate references to add here (i.e. where Uthicke reference appears)	The 2019 Great Barrier Reef Outlook Report cites the methodology undertaken by Uthicke and others 2016 as being needed to manage the relevant threats and impacts to the Great Barrier Reef. The report does not provide any detail on the methods undertaken in assessing cumulative effects. It is therefore more appropriate to cite the original source of the methodology where the detail is provided.
257	GBRMPA: Synthesis & Reporting	Section 3.1 GBR – Australia • Replace Reference Uthicke at line 7 with Great Barrier Reef Outlook Report 2019 • After the first sentence at line 14 add the following "However the GBRMPA also invests in reducing key threats which occur outside its jurisdiction, but impact the Reef (such as climate change, land-based run off) through key partnerships, position statements and education. The GBRMPA is key partner in the Reef 2050 Plan which has a focus on reducing the key threats identified in the 2019 Outlook Report. Page 773, line 48-50 • Check accuracy of statement about framework being	First dot point: see response to comment 256. Second dot point: The sentence suggested is out of place with the text given that the two paragraphs are discussing a combined cumulative impacts and structured decision making framework and associated methodology. The text suggested appears to relate to investment by the marine park authority which is not relevant to the framework and

		underwritten into all processes • The Dustan reference is to **Draft** guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef. Report to the National Environmental Science Programme. Marine Biodiversity Hub. CSIRO. • REWORD SUGGESTED BELOW (lines 47-50) Formal application of this CEA framework, with a set of guidelines for its implementation, has been formalized in a Cumulative Impact Management Policy for the Great Barrier Reef. Ref here: http://hdl.handle.net/11017/3389	associated methodology, particularly as the chapter is focused on cumulative effects approaches and associated methodology. The text has therefore not been included. Third dot point: see response below to fifth dot point. Fourth dot point: The citation was provided by the lead author on the report following guidelines set out under the NESP Marine Biodiversity Hub, noting that the report has been published. Fifth dot point: the section has been rewritten and now reads: "Formal application of this CEA framework (The Reef 2050 Cumulative Impact Management Policy; CIMP), with a proposed set of guidelines for its implementation (Dunstan and others, 2019), has only recently occurred. The involvement of the Great Barrier Reef Marine Park Authority (the management agency responsible for the GBR) in the development of the CIMP has seen it underwritten into all future planning and approval processes at the regional level, as well as at the level of specific development applications." A footnote linking to the policy has also been added.

258	Section 2: Cumulative effects assessments.	Reference to Dunstan and others, 2019 - Dunstan, P.K. and others (2019). Draft guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef. Report to the National Environmental Science Programme. Marine Biodiversity Hub. This product is not yet publicly available, however it may be publicly released when the final WOA II report is released. We would appreciate if this is only referenced when public via: https://www.nespmarine.edu.au/project/project-e1-guidelines-analysis-cumulative-impacts-and-risks-great-barrier-reef.	See response to fourth dot point in comment 257. The report is publicly available at: https://www.nespmarine.edu.au/reports
259	Section 3.1: Great Barrier Reef, Australia: Page 773, line 7.	The 2019 Great Barrier Reef Outlook Report (and perhaps also (2009, 2014 editions) would be highly appropriate references to add here (i.e. where Uthicke reference appears).	See response to comment 256.
260	Section 3.1: Great Barrier Reef, Australia: Page 773	• Replace reference to Uthicke at line 7 with Great Barrier Reef Outlook Report 2019.	See response to comment 256.
261	Section 3.1: Great Barrier Reef, Australia: Page 773, line 14.	• After the first sentence at line 14 add the following *"However the GBRMPA also invests in reducing key threats which occur outside its jurisdiction, but impact the Reef (such as climate change, land-based run off) through key partnerships, position statements and education. The GBRMPA is a key partner in the Reef 2050 Plan, which has a focus on reducing the key threats identified in the 2019 Outlook Report."*	See response to second dot point in comment 257.
262	Section 3.1:	• Suggest rewording as follows:	See response to fifth dot point in comment 257.

	Great Barrier Reef, Australia: Page 773, lines 48-50.	*"Formal application of this CEA framework, with a set of guidelines for its implementation, has been formalized in a Cumulative Impact Management Policy for the Great Barrier Reef. Ref here: http://hdl.handle.net/11017/3389"*	

#	Chapter 29: Marine spatial planning		
	Section	**Comment**	**Responses**
Australia			
263	Section 5.2: Case Study – Australia: Pages 796-797.	Outlook Report 2019 could be used as a reference in this section as well as it provides good overview information on these topics (e.g. in its chapters 1 and 7). For example, add it to the brackets containing the Kenchington and Day reference.	Reference added as suggested.
264	Section 5.2: Case Study – Australia: Page 796, line 20 onwards.	This arrangement is not unique. See for example other authorities such as the Murray Darling Basin Authority and the Australian Fisheries Management Authority which also "liaises and coordinates policies with other departments of the Commonwealth of Australia" and states/territories.	The word "unique" has been removed.
265	Section 5.2: Case Study – Australia: Page 797, line 26.	Unclear what is meant by "However, little of this action developed," as considerable progress has been made.	Progress has clearly been made, but not specifically as foreseen in the plan. This has been clarified.
266	Section 5.2: Case Study – Australia: Page 844, para 2.	Considerable progress has been made in relation to spatial planning and the designation of marine protected areas in Australia. We recommend that this section be updated to include reference to the establishment of the National Representative System of Marine Protected Areas. For reference, here is some explanatory text from	Reference to the NRSMPA added.

		the Australian Marine Parks management plans: *The Australian, state and territory governments agreed in 1998 to establish a National Representative System of Marine Protected Areas (NRSMPA). The NRSMPA was designed to create a comprehensive, adequate and representative (CAR) system of marine protected areas, to contribute to the long-term viability of the marine environment and protect biodiversity. To identify areas to protect in the NRSMPA, the Australian Government undertook scientific research and consolidated the best available information on the natural, social and economic characteristics of Australia's marine environment.* *On the basis of this work, in 2012, the Australian Government expanded the total coverage of Australia's National Representative System of Marine Protected Areas to 3.3 million km^2. This included new marine parks in the North, North-west, South-west, and Temperate East marine regions, and in the Coral Sea. This is in addition to marine parks already established in the South-east Network, the Great Barrier Reef and at Heard and McDonald Islands.* We also note that previous comments made in relation to marine bioregional plans (MBP) have not been incorporated in version 2, specifically, that "MBP was based on conservation values, which are: key ecological features, protected species (/habitats for those species), and protected places. They could include an ecosystem, but that was just one example".	
267	Section 5: Progress in implementing marine spatial planning	Based on the footnote, the 22 coastal states of the EU may be more accurately reflected in the planned/started/in progress column and not the full/partial MSP approved column. Alternatively, the footnote may benefit from further clarity.	As the specification of the source makes clear, this table is drawn from an IOC publication. The classifications adopted in that publication cannot therefore be changed.

268	Section 5.2: Case Study – Australia: Page 797, line 28 onwards.	MBP was based on conservation values, which are: key ecological features, protected species (/habitats for those species), and protected places. They could include an ecosystem, but that was just one example. Section should be updated as it appears outdated and considerable progress has been made, including establishing the national representative set of marine protected areas for all regions surrounding mainland Australia, financial assistance for impacted industries, and ongoing scientific work to monitor the changes. This could be linked back to section three (and the recommended steps outlined there as a worked example).	Reference to the NRSMPA added.
Colombia			
269	**Tools for marine spatial planning**	The analysis of the competences and jurisdiction of the national authorities in the marine area is essential to be able to have a comprehensive vision and assignment of responsibilities in the Marine Spatial Planning MSP process.	Sections 2 and 3 of the Chapter stress the importance of understanding the range of competences and jurisdictions involved in MSP, while recognizing the great variety of structures that exist.
270	**Progress in implementing marine spatial planning**	In Table 1: Colombia has no MSP started or in progress as a national goal. Only had developed isolated exercises of the MSP methodology; the country is compromised with integrated Coastal zone management for coastal and marine areas	Table 1 is summarizing information from the IOC, which is the best global overview. It shows Colombia as one of the countries where MSP is planned, started or in progress. This is consistent with the comment, which recognizes that there have been MSP exercises.

#	Chapter 30: Management approaches (incorporates elements from Chapter 8D)		
	Section	**Comment**	**Responses**
		Argentina	
271	Page 855	**<u>Precautionary principle.</u>** Argentina suggests replacing it by precautionary approach in line with the Rio Declaration. In particular, in the following references: Argentina also suggests deleting this statement as there is not internationally agreement: "The precautionary approach, as reflected in Principle 15 of the 1992 Rio Declaration on Environment and Development, which states that, where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation, has been incorporated into an increasing number of international treaties and other instruments ~~**and is now considered as part of customary international law**~~ (see, for example, Advisory Opinion of the Seabed Disputes Chamber of the International Tribunal of the Law of the Sea, ITLOS (2011), para. 125)." Regarding the quotation related to the Advisory Opinion, it should be noted that in said precedent it is not stated that the "precautionary approach" constitutes customary international law. The fact that within the framework of the Authority and the mineral exploration activities in the Area, Member States have agreed that this approach had a binding nature does not make it so in other areas. Furthermore, paragraph 135 of said opinion states "In the opinion of the Chamber, this has initiated a tendency to make this approach part of customary international law", which does not imply in any way that such process has concluded, especially when - as noted above - there is no international consensus regarding said status. In any case, it does not correspond to the content of WOA II to prejudge the legal nature of the "precautionary approach",	Text missing. However, there is no reference to the precautionary principle in p. 855. Comment noted. Text has been revised as follows: "…and other instruments, reflecting a trend towards making the precautionary approach part of customary international law (see, for example, Advisory Opinion of the Seabed Disputes Chamber of the International Tribunal of the Law of the Sea, ITLOS (2011), para. 135)."

		so that statement should be deleted.	
272	**Page 859**	Argentina suggests this wording: "The indicator and global targets for MPAs as identified under the CBD are currently under revision through **THE PROCESS OF NEGOTIATION OF** the CBD post 2020 **GLOBAL BIODIVERSITY** framework."	Text amended as suggested.
Australia			
273	Section name 3.2 Area based management tools	The second paragraph of this section provides a range of global examples of large MPAs and MPA networks. Australia's network of Australian Marine Parks represents a significant global contribution and could be mentioned here. There are 58 Australian Marine Parks, which cover nearly 2.8 million square kilometres of Australia's marine environment. Australian Marine Parks are part of Australia's 3.3 million square kilometer National Representative System of Marine Protected Areas.	Due to word limits placed on chapters it is impossible to detail all MPAs that might have been established within the EEZs of countries. We have instead provided a small selection of examples of MPAs designated primarily under international and regional organisations.
274	Section 2.1: Introduction to the ecosystem approach	Page 808 of the WOA II makes a reference to the precautionary approach as part of customary international law. In support of this assertion, the WOA II refers to the 2011 Advisory Opinion of the Seabed Disputes Chamber of the International Tribunal for the Law of the Sea on 'Responsibilities and Obligations of States Sponsoring Persons and Entities with respect to Activities in the Area'. Australia considers that the precautionary approach is not a part of customary international law, and does not consider that it should be. Further, we do not agree that the Advisory Opinion referred to in the WOA II supports the assertion that the precautionary approach is now considered part of customary international law. Relevantly, paragraph 135 of that Advisory Opinion states: 135. The Chamber observes that the precautionary	See response to Argentina

		approach has been incorporated into a growing number of international treaties and other instruments, many of which reflect the formulation of Principle 15 of the Rio Declaration. In the view of the Chamber, this has initiated a trend towards making this approach part of customary international law. This trend is clearly reinforced by the inclusion of the precautionary approach in the Regulations and in the "standard clause" contained in Annex 4, section 5.1, of the Sulphides Regulations. So does the following statement in paragraph 164 of the ICJ Judgment in Pulp Mills on the River Uruguay that "a precautionary approach may be relevant in the interpretation and application of the provisions of the Statute" (i.e., the environmental bilateral treaty whose interpretation was the main bone of contention between the parties). This statement may be read in light of article 31, paragraph 3(c), of the Vienna Convention, according to which the interpretation of a treaty should take into account not only the context but "any relevant rules of international law applicable in the relations between the parties". A reference to the initiation of 'a trend towards making [the precautionary] approach part of customary international law' does not indicate that the precautionary approach is already considered part of customary international law.	
Colombia			
275	**Area-based management tools**	To include in "Examples of area-based management tools that change or regulate aspects of human use of the marine environment" managements areas that let integrated use of the resources i.e. DRMI (Spanish acronym for Distritos Regionales de Manejo Integrado)	Comment noted. However, DRMI sets out a framework for managing an area (similar to a "management plan") rather than being a specific area-based management tool such as an MPA.

276	**Non area-based management tools**	In example, Colombia has delimited an exclusive artisanal fishing zone (named ZEPA Spanish acronym) has been delimited as a collective strategy of responsible management that provides regulations such as fishing quotas and closures, more effective control and surveillance mechanism for illegal fishing, prohibition and substitution of harmful fishing gear such as trawling by others more responsible, proposals for fisheries management and creation of fishing reserve areas.	The cited example (exclusive artisanal fishing zone) would seem to be an area-based management tool. Spatial regulation of fishing is already covered in section 3.2.
277	**Outlook**	Area-based and non-area-based management approaches must overcome the often fragmented and complex governance regimes around the world, they must be integrative with different instruments of land management.	These issues are mentioned in the fourth paragraph of section 8 already and it is beyond the remit of the WOA2 to go into these further.
Japan			
278	2. Management approaches 2.1 Introduction to the ecosystem approach (Page.855)	Paragraph 135 of the Advisory opinion of the ITLOS (2011) stated; "In the view of Chamber, this has initiated a trend towards making this 【precautionary】 approach part of customary international law." This does not mean "the precautionary approach is considered as part of customary international law" as you wrote. In our understanding, there are still various views on this. This part should be modified or deleted as follows. "The precautionary approach, as reflected in Principle 15 of the 1992 Rio Declaration on Environment and Development, which states that, where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation, has been incorporated into an increasing number of international treaties and other instruments ~~and is now considered as part of customary international law~~ (see, for example, Advisory Opinion of the Seabed Disputes Chamber of the International	See response to Argentina.

		Tribunal of the Law of the Sea, ITLOS (2011), para. ~~125~~ 135). *Please confirm the number of the paragraph of the case. It may be wrong (para. 125 should be para.135).	
279	P861 3.2. Area-based management tools	Marine protected areas may also be used in combination with fisheries management tools and sanctuaries (no take zones which may be within MPAs). Sanctuary areas and seasonal and year-round fisheries closures and exclusion zones provide area-based management mechanisms that seek to improve species population and biodiversity recovery. For example, the International Whaling Commission has established two sanctuaries, both of which prohibit commercial whaling: the Indian Ocean Sanctuary which was established in 1979 and covers the whole of the Indian Ocean south to 55°S; and the Southern Ocean Sanctuary which was established in 1994 and covers the waters around Antarctica. Should be changed to Marine protected areas may also be used in combination with fisheries management tools and sanctuaries (no take zones which may be within MPAs). Well defined sanctuary areas and seasonal and year-round fisheries closures and exclusion zones can provide area-based management mechanisms that seek to improve species population and biodiversity recovery. (Justification) If the intent of the Group of Experts is to provide examples of management approaches that "seek to improve species population and biodiversity recovery", examples which brought no such improvement cannot be cited. The two sanctuaries adopted by the	The purpose of this text is to provide examples of management approaches that "seek to improve species population and biodiversity recovery". The Indian Ocean sanctuary was established prior to a full moratorium on whaling (adopted in 1982) with the aim of protecting not only those species that might have been identified as endangered at the time, but all that might be the focus of commercial whaling. A management plan for the Southern Ocean Sanctuary was developed in 2018 and a research partnership established with the aim of achieving the objectives of the management plan. As such we respectfully disagree that these examples are inappropriate.

		IWC without scientific justifications are the very examples of those that cannot be cited. As explained in our previous comment, the Southern Ocean Sanctuary was recognized by outside reviewers that it does not contribute to whale resources management.	
280	8. Outlook	P874 Line 251 Replace “the Samoa Pathway” by “the SAMOA Pathway” which is a more appropriate term for the abbreviation of the SIDS Accelerated Modalities of Action. https://sidsnetwork.org/samoa-pathway/	Accepted

#	Chapter 31 Developments in the Understanding of Overall benefits from the Ocean to Humans		
	Section	**Comment**	**Responses**
		Argentina	
281	**Page 890.**	"*the same time, while there is widespread coverage by regional instruments relevant to the implementation of aspects of the United Nations Convention on the Law of the Sea and the Fish Stocks Agreement (United Nations, 2017b), still some gaps remain."* Argentina would strongly prefer that the word "gap" is replaced with "challenges". We believe that an in-depth analysis on the application of the regulations issued by Regional Fisheries Management Organizations and their efficiency in the conservation field should be carried out, especially considering that this type of organizations tend to favor the interests of large long-distance fishing fleets that are usually subsidized.	Comment noted. However, in this context, the use of the term “gap”, which also appears in many UN documents, is more appropriate. Furthermore, as already pointed out in our comments in the first round, due to word constraints it is not possible to include such an in-depth analysis in the chapter. In addition, this would risk undertaking policy analysis which is outside the remit of the Regular Process.