13 Fisheries and Marine Ecosystems

13.1 Scenarios

The fisheries and marine ecosystem models are quite diverse. Most include climate-impact models via ESM-simulated primary-production changes, and many also include impacts of changes in water temperature on ectotherm metabolic rates. A very small subset of the models includes ocean-acidification effects. Most models include fishing, either as an imposed process based on observed historical fishing effort (which start in 1950), or as an endogenous process based on simple economic factors.

Fishing effort should be held at constant 1950 levels from 1861-1950. It should then follow the standard historical reconstruction from 1950-2006 typically used by the model, using reconstructed effort or economic forcings as appropriate. Effective effort should be held constant following 2005 in all simulations.

For models that include acidification effects, all simulations should include ocean acidification in accordance with the respective climate scenario.

For further information about global ocean input data from the ocean models CESM1-BEC, GFDL-ESM2M and IPSL-CM5A-LR, please see **Section 2.2**.

Climate scenarios	
picontrol	Pre-industrial climate and 286ppm CO_2 concentration. The climate data for the entire period (1661-2299) are unique – no (or little) recycling of data has taken place.
historical	Historical climate and CO_2 concentration.
rcp26	Future climate and CO_2 concentration from RCP2.6.
rcp60	Future climate and CO_2 concentration from RCP6.0.
rcp85	Future climate and CO_2 concentration from RCP8.5.
Human influences scenarios	
nosoc	No fishing.
histsoc	Historical reconstruction of fishing starting in 1950.
2005soc	Fishing fixed at year 2005 levels.

Table 47 ISIMIP2b scenarios for simulations of the impacts on marine ecosystems and fisheries.

	Experiment	Input	Pre-industrial 1661-1860	Historical 1861-2005	Future 2006-2099	Extended future 2100-2299
I	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	**picontrol**	**picontrol**	**picontrol**
	varying fishing up to 2005, then fixed at 2005 levels thereafter	Human & LU		**histsoc**	**2005soc**	**2005soc**

II	RCP2.6 climate & CO_2	Climate & CO_2	not simulated	**historical**	**rcp26**	**rcp26**
	varying fishing up to 2005, then fixed at 2005 levels thereafter	Human & LU		**histsoc**	**2005soc**	**2005soc**
III	RCP6.0 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp60**	not simulated
	varying fishing up to 2005, then fixed at 2005 levels thereafter	Human & LU			**2005soc**	
IV-VII	not simulated					
VIII	RCP8.5 climate & CO_2	Climate & CO_2	not simulated	Experiment II	**rcp85**	not simulated
	varying fishing up to 2005, then fixed at 2005 levels thereafter	Human & LU			**2005soc**	

Table 48 Additional sector-specific simulations for the fisheries and marine ecosystems sector

	Experiment	Input	Pre-industrial 1661-1860	Historical 1861-2005	Future 2006-2099	Extended future 2100-2299
Ia	no climate change, pre-industrial CO_2	Climate & CO_2	not simulated	**picontrol**	**picontrol**	not simulated
	no fishing	Human & LU		**nosoc**	**nosoc**	
Ib	NPP control. All forcings except NPP at pre-industrial levels.	Climate & CO_2	not simulated	**npp-control**	**npp-control**	not simulated
	No fishing	Human & LU		**nosoc**	**nosoc**	
Ic	Temperature control. All forcings except NPP at pre-industrial levels.	Climate & CO_2	not simulated	**temperature-control**	**temperature-control**	not simulated
	no fishing	Human & LU		**nosoc**	**nosoc**	
VIIIa	RCP8.5 climate & CO2	Climate & CO_2	not simulated	**historical**	**rcp85**	not simulated
	no fishing	Human & LU		**nosoc**	**nosoc**	

13.2 Output data

Table 49 Common output variables to be provided by global and regional marine fisheries models.

Variable name (long name)	Variable name	Unit (NetCDF format)	Resolution	Comments
Essential outputs from global and regional models (provide as many as possible)				
TOTAL system biomass density	**tsb**	g C m-2	monthly	All primary producers and consumers
TOTAL consumer biomass density	**tcb**	g C m-2	monthly	All consumers (trophic level >1, vertebrates and invertebrates)
Biomass density of consumers >10cm	**b10cm**	g C m-2	monthly	If L infinity is >10 cm, include in >10 cm class
Biomass density of consumers >30cm	**b30cm**	g C m-2	Monthly	If L infinity is >30 cm, include in >30 cm class
TOTAL Catch (all commercial functional groups / size classes) where fishing included in model	**tc**	g wet biomass / m2, g m-2	monthly	Catch at sea (commercial landings plus discards, fish and invertebrates)
TOTAL Landings (all commercial functional groups / size classes) where fishing included in model	**tla**	g wet biomass / m2, g m-2	monthly	Commercial landings (catch without discards, fish and invertebrates)
Optional output from global and regional models				
Biomass density of commercial species where fishing included in model	**bcom**	g C m-2	monthly	Discarded species not included (Fish and invertebrates)
Biomass density (by functional group / size class) where fishing included in model	**b-<class>-<group>**	g C m-2	monthly	Provide name of each size class (<class>) and functional group (<group>) used, and provide a definition of each class/group
Catch (by functional group / size class) where fishing included in model	**c-<class>-<group>**	g wet biomass / m2,g m-2	monthly	Provide name of each size class (<class>) and functional group (<group>) used, and provide a definition of each class/group

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