UNIVERSITÀ DEGLI STUDI DI MILANO

Milano, 24 Novembre 2022

Fondazione
Planet Life Economy Foundation ETS
Alzaia Naviglio Pavese, 78/3
20142 Milano

14 LIFE BELOW WATER

SDG-14 Life under water

Obiettivo-14 per lo Sviluppo Sostenibile secondo Agenda ONU 2030: la vita nei mari

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Obiettivo-14: Conservare e utilizzare in modo sostenibile gli oceani, i mari e le risorse marine

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Docente Ecologia

M. Sugni
Docente Zoologia

L'**inquinamento** e lo **sfruttamento eccessivo** degli oceani causano un numero sempre maggiore di problemi, come il **pericolo acuto** per la **diversità delle specie**, l'**acidificazione** dei mari e l'aumento dei **rifiuti di plastica**. Oltre alla **pesca** e allo sfruttamento a livello industriale delle risorse marine, anche i **mutamenti climatici** sono causa di una pressione sempre maggiore sugli ecosistemi. La **popolazione mondiale** in continuo aumento sarà in futuro ancora più **dipendente dalle risorse dei mari**.

L'obiettivo 14 mira a **ridurre in modo significativo** entro il **2025** **tutti i tipi di inquinamento** marittimo e a portare a un livello minimo l'acidificazione degli oceani. Già entro il **2020** gli **ecosistemi marini** e costieri dovranno essere **gestiti e protetti in modo sostenibile**. Entro il **2020** anche la **pesca** dovrà essere **disciplinata in modo efficace**. Per porre un limite alla pesca eccessiva nei mari, le attività illegali e non regolamentate in questo campo nonché le **pratiche distruttive** dovranno essere **sradicate entro il 2020**. Inoltre, determinate forme di sovvenzioni alla pesca dovranno essere vietate.

Obiettivo 14: Conservare e utilizzare in modo sostenibile gli oceani, i mari e le risorse marine

14.1: Entro il 2025, prevenire e ridurre in modo significativo ogni forma di inquinamento marino, in particolar modo quello derivante da attività esercitate sulla terraferma, compreso l'inquinamento dei detriti marini e delle sostanze nutritive

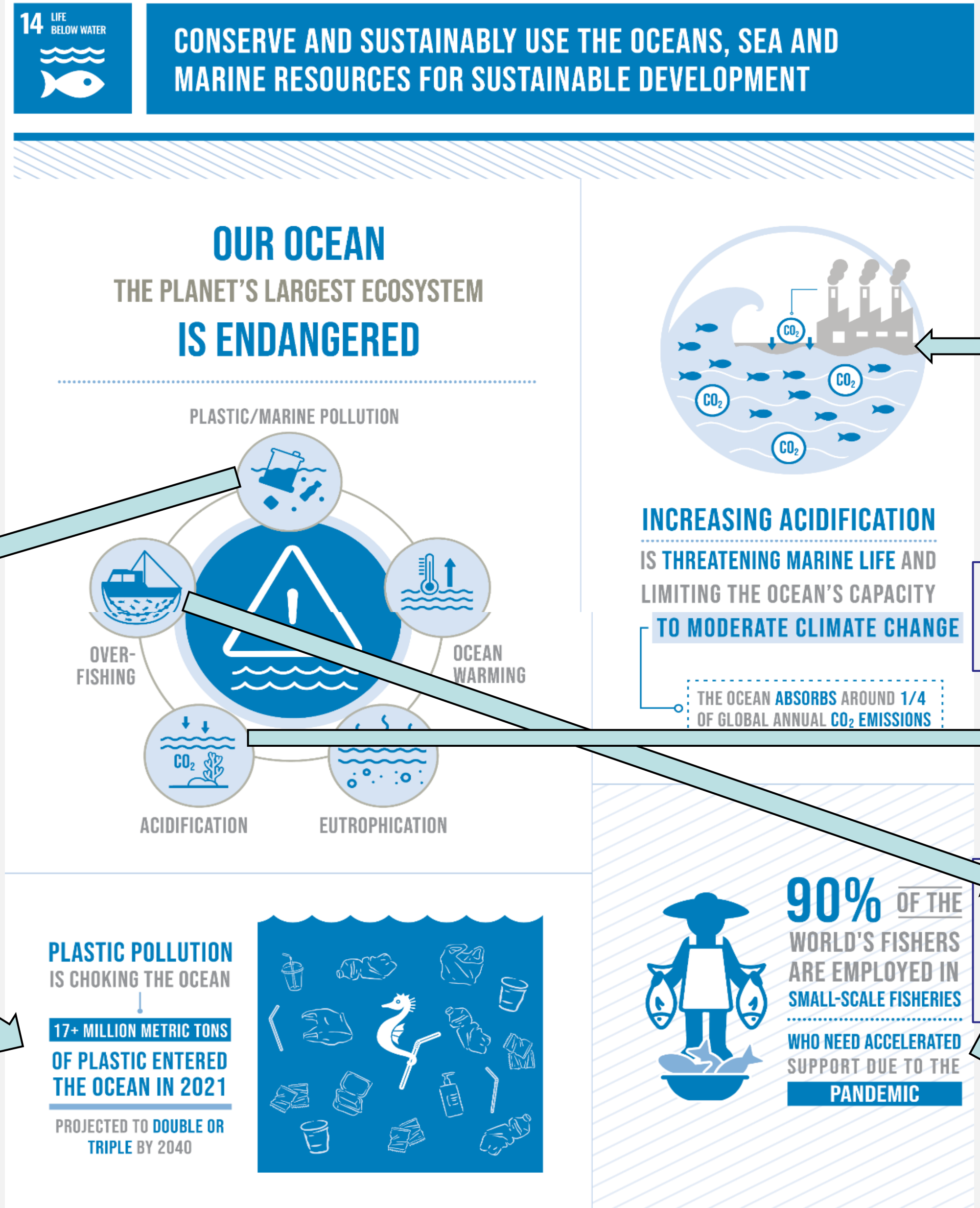
14.2: Entro il 2020, gestire in modo sostenibile e proteggere l'ecosistema marino e costiero per evitare impatti particolarmente negativi, anche rafforzando la loro resilienza, e agire per il loro ripristino in modo da ottenere oceani salubri e produttivi

14.3: Ridurre al minimo e affrontare gli effetti dell'acidificazione degli oceani, anche attraverso una maggiore collaborazione scientifica su tutti i livelli

14.4: Entro il 2020, regolare in modo efficace la pesca e porre termine alla pesca eccessiva, illegale, non dichiarata e non regolamentata e ai metodi di pesca distruttivi. Implementare piani di gestione su base scientifica, così da ripristinare nel minor tempo possibile le riserve ittiche, riportandole almeno a livelli che producano il massimo rendimento sostenibile, come determinato dalle loro caratteristiche biologiche

SDG-14: sito UFFICIALE DELLE NAZIONI UNITE

https://sdgs.un.org/goals/goal14



$CO_2 + H_2O \rightleftarrows H_2CO_3$

$H_2CO_3 \rightleftarrows HCO_3^- + H^+$

$HCO_3^- \rightleftarrows CO_3^{--} + H^+$

$CO_3^{--} \rightleftarrows$ Rocce carbonatiche ($CaCO_3$)

ACIDIFICAZIONE DEGLI OCEANI

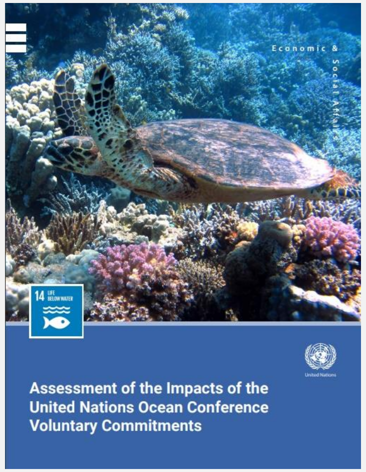
INQUINAMENTO MARINO E INQUINAMENTO DA PLASTICA

SOVRAPESCA ovvero SOVRASFRUTTAMENTO DELLE RISORSE ITTICHE

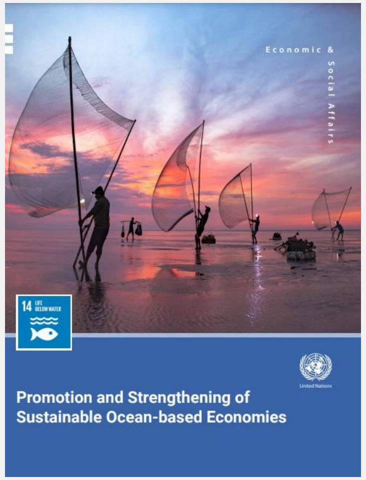
1. RISCALDAMENTO DEGLI OCEANI: REPORT INTERNAZIONALI

ONU: https://sdgs.un.org/goals/goal14

SPECIFICI SDG-14

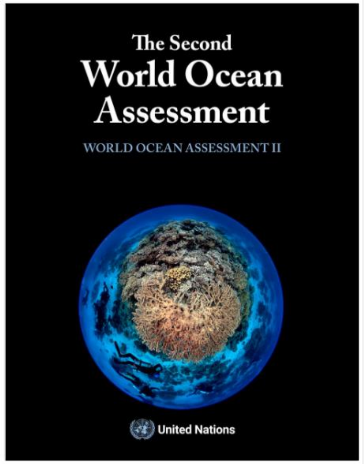


UN, 2021



UN, 2021

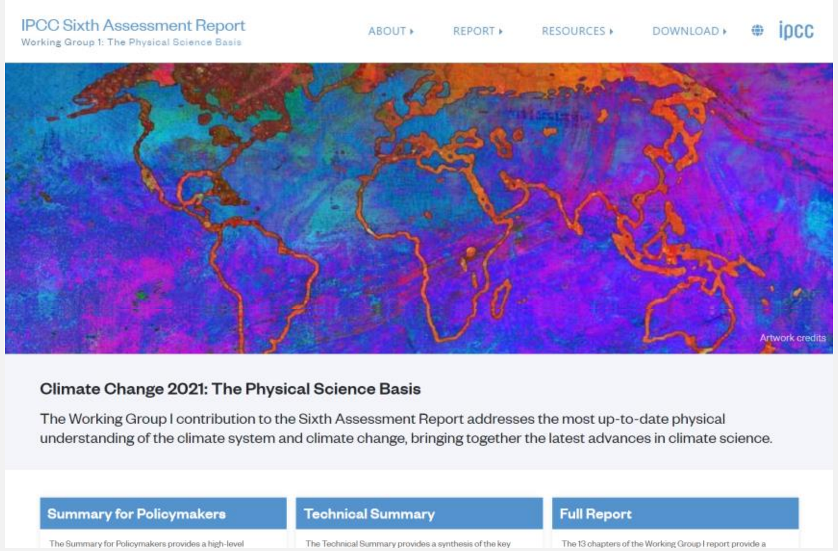
UNESCO, 2022



UN, 2021

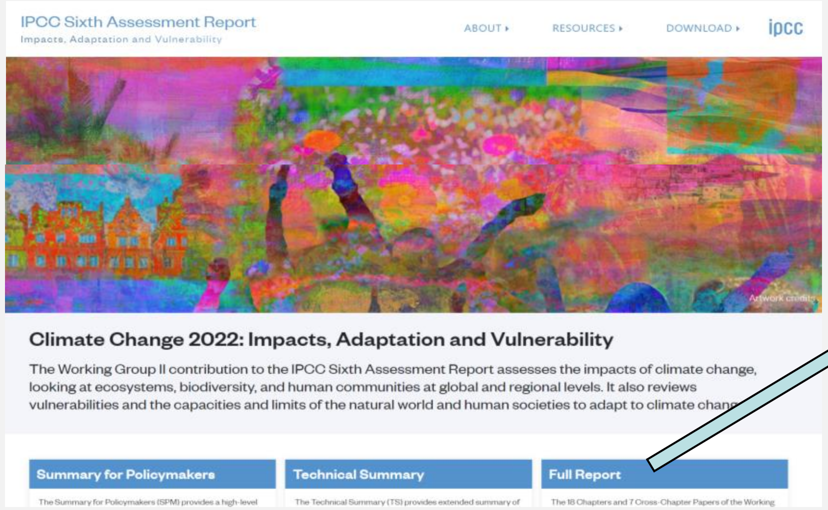
GENERALI
CAMBIAMENTO CLIMATICO

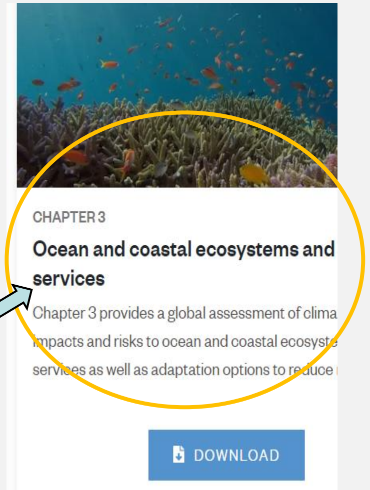
IPCC, 2021: https://www.ipcc.ch/report/ar6/wg1/



LE BASI FISICHE

IPCC, 2022: https://www.ipcc.ch/report/ar6/wg2/





RISCALDAMENTO GLOBALE: un po' di storia

EVIDENZE SCIENTIFICHE

1992

Conference ONU di Rio de Janeiro sullo Sviluppo sostenibile, «Conferenza di Rio» o «Summit della Terra»

- Dichiarazione di Rio: 27 principi (dimensione globale dei problemi ambientali)
- Agenda 21
- Convenzione sulla diversità biologica
- Principi sulle foreste
- Convenzione quadro ONU sul cambiamento climatico → Conference of the Parties (COP)

1997

COP3 a Kiōto: Protocollo di Kiōto

ciascun paese doveva ridurre le proprie emissioni per almeno il 5% rispetto alle sue emissioni al 1990, sarebbe entrato in vigore qualora fosse stato ratificato da un numero sufficiente di paesi che avessero rappresentato almeno il 50% delle emissioni globali

2015

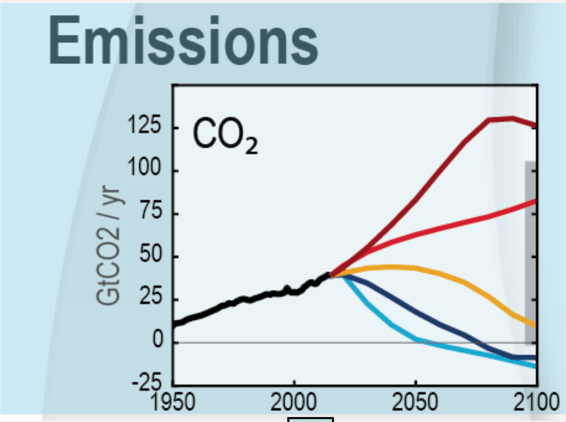
COP21 a Parigi: Accordo di Parigi

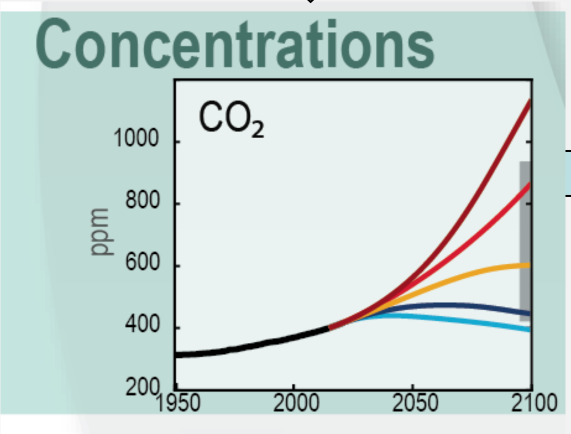
i firmatari si sono impegnati a non superare un aumento di temperatura possibilmente non superiore a 1,5 °C e comunque non superiore a 2°C rispetto alle temperature medie globali del periodo 1850-1930.

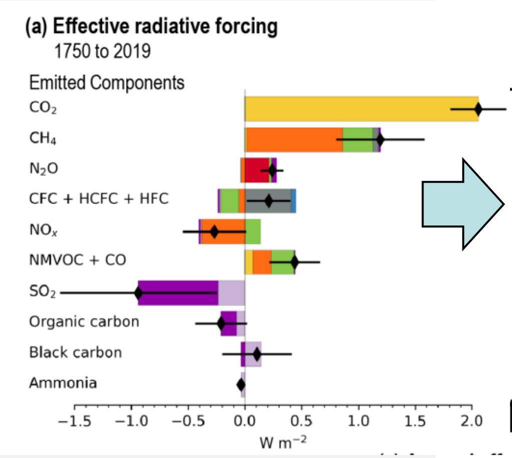
2022

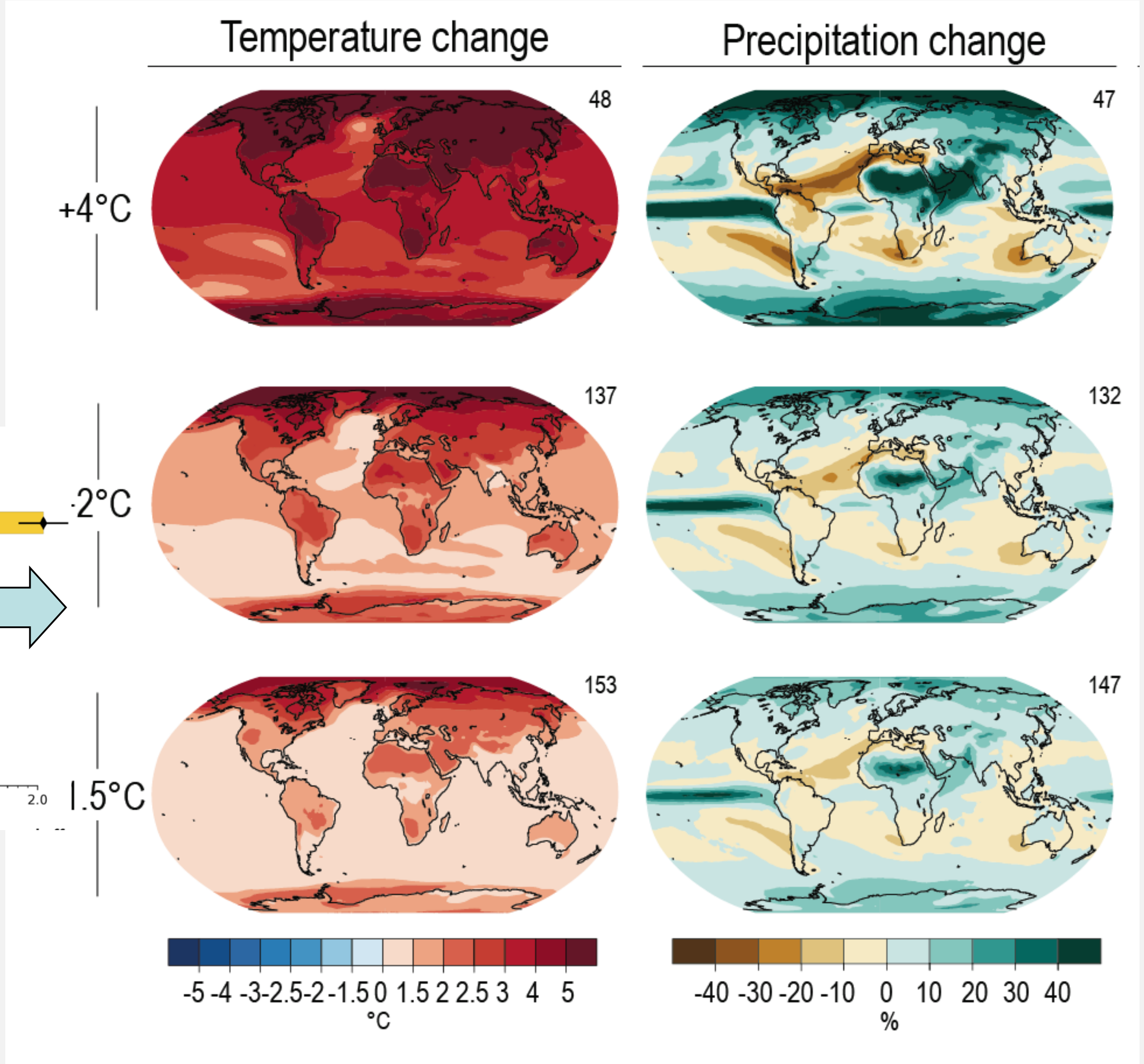
COP27 a Sharm el-Sheikh, Egitto

Riscaldamento globale: aumento delle temperature









IPCC, 2021: Physical Science Basis:
https://www.ipcc.ch/report/ar6/wg1/

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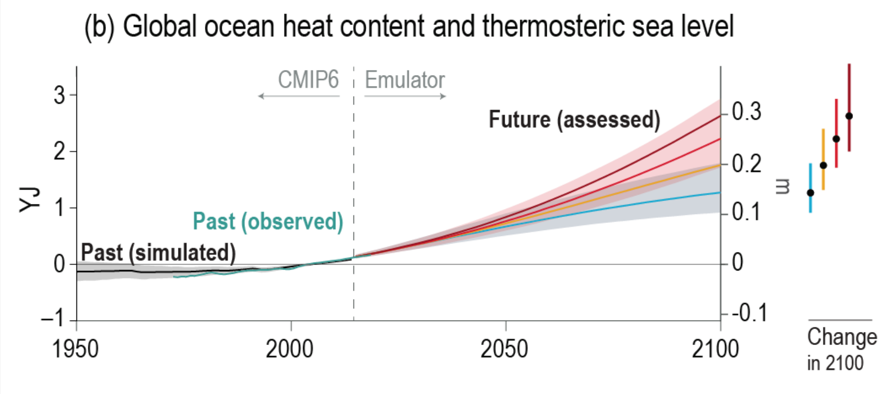
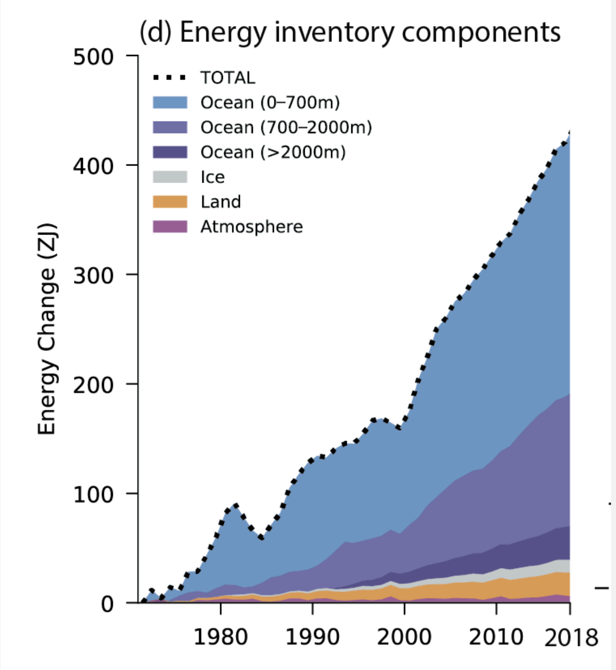
EFFETTI dell’aumento delle temperature negli oceani

AUMENTO DEL LIVELLO DEI MARI



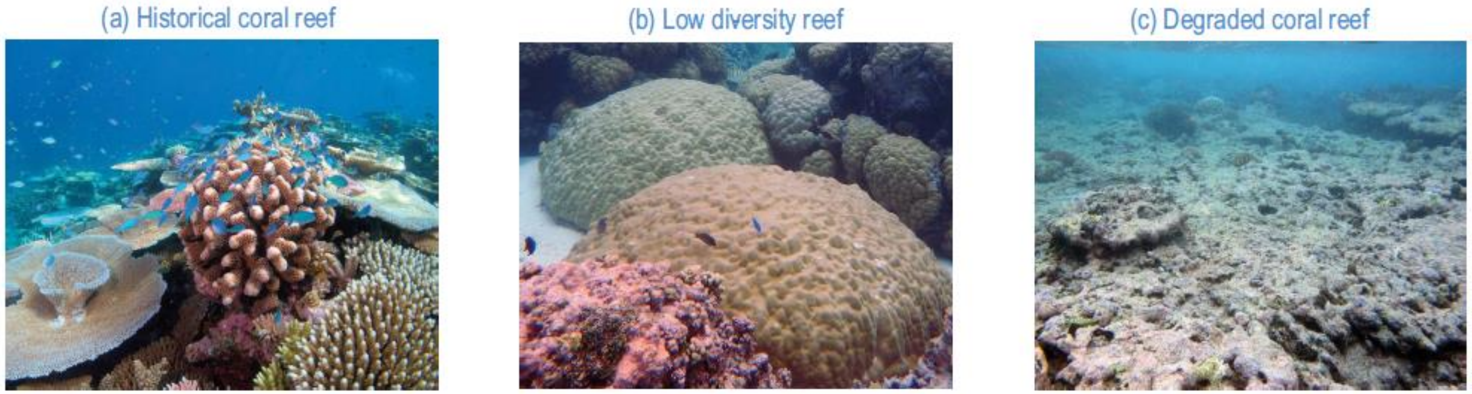
AUMENTO ENERGIA IMMAGAZZINATA

IPCC, 2021: Physical Science Basis: https://www.ipcc.ch/report/ar6/wg1/



IPCC, 2022: Impacts, Adaptation and Vulnerability https://www.ipcc.ch/report/ar6/wg2/

EFFETTI SUGLI ORGANISMI



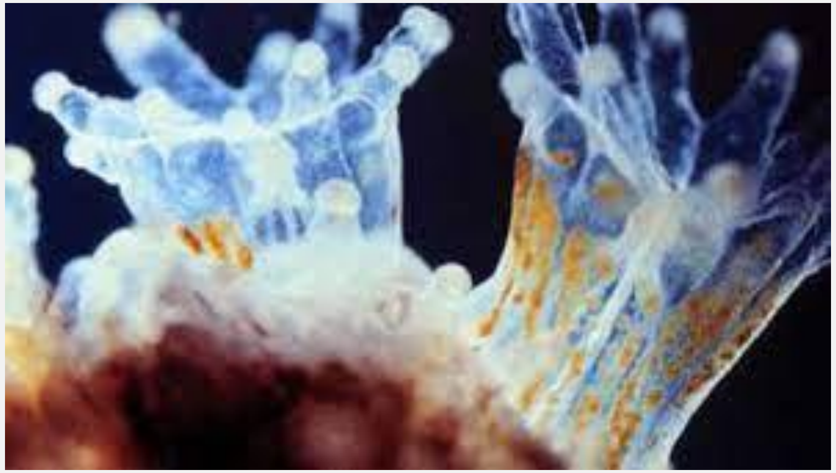
High coral cover and diversity; high physical complexity and reef growth; high fish biomass and diversity

Moderate cover composed of few, heat-tolerant taxa; lower complexity and growth rate; lower fish diversity

Limited cover with few species; low complexity with limited growth; low fish biomass and diversity

I coralli

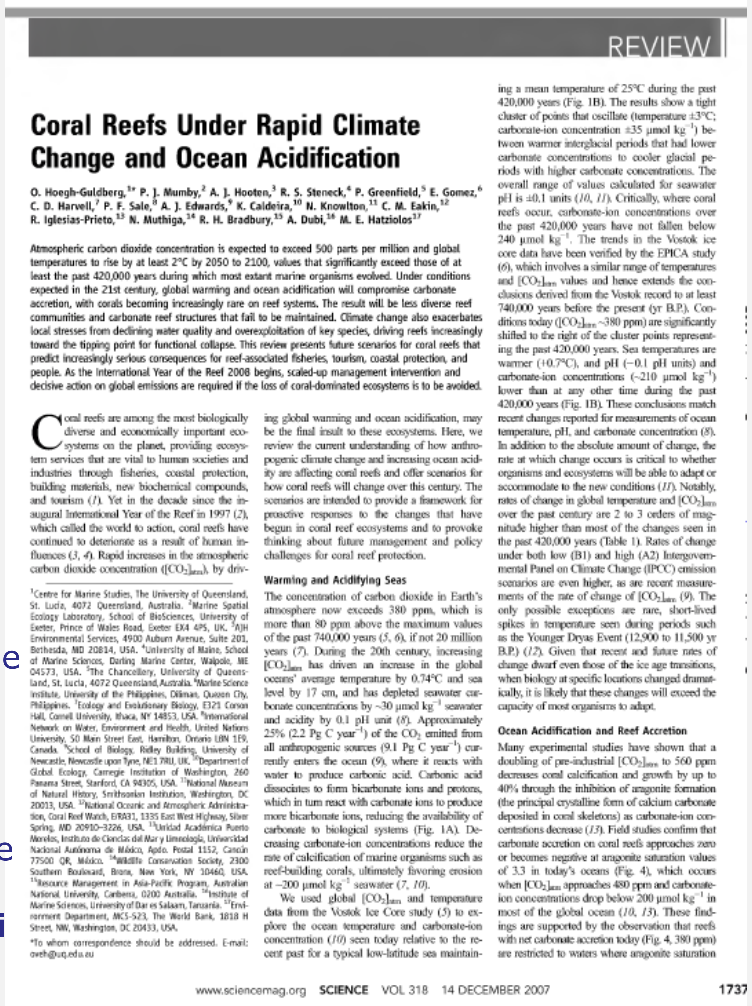
Le zoozantelle (alghe endosimbionte) forniscono oltre il 95% delesigenze metaboliche del corallo che le ospita, che è quindi in grado di mantenere un'elevata calcificazione.



Quando le temperature superano i massimi estivi da 1° a 2° C per 3 o 4 settimane, si ha l'espulsione delle zooxantelle e il fenomeno dello **sbiancamento dei coralli**, se prolungato può portare alla morte del corallo.

La causa principale del fenomeno è l'aumento delle temperature, s**e le temperature non tornano alla normalità entro le 6-8 settimane, i coralli muoiono**.

Nel 2016, il 93% dei coralli della Grande Barriera Corallina è stato soggetto a sbiancamento, e il 22% è poi morto, con aree più colpite dal fenomeno dove la mortalità dei coralli ha raggiunto il 50-90%.



REVIEW

Coral Reefs Under Rapid Climate Change and Ocean Acidification

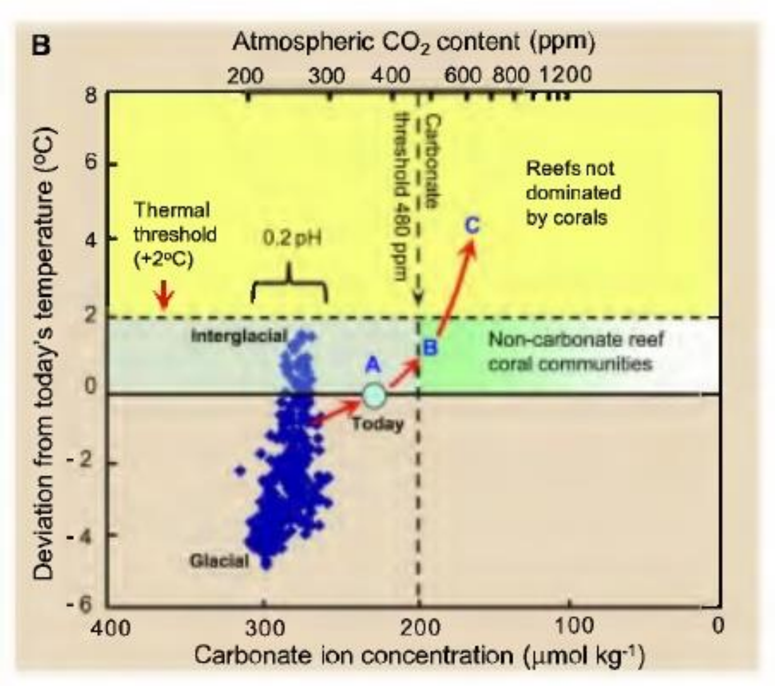
O. Hoegh-Guldberg, P. J. Mumby, A. J. Hooten, R. S. Steneck, P. Greenfield, E. Gomez, C. D. Harvell, P. F. Sale, A. J. Edwards, K. Caldeira, N. Knowlton, C. M. Eakin, R. Iglesias-Prieto, N. Muthiga, R. H. Bradbury, A. Dubi, M. E. Hatziolos

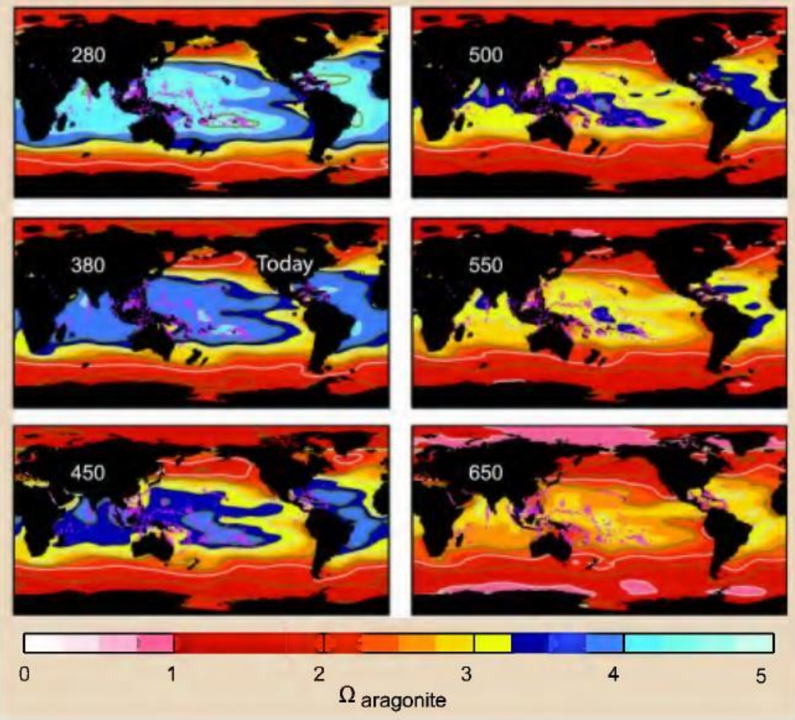
Atmospheric carbon dioxide concentration is expected to exceed 500 parts per million and global temperatures to rise by at least 2°C by 2050 to 2100, values that significantly exceed those of at least the past 420,000 years during which most extant marine organisms evolved. Under conditions expected in the 21st century, global warming and ocean acidification will compromise carbonate accretion, with corals becoming increasingly rare on reef systems. The result will be less diverse reef communities and carbonate reef structures that fail to be maintained. Climate change also exacerbates local stresses from declining water quality and overexploitation of key species, driving reefs increasingly toward the tipping point for functional collapse. This review presents future scenarios for coral reefs that predict increasingly serious consequences for reef-associated fisheries, tourism, coastal protection, and people. As the International Year of the Reef 2008 begins, scaled-up management intervention and decisive action on global emissions are required if the loss of coral-dominated ecosystems is to be avoided.

Warming and Acidifying Seas

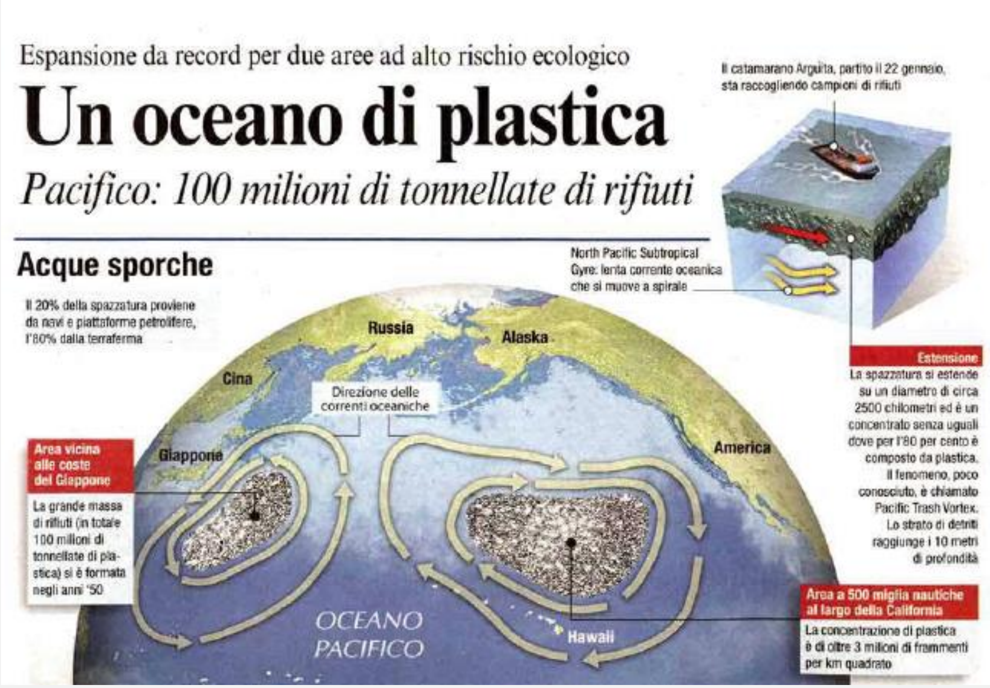
Ocean Acidification and Reef Accretion

www.sciencemag.org SCIENCE VOL 318 14 DECEMBER 2007 1737





INQUINAMENTO CHIMICO E DA PLASTICA



PLASTICA

MACROPLATICHE

MESOPLASTICHE

MICROPLASTICHE

NANOPLASTICHE

INGESTIONE

INTRAPPOLAMENTO

Le microplastiche: sono ovunque?

Environ. Res. Lett. 15 (2020) 023003 https://doi.org/10.1088/1748-9326/ab6d7d

Environmental Research Letters

TOPICAL REVIEW

The physical oceanography of the transport of floating marine debris

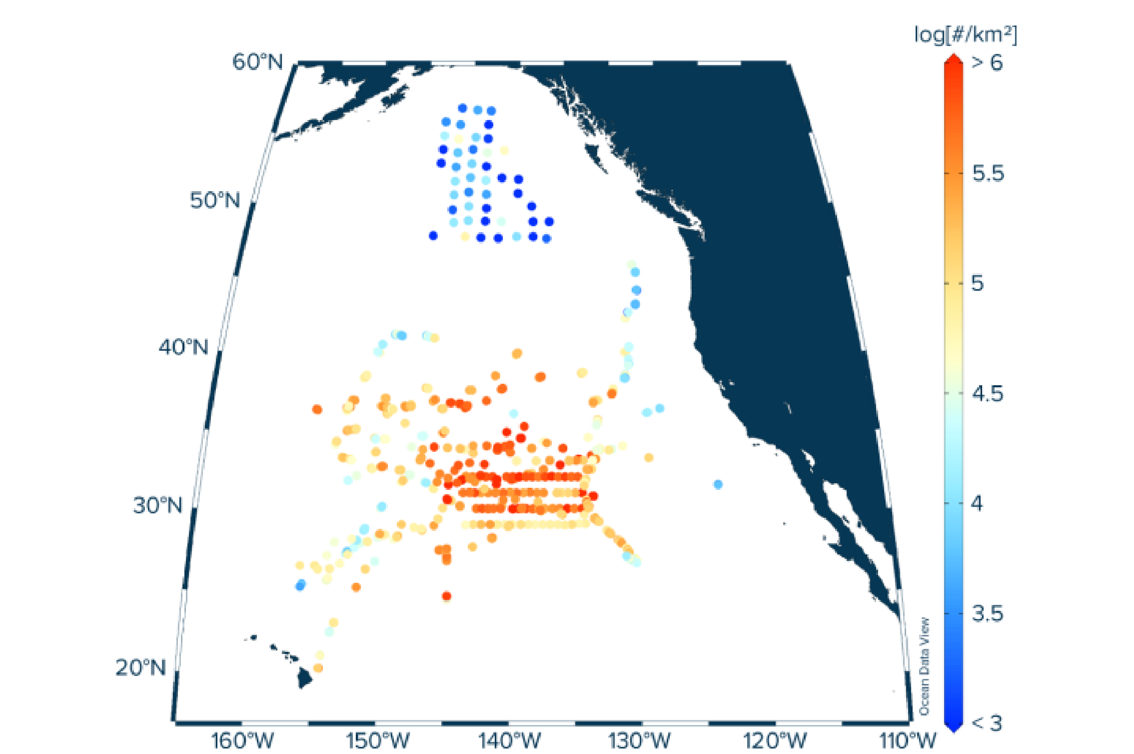
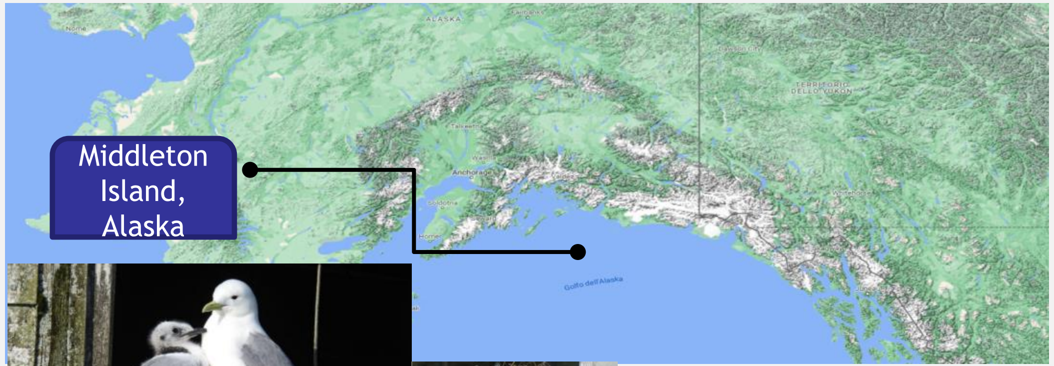
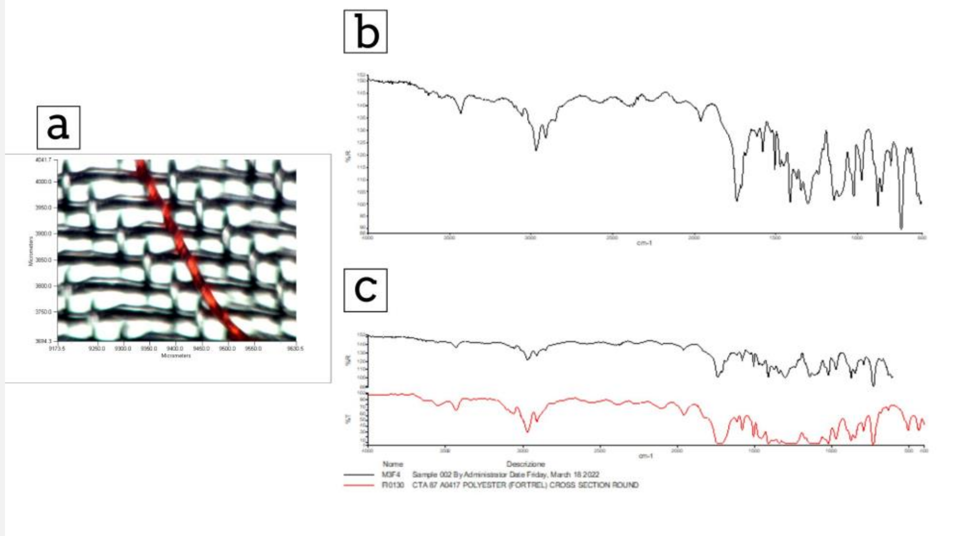


Figure 1. Neuston trawl deployment locations ($n = 679$) considered in this study and associated measured numerical concentrations of floating micro- and meso-plastic debris (i.e. 0.05–5 cm in size). See table 1 for details on expeditions and year of sampling.



Gabbiano zampe nere(*Rissa Trydactila*)



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INQUINAMENTO CHIMICO: CONTAMINATI ORGANICI PERSISTENTI: DA DOVE VENGONO?

Science of the Total Environment 452–453 (2013) 253–261

Contents lists available at SciVerse ScienceDirect

Science of the Total Environment

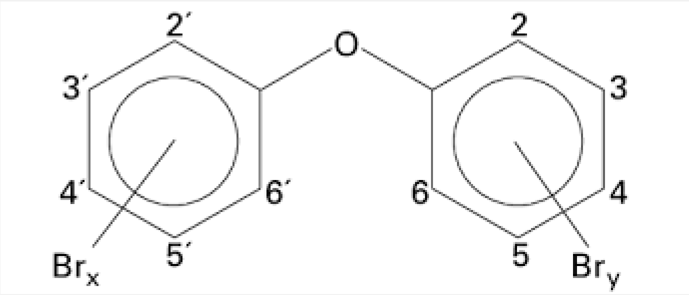
journal homepage: www.elsevier.com/locate/scitotenv

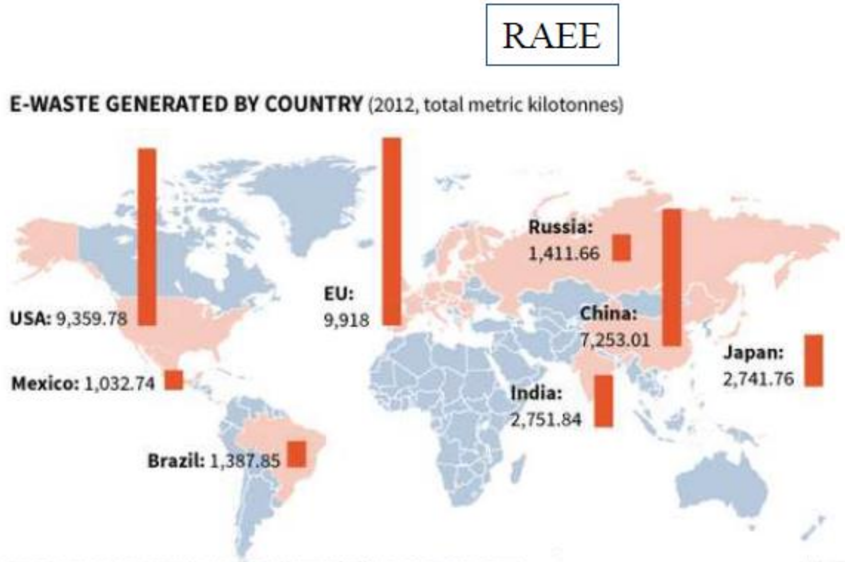
Background levels of polybrominated diphenyl ethers (PBDEs) in soils from Mount Meru area, Arusha district (Tanzania)

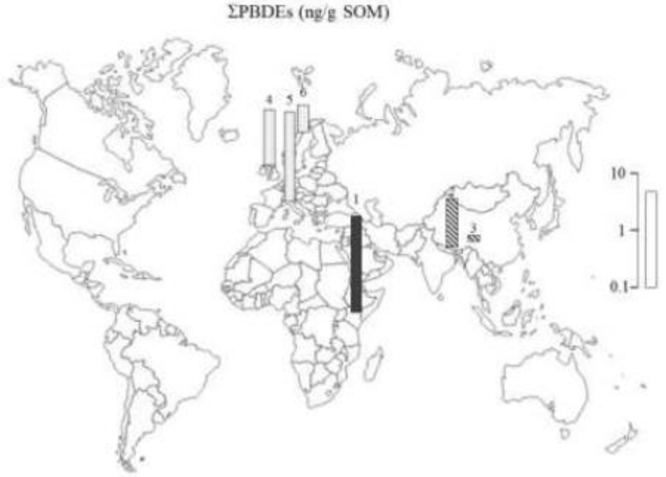
Marco Parolini [a,*], Niccolò Guazzoni [a], Roberto Comolli [b], Andrea Binelli [a], Paolo Tremolada [a]

[a] Department of Biosciences, University of Milan, via Celoria 26, 20133 Milan, Italy
[b] Department of Environmental and Landscape Sciences, University of Milano-Bicocca, Piazza della Scienza 1, Milan, Italy

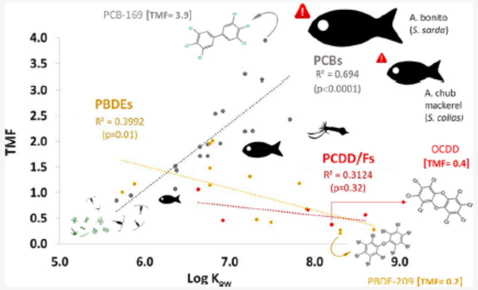
Polibromodifenileteri
(ritardanti di fiamma)







INQUINAMENTO CHIMICO: CONTAMINATI ORGANICI PERSISTENTI



Environmental Science & Technology
pubs.acs.org/est Article

Persistent Organic Pollutants Burden, Trophic Magnification and Risk in a Pelagic Food Web from Coastal NW Mediterranean Sea

Javier Castro-Jiménez,* Daniela Bănaru, Chia-Ting Chen, Begoña Jiménez, Juan Muñoz-Arnanz, Geneviève Deviller, and Richard Sempéré

Cite This: *Environ. Sci. Technol.* 2021, 55, 9557−9568 Read Online

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The storage capacity, trophic magnification and risk of sixty-two POPs have been evaluated in a well-characterized pelagic food web (including phytoplankton, zooplankton, six fish, and two cephalopods species) from an impacted area in NW Mediterranean Sea. Our results show the high capacity of the planktonic compartment for the storage of polybrominated diphenyl ethers (PBDEs) and polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), consistent with their estimated low trophic magnification factors (TMF) of 0.2−2.0 (PBDEs) and of 0.3−1.1 (PCDD/Fs). ∑PBDEs dominated in the zooplankton size-class 200−1000 μm (~330 ng g^{-1} lw, median), whereas ∑PCDD/Fs accumulated preferentially in phytoplankton size-class 0.7−200 μm (875 pg g^{-1} lw, median). In contrast, polychlorinated biphenyls (PCBs) were preferentially bioaccumulated in the higher trophic levels (six fish species and two cephalopods) with TMFs = 0.8−3.9, reaching median concentrations of 4270 and 3140 ng g^{-1} lw (∑PCBs) in Atlantic bonito (*Sarda sarda*) and chub mackerel (*Scomber colias*), respectively. For these edible species, the estimated weekly intakes of dioxin-like POPs for humans based on national consumption standards overpassed the EU tolerable weekly intake. Moreover, the

La palamita

(*Sarda sarda*)

Environmental Science & Technology pubs.acs.org/est Article

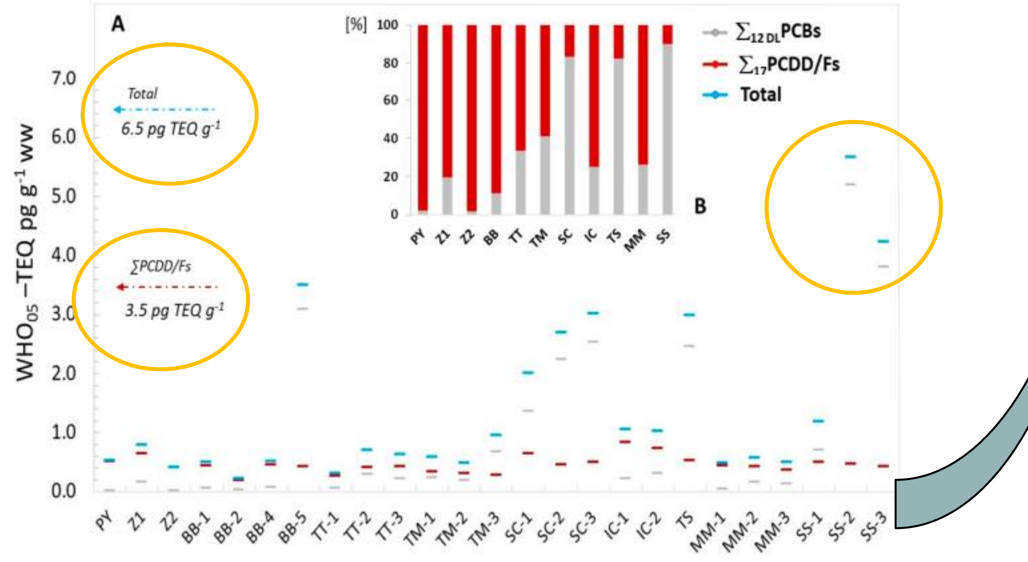


Figure 3. Calculated WHO$_{05}$-TEQ (pg g^{-1} ww) in all samples from the pelagic food web in coastal NW Mediterranean Sea (A) and median relative contribution (%) of $\sum_{12DL}$PCBs (gray) and $\sum_{17}$PCDD/Fs (red) to the total WHO$_{05}$-TEQ (PCBs+PCDD/Fs) in blue (B), except for PY, Z1, Z2, and TS, which are single values. The horizontal dotted lines show the EU concentration thresholds in sea foodstuffs and wild fish (see text for details). PY = phytoplankton 0.7−200 μm; Z1 = zooplankton 200−1000 μm; Z2 = zooplankton >2000 BB = *B. boops*; TT = *T. trachurus*; TM = *T. mediterraneus*; SC = *S. colias*; IC = *I. coindetii*; TS = *T. sagittatus*; MM = *M. merluccius*; SS = *S. sarda*.

INQUINAMENTO CHIMICO: CONTAMINATI ORGANICI PERSISTENTI

BIOCONCENTRAZIONE
BIOMAGNIFICAZIONE

Aumento delle concentrazioni in funzione del livello trofico

Environ. Sci. Technol. 2001, 35, 14–20

Biomagnification of DDT through the Benthic and Pelagic Food Webs of Lake Malawi, East Africa: Importance of Trophic Level and Carbon Source

KAREN A. KIDD,*
HARVEY A. BOOTSMA,† AND
RAYMOND H. HESSLEIN
Department of Fisheries and Oceans, Freshwater Institute, 501 University Crescent, Winnipeg, Manitoba, R3T 2N6 Canada

DEREK C. G. MUIR AND
ROBERT E. HECKY‡
Environment Canada, National Water Research Institute, 867 Lakeshore Road, P.O. Box 5050, Burlington, Ontario, L7R 4A6 Canada

undergone dramatic evolutionary radiation in neurocranial morphology, and it is thought that this morphological diversity may allow them to have specific dietary habits and partition food resources and niches within the lake. Current estimates of the number of species of cichlids range from 700 to 1000 (1), with species densities being greatest in the nearshore rocky habitats. These nearshore areas of Lake Malawi are highly productive with C fixation rates of up to 1000 mg C m^{-2} day^{-1}, and they can support more than 500 fish in a 50 m^2 area (2, 3). In contrast, the offshore pelagic food web is less species-rich and is based on much lower areal rates of algal photosynthesis.

Stable nitrogen and carbon isotope ratios of biota can be used to characterize an organism's trophic position and carbon source, respectively. These isotopic signatures integrate dietary habits over a period of months to years for slower-growing species (4). The enrichment of the heavier isotope of nitrogen from prey to predator (3–5‰ (5)) provides a continuous variable with which to quantify and contrast the biomagnification of organochlorines in aquatic food webs (6, 7). Little change in isotope ratios is observed when carbon is incorporated into a consumer from its diet, and, for this reason, these ratios are used to trace carbon flow from primary producers to tertiary consumers (8). In

pesci: 10.000.000 pg/L

ZOOPLANCTON: 130.000 pg/L

FITOPLANCTON

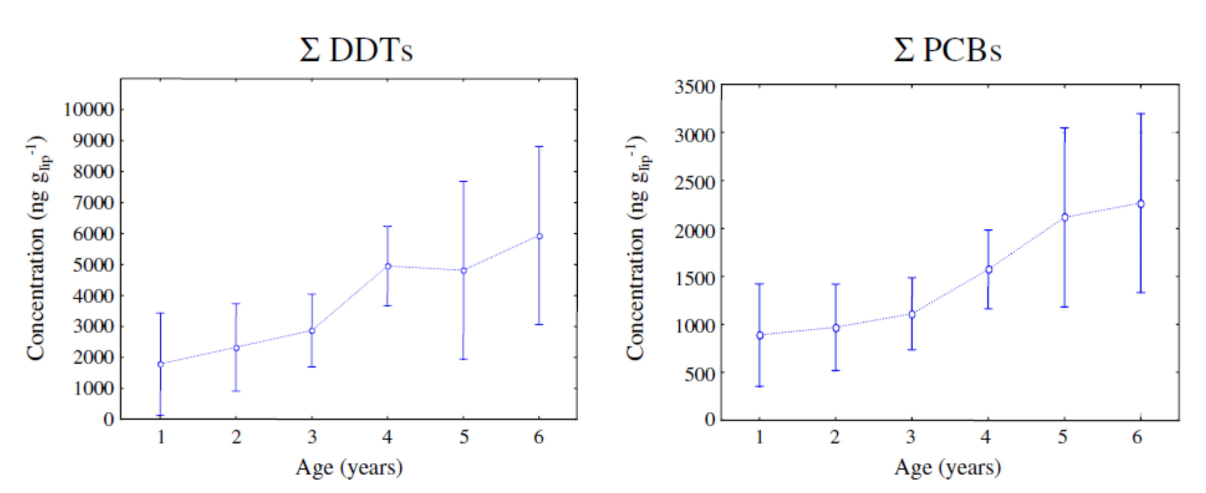
WATER: 28 pg/L

Aumento delle concentrazioni in funzione dell'età

Water Air Soil Pollut (2009) 197:193–209
DOI 10.1007/s11270-008-9803-z

Age-Dependent Bioaccumulation of Organochlorine Compounds in Fish and their Selective Biotransformation in Top Predators from Lake Maggiore (Italy)

Pietro Volta · Paolo Tremolada ·
Maria Chiara Neri · Gianluigi Giussani ·
Silvana Galassi



INQUINAMENTO CHIMICO: CONTAMINATI ORGANICI PERSISTENTI: CHE COSA E' STATO FATTO?

1989 1998 2001

http://chm.pops.int/Home/tabid/2121/Default.aspx

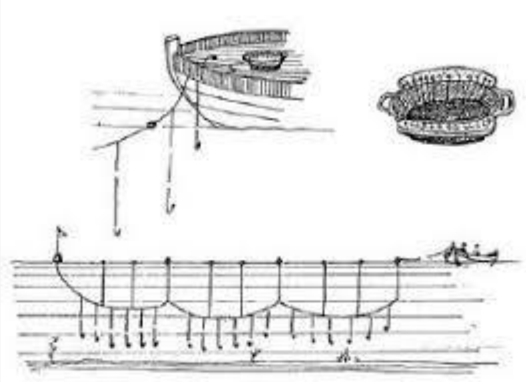
FIRMA → Stockholm, 22 maggio 2001

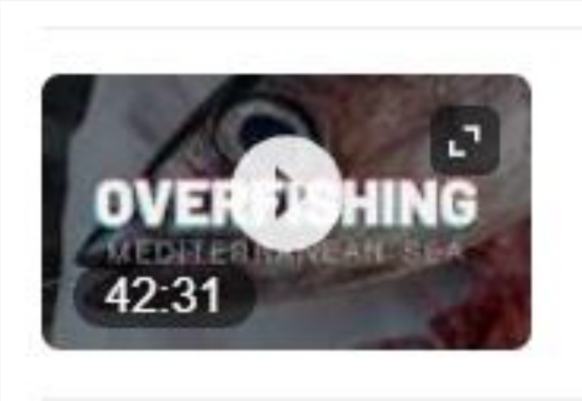
ENTRATA IN VIGORE → 17 maggio 2004

CHE COSA CI RESTA DA FARE?

IUCN-Italia: http://www.iucn.it/scheda.php?id=1108177324

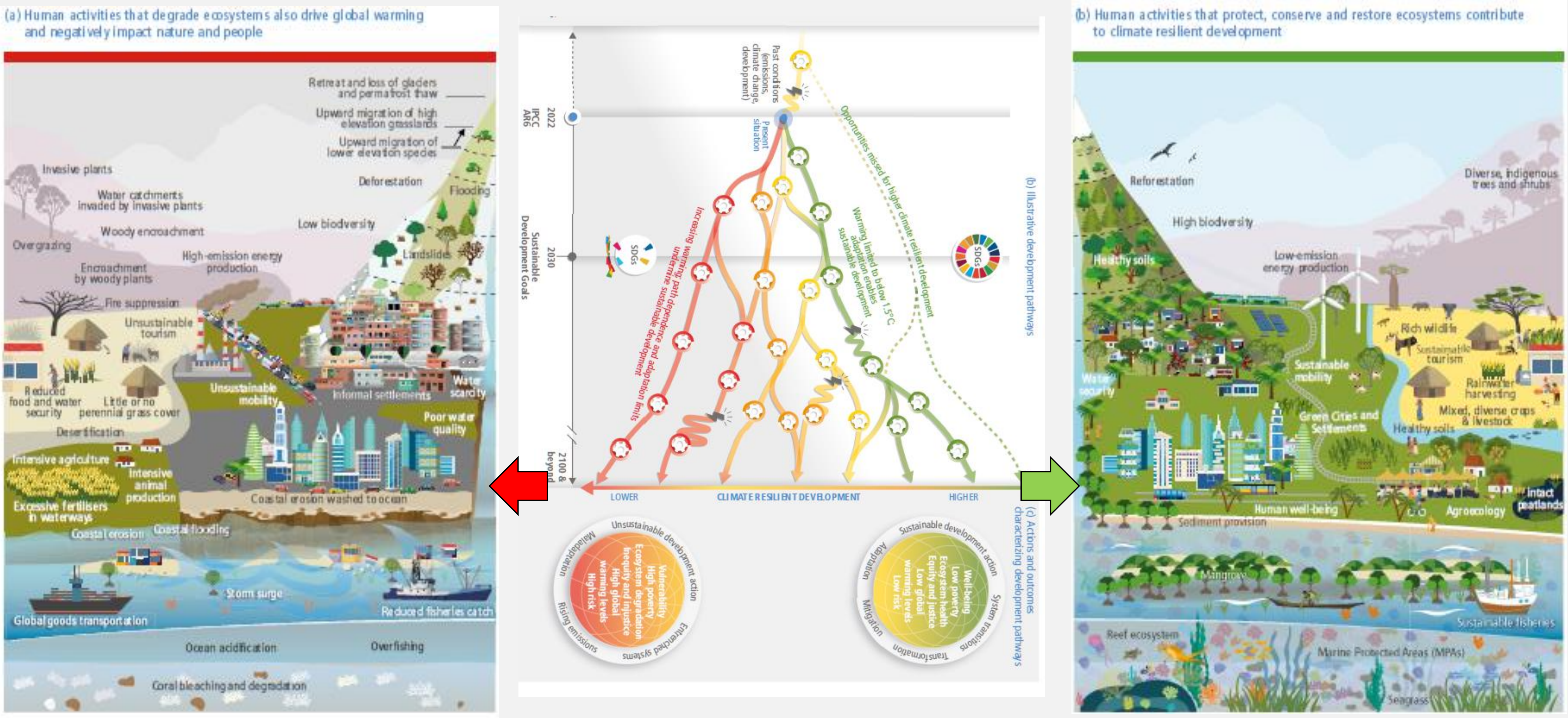
Il palamito
lunga lenza di grosso diametro con spezzoni di lenza più sottile con un amo ciascuno





https://www.youtube.com/watch?v=6lp-2m4awg4

Le prospettive: oggi (2022),2030 e 2100



IPCC, 2022: https://www.ipcc.ch/report/ar6/wg2/