

海洋 THE OCEAN WILL... 未來式

/ 新正常特展 /

115 05/29 — 10/11

【展覽地點】 臺北市士林區士商路189號
科教館3F西側特展區

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NATIONAL MUSEUM OF MARINE SCIENCE & TECHNOLOGY

【合辦單位】  國立臺灣科學教育館
National Taiwan Science Education Center



地球有七成以上是海洋
提供海量資源
海納百川萬物

海洋的未來
就是地球的未來

海洋未來式
關鍵思考
迎向未來
需要現在的行動

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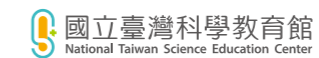
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THE OCEAN WILL...



海洋未來式 - 新正常特展

The Ocean Will... - New Normal Special Exhibition

海洋是人類甚至地球的母親。它不僅孕育豐沛資源，也無私地接收了大量人造廢棄物。她海洋吸收大氣中超過 90% 熱量，也接納人類製造大量溫室氣體，這些無法平衡的能量，最終總會以某種危機形式顯現出來。換句話說，在我們一如往常的過著生活的同時，海洋其實一直在默默承受一切惡果。而了解、善待海洋、改變生活、保護地球，這一點是我們每個人都能做到的。

「海洋未來式—新正常」特展，以海洋為關注範疇，未來為前瞻想像，在氣候變遷威脅下，啟發種種靈感，一同迎向未來可能的機會、使命與行動。展示命題主要包羅很廣，包含地球氣候觀測、海洋生物多樣性及因應淨零碳排綠生活行動，透過這三大面向，期待喚起民眾對環境永續行動反思。讓我們一起認識知與未知的海洋，呼應聯合國 2030SDGs 與 2050 臺灣淨零排放的目標，透過敘事展示與啟發，期待提供未來海洋視角與素養。

The ocean is the mother of humanity, and even of the Earth itself. It not only affords abundant resources but also selflessly absorbs vast amounts of human waste. The ocean absorbs over 90% of the heat from the atmosphere, taking in the greenhouse gases we humans produce. This excess energy will eventually tip the balance into crisis. While we go about our daily lives, the ocean has been silently bearing the brunt. Understanding the ocean and treating it with care—by simply living more sustainably to protect the Earth—is something each of us can do.

“The Ocean Will...” exhibition has its feet in the ocean and its eyes on the horizon—the future. As we face the threat of climate change, it gets us thinking, inviting us to embrace the opportunities that may lie ahead, new missions and actions. The exhibition’s three main themes are: 1. global climate observation, 2. marine biodiversity, and 3. how to achieve carbon neutrality. Through these three key areas, the exhibition aims to prompt reflection on action towards sustainability. The exhibition layout leads one towards a global perspective and an exploration of the world’s oceans, both the knowns and the unknowns. It aligns with the United Nations’ 2030 Sustainable Development Goals (SDGs) and Taiwan’s 2050 Net-Zero emissions target. Through stirring stories and informative displays, it aims to inspire and educate.





展覽永續作為

Sustainable Exhibition Approach

本展覽透過選用永續材料以及模組化設計方式盡量減少一次性耗材之使用量，期能降低對環境之影響。

To reduce environmental impact and the use of single-use disposable items, this exhibition substitutes sustainable materials and adopts a modular design.

1. 主體木構採用 2,100 才 (約 6 立方公尺) 柳杉國產材，約可固碳 3,840 公斤。

The main wooden structure uses 6m³ of domestically sourced cypress wood, which sequesters approx. 3,840kg of carbon.

2. 展板及展座箱體採樺木夾板，係現代傢俱、玩具、建築用材料，也是永續森林木材。

Exhibition panels and display cases are made from birch plywood, a material sourced from sustainably managed forests and used in modern furniture, toys, and construction.

3. 全展廳木作不施化學油漆，呈現自然原色與溫潤質感，並飄散木質香氣。

No chemical paint is applied to the wood used in this exhibition, showcasing its natural color, warm texture, and pleasant aroma.

4. 主體結構模組化，可拆卸移地組裝並適地調整規模。

The main structure is modular, allowing for disassembly, off-site reassembly, and on-site scale adjustment.

全區導覽

Site Map

Site Map

全區導覽

1 22

13. 海洋選歌 & 氣候選書
Oceanic Playlist & Climate Bookshelf

14. 藻藍碳
Algae Blue Carbon

15. 碳的終結者
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Climate Sentiment Emoticons

1. 汪洋
Ocean

2. 新正常
The New Normal

3. 不能沒有水
Can't Live without Water

4. 藍色經濟
Blue Economy

5. 鱗
Halfbeaks

6. 潛水的北火熊
Diving Power Bear

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8. 海洋生態系指標物種
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The Wishing Tree

11. 北極熊的冰箱
Polar Bear's Fridge

12. 嬰兒潮與玩具潮
The Baby and Toy Booms

THE OCEAN WILL...
海洋未來式
新正常特展

1. 藍色碳匯

海洋藍色碳匯，我是個支持者

- 投一票給紅樹林
- 投一票給藻礁
- 投一票給海草床
- 投一票給巨藻

2. 北極熊的冰箱

最深深吸引你的北極熊魅力是？

- 可愛
- 速度
- 狩獵技巧
- 感同身受面臨的處境

3. 玩具潮

數一下！你共有多少玩具？

- 10以下
- 10-30個
- 30個以上

再回想一下，它們的材質大多是？

- 塑膠類
- 紙類
- 木質類
- 金屬類

4. 碳終結者

碳是溫室效應、地球發燒的主嫌，我要成為一名

- 覺得沮喪
- 充滿希望
- 生氣忿怒
- 包容接納
- 拒絕往來

5. 復育之心

不斷聽到珊瑚白化的壞消息，我想要

- 學習珊瑚復育
- 培育耐熱珊瑚、超級珊瑚
- 成為珊瑚園丁
- 阻止海水升溫

6. 娃娃臉

如果海洋也有情緒，面對人類應該會

- 覺得沮喪
- 充滿希望
- 生氣忿怒
- 包容接納
- 拒絕往來

7. 韌性海洋

韌性是面對衝擊的承受力，以及衝擊過後的回復能力你覺得你對什麼最具韌性？

- 天氣變化
- 氣溫
- 缺水
- 飢餓



汪洋

Ocean

1

透過入口意象海平面上升動畫影片，描述我們人類迄今放肆消費與方便購物；無所節制導致碳足跡延續排放不止息，造成海洋母親酸化、暖化...而發出求救訊號！

This entrance sign is an animated film showing how sea levels have risen and describing how we humans have indulged in excessive consumption and convenience shopping. Our lack of restraint has swelled our carbon footprint, causing the Ocean Mother to acidify and warm up... and send out distress signals!

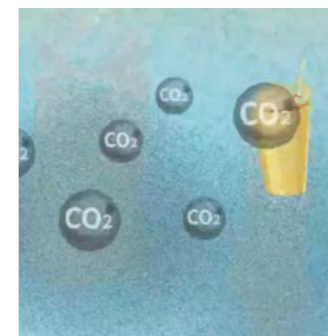
Protect the ocean, so you can "sea".

(以 see 與 sea 的諧音，一語雙關表達：保護海洋，便能看見 (與海合一))

(Playing on the homophones "see" and "sea," this pun conveys the idea that protecting the ocean allows us to see the sea)

"The biggest problem is greed." ~Jane Goodall
(最大的問題是貪婪。.....珍古德)

The health of our ocean is hanging in the balance. But the wonderful thing is that we have the power, and the knowledge, to change that. ~David Attenborough
(我們的海洋健康正處於臨界點，但令人欣慰的是，我們擁有改變現狀的力量與知識。~大衛·艾丁堡)



海洋 THE OCEAN WILL... 未來式

/ 新正常特展 /



“The biggest problem is greed.”
— Jane Goodall



新正常

The New Normal

本特展期勉與觀眾溝通：未來需要今天行動！

This special exhibition endeavors to communicate a simple message: we have to act now!

2

面對海洋暖化、酸化、塑化、優養化...·海洋與氣候的臨界點·我們需要：調適、增韌、逆轉與作出行動。因為我們的想法、做法將會塑造出新正常的海洋未來式。

所謂新正常（新常態）是指社會或經濟在危機後的穩定狀態·而這狀態與危機前並不相同。例如新冠疫情後的疫後時代·便是「新正常」的例證·我們面對氣候變遷所帶來種種危機與衝擊·在不斷地解決問題、提出對策、付諸行動之間·最終將彼此連動、交相作用·進入氣候變遷後的未來新正常。

We confront ocean warming, acidification, plasticization, eutrophication...and ocean and climate tipping points. We must adapt and act to raise resilience and buck the trend.

What we think and do will shape the New Normal, as the ocean will...

The “new normal” refers to the stable state of society or the economy after a crisis, which is different from before. For example, the post-pandemic era following the COVID-19 pandemic is kind of “new normal.” As we confront the crises and impacts brought by climate change, we have to solve problems, develop strategies, and take action. Ultimately, we have to collaborate and synergize to handle the new normal of the post-climate change future.



不能沒有水

Can't Live without Water

<https://www.water.gov.tw/ch/Subject/Detail/3760?nodeId=4889>

3

人體 7 成是水·水是生命之源·人不可一日無水。取材倉儲運輸液體常用的噸桶·給予觀者 1 噸水的具象體積量體·噸桶化作展示燈箱·作各種水量的換算式。

您珍惜水資源嗎？水對地球至關重要。水覆蓋地球 2/3·約 97% 鹹水·2% 冰凍水·只有 1% 淡水·而淡水正是人類所需的。我國保障民生基本生活用水：按每人每日 250 公升（相當 417 瓶 600ml 罐裝水）標準。另比較上方塑膠瓶裝水售價 20 元·面前這水箱體積 1 立方公尺（1,000 公升）·即 1 度自來水費用約新臺幣 9 元·永續未來該選擇哪個？！

The human body is 70% water, and water is the source of life. Humans cannot survive for very long without water. Using an IBC (Intermediate Bulk Container), a container commonly used for liquid storage and shipping, the installation provides viewers with a tangible idea of one ton (1,000 liters) of water. The container is transformed into a light display, showcasing various volume conversion formulas.

Do you value water resources? Water is crucial to the Earth. Water covers two-thirds of the Earth's surface, but approximately 97% is salty, 2% is frozen, and only 1% is fresh—the very water humans need. Our country ensures basic domestic water supply: 250 liters of daily per capita water allocation (equivalent to 417 600ml bottles). Comparing the price of a plastic bottle of water at 20 NT dollars, the water tank in front of you has a volume of 1 cubic meter (1,000 liters), which is equivalent to approximately 9 NT dollars per cubic meter of tap water. Which should we choose for a sustainable future?



藍色經濟

Blue Economy

海洋是全球經濟的主要貢獻者
The oceans are a major contributor to the global economy.

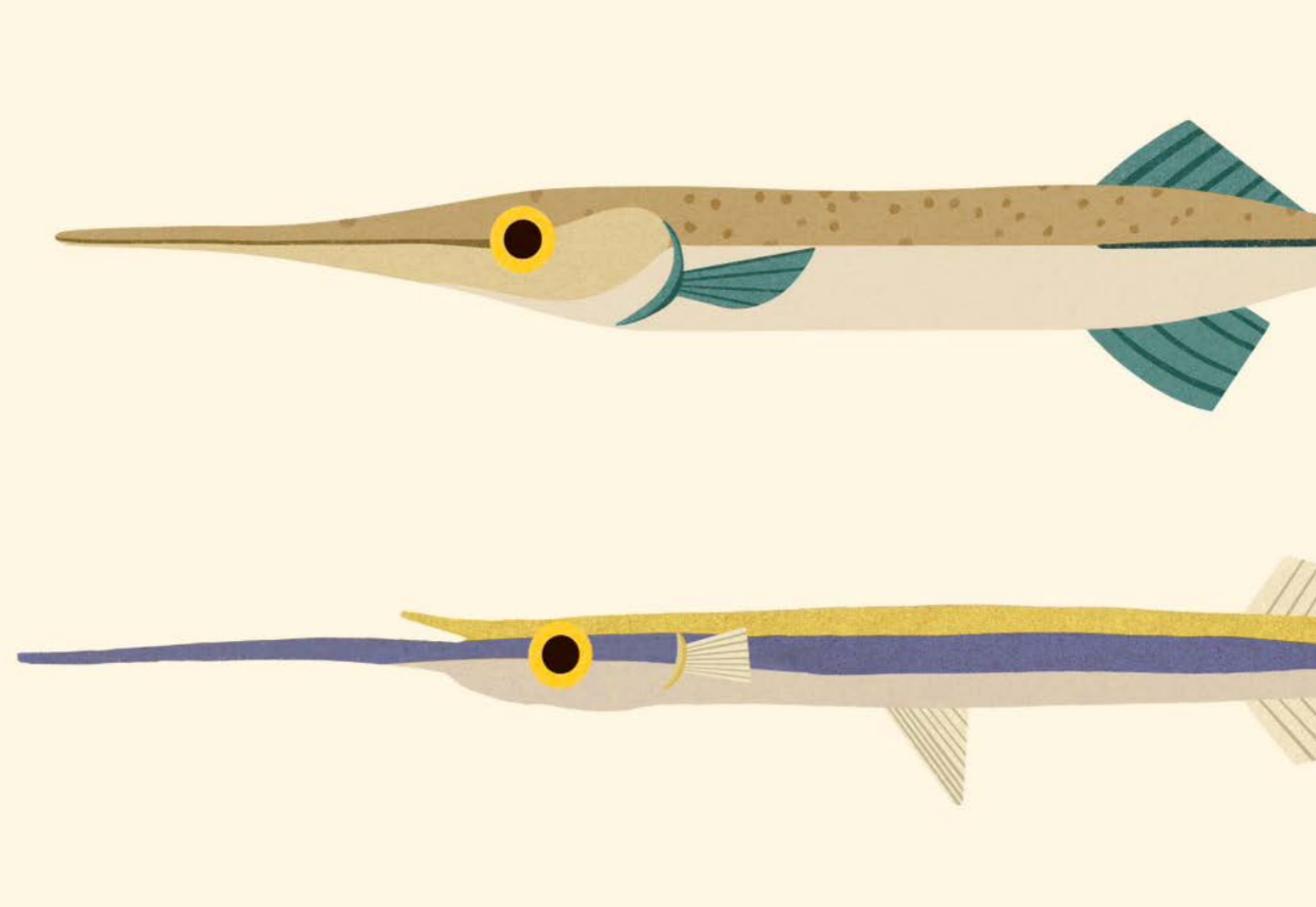
4

本特展有個隱形世界輪廓，非洲尚比西河是人類起源地，本展參觀動線與人類遷徙路線不謀而合。儘管相對條件不佳，相反地，人口卻爆增突破 15 億，預測 2100 年更將翻倍，藍色經濟將會成為非洲改善經濟體質的一帖良方。

藍色經濟是永續使用海洋資源，帶來經濟成長、促進生活、福祉、就業的同時並兼顧海洋生態系健康。估計可為經濟貢獻 1.5 兆美元及 3,000 萬就業機會。聯合國非洲經濟委員會 (UNECA) 早定出藍色經濟戰略，而美國國家沿海海洋科學中心 (NCCOS) 將藍色經濟分海洋經濟、藍色經濟、新藍色經濟三階段逐步轉型。

This special exhibition traces the lineaments of the world. The Zambezi River in Africa is the origin of humanity, and the route you follow through the exhibition represents human migration routes. Despite relatively poor living conditions, the population has surged past 1.5 billion and is projected to double by 2100. The Blue Economy is a viable approach to treating Africa's economic ills. The Blue Economy involves the sustainable use of

marine resources to drive economic growth, enhance living standards, promote well-being, and create jobs while maintaining the health of marine ecosystems. It is estimated to contribute 1.5 trillion dollars to the economy and generate 30 million jobs. The United Nations Economic Commission for Africa (UNECA) has already established a blue economy strategy, while the US National Centers for Coastal Ocean Science (NCCOS) has divided the blue economy into three phases of transformation: Marine Economy, Blue Economy, and New Blue Economy.



鱻

Halfbeaks

5

美國國家科學院院士彼得·雷文 (Peter Raven) 不斷呼籲「全球物種正以每年消失 1,000 種的速度滅絕」。俗稱「水針」的鱻科魚類，兩種鱻一個滅絕，一個被新發現，都是海洋的現在進行式。臺灣下鱻是美國魚類學家布魯斯·科萊特 (Bruce Collette) 在 1986 年所正式發表的新種，標本散藏於國外多所博物館，魚標本分別於 1908、1943、1956、1969 年，由淡水河的挖仔尾以及基隆河下游的士林一帶所採到，顯示當年數量不少。然而中央研究院幾年調查，卻始終沒有發現，推測可能已經滅絕。臺灣下鱻是在被分類學家發現和證實牠是新種之前，就已經在地球上消失了。

相對於臺灣下鱻的消失，德國漢堡自然博物館中有一不明魚類標本，標記採於 1907 年，採集地為「Takao, Formosa」(打狗，高雄舊稱)，牽起了臺德雙方攜手合作，2023 年在嘉義再度發現此魚，並命名為新種「打狗異鱻」。

<https://www.endangered.org/campaigns/wild-success-endangered-species-act-at-40/peter-h-raven/>

Peter Raven of the National Academy of Sciences has repeatedly warned that “species are now disappearing at thousands of times the historical rate.” The halfbeak family, commonly known as “water needles” in Chinese, has seen the discovery of one species to replace another that has gone extinct, reflecting the current state of the ocean. The Taiwanese halfbeak was formally described by American ichthyologist Bruce Collette in 1986. Specimens are scattered across numerous museums abroad, with fish specimens collected in 1908, 1943, 1956, and 1969, from the Waziwei area of the Tamsui River, and the Shilin stretch of the Keelung River, right before it pours into the Tamsui, indicating that their numbers were once significant. However, despite several years of surveys by the Academia Sinica, no live individuals have been found, leading to the conclusion that they may have already gone extinct. The Taiwanese halfbeak disappeared from Earth before it was classified and confirmed as a new species by taxonomists.

In contrast to the disappearance of the Taiwanese halfbeak, an unidentified fish specimen at the Hamburg Natural History Museum, labelled as collected in 1907 from “Takao, Formosa” (Takao being the former name of Kaohsiung), has fostered collaboration between Taiwanese and German researchers. In 2023, the fish was rediscovered in Chiayi and named “Takao river garfish.”



潛水的北火熊

Diving Power Bear

6

海洋維繫著人類和地球上所有生命，儘管我們完全仰賴海洋，但探索過的海洋部分卻僅約 10%，我們對浩瀚海洋知之甚少。縱使海洋兇險，也從未讓人的探索、研究卻步，器材、設備不斷日新月異，讓我們的好奇心可達到更深的海底。

海洋科技博物館典藏的深海作業頭盔，既是文物也是現行水下作業現役的頭盔，仿如電影變形金剛中的大黃蜂，讓深海潛水人員有著英雄般的身影，在水底執行著不同的艱鉅任務。本展也為海洋科技博物館的吉祥物「北火熊」也配上潛水頭盔，海洋探索出任務。

The ocean sustains humanity and all life on Earth. Despite our complete reliance on the ocean, only about 10% of it has been explored, leaving us with limited knowledge of its vastness. Despite its dangers, the ocean has never deterred human exploration and research. With constantly evolving equipment and technology, our curiosity can now probe deeper.

The deep-sea diving helmet in the collection of the National Museum of Marine Science & Technology in Keelung may be a historical artifact, but it's still dive-ready. Donning the helmet, which looks like Bumblebee from the Transformers movies, would turn any diver into a superhero, ready to tackle any underwater challenge.

This exhibition also features the museum's mascot, the "Power Bear," wearing a diving helmet, ready for ocean exploration missions.

提供單位：國立海洋科技博物館
Organization Name: National Museum of Marine Science and Technology



殼

Shells

7

臺灣海域可見 5 種海龜，包括綠蠔龜 (Chelonia mydas)、赤蠔龜 (Caretta caretta)、玳瑁 (Eretmochelys imbricata)、欖蠔龜 (Lepidochelys olivacea) 及革龜 (Dermochelys coriacea)，雖然過去也有赤蠔龜上岸產卵記錄，但如今只有綠蠔龜還會上岸產卵。

然而海龜性別卻是溫度所決定，氣候變遷帶來暖化，直接衝擊海龜族群性別均衡，溫度一升高，雌龜比例大增，太多雌龜、太少雄龜，將讓海龜世代傳續亮起紅燈。

海龜的性別仰賴環境「溫度決定系統」，關鍵溫度約為 29°C，低於攝氏 27.7°C 會孵出雄海龜，高於 31°C 則會孵出雌海龜。愈接近「關鍵溫度」孵出雌雄比例越相等。

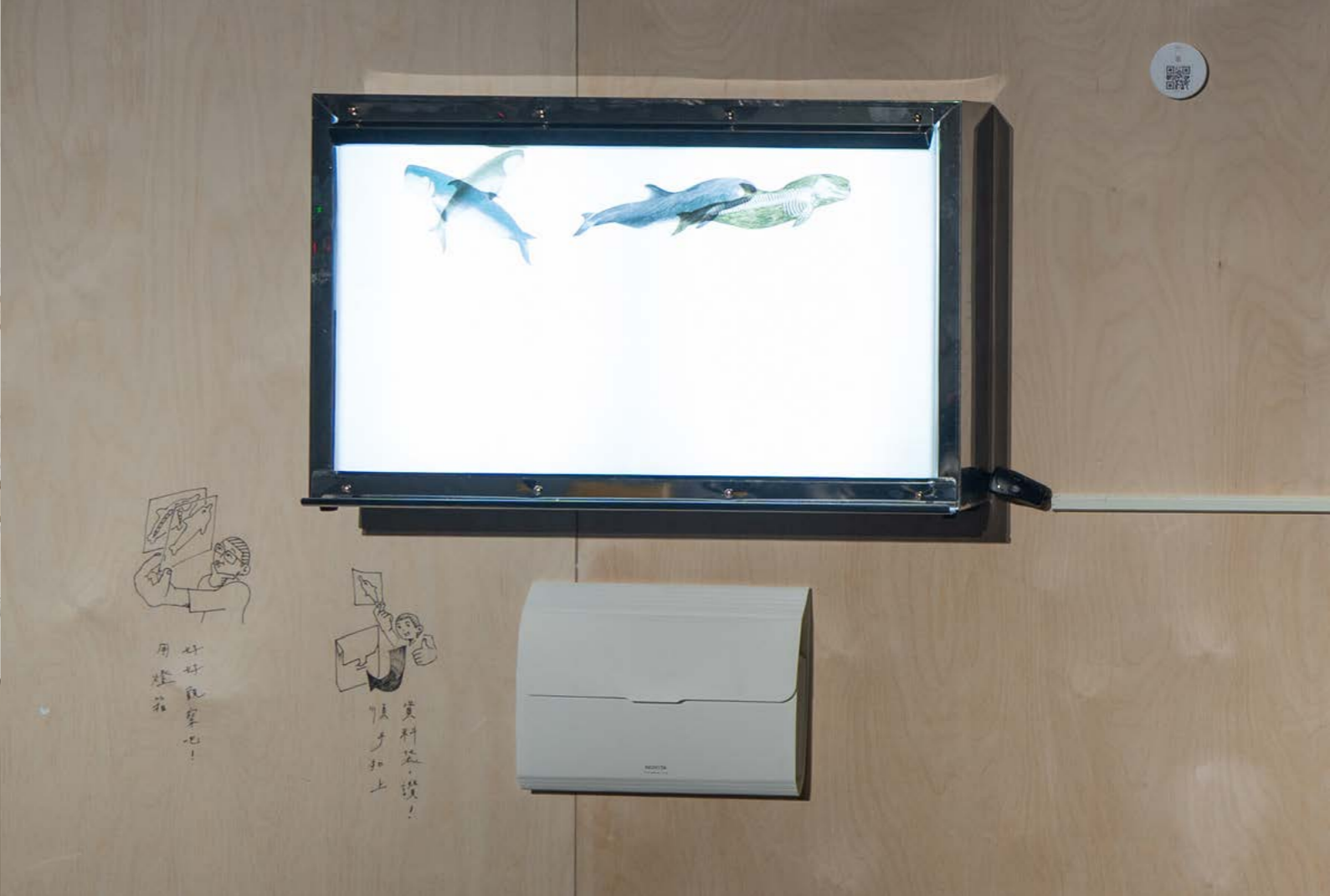
Five species of sea turtle can be found in Taiwanese waters, including the green sea turtle (*Chelonia mydas*), loggerhead sea turtle (*Caretta caretta*), hawksbill sea turtle (*Eretmochelys imbricata*), olive ridley sea turtle (*Lepidochelys olivacea*), and leatherback sea turtle (*Dermochelys coriacea*). While there have been records of loggerheads coming ashore to lay eggs in the past, only green sea turtles still do so today.

The sex of sea turtles is temperature dependent. Climate change-induced warming directly impacts the sex balance of sea turtle populations. As temperatures rise, the proportion of female turtles increases significantly. An excess of female turtles and a shortage of male turtles threaten the future of sea turtle populations.

Sea turtle gender depends on the environmental "thermostat," with a critical temperature of approximately 29 °C. Temperatures below 27.7 °C result in mostly male hatchlings, while temperatures above 31 °C result in mostly female hatchlings. The closer the temperature is to the critical temperature, the more balanced the ratio will be.

提供單位：國立海洋科技博物館
Organization Name: National Museum of Marine Science and Technology

<https://www.facebook.com/photo.php?fbid=3494519743946117&id=2318252258239544&set=a.2324050000993103>



海洋生態系指標物種

Marine Ecology Indicator Species

8

海洋健康指標中，多項都與生態有關，除了涵蓋棲地與物種兩面向構成的生物多樣性外，更有在地意識項下，特別舉出標誌物種。標誌物種 (iconic species) 指的是在公眾心中具有高知名度、象徵性，常被用來代表特定地區或生態系，或與文化連結以及促進保育意識、議題的物種。在陸地上，臺灣黑熊、黑長尾雉、藍腹鵲... 都堪稱是臺灣的指標物種，而海洋的標誌物種則因多元棲地而異。

Many marine health indicators are ecological. In addition to biodiversity, which encompasses both habitat and wildlife, there are also "iconic species." Highly recognizable and symbolic in the public eye, such species often represent specific regions or ecosystems. Such species are often linked to culture and used to promote conservation awareness. On land, Taiwan black bears, Mikado pheasants, and Swinhoe' s pheasants ... are all iconic species, while marine iconic species vary due to diverse habitats.



鯨豚的內在外在

Cetaceans Inside and Out

9

與人類同是哺乳類動物，鯨豚不是魚，而是生活在海洋的哺乳類動物。

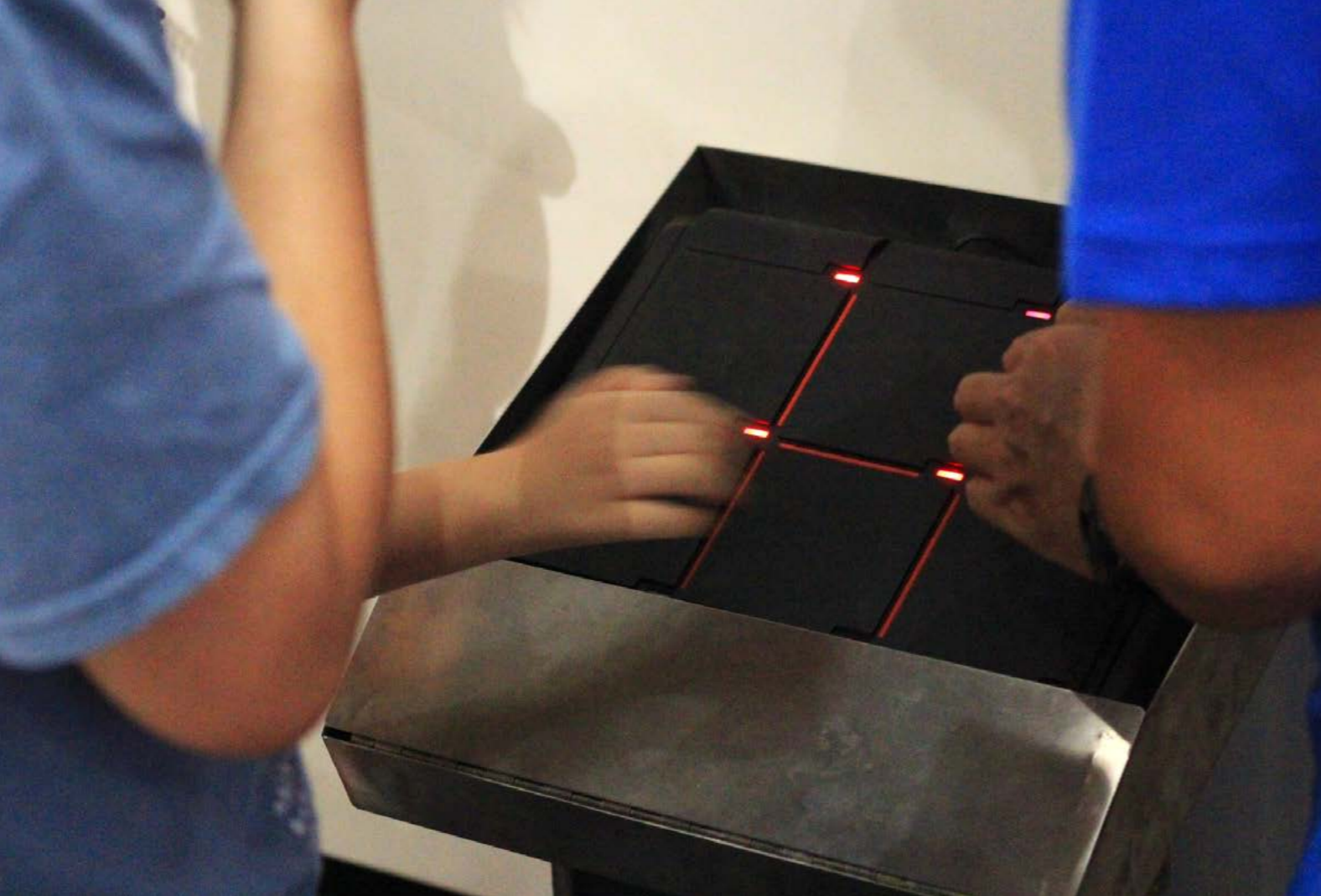
臺灣海域鯨豚超過 30 種，佔全球種類的 1/3，小小臺灣海域有此佔比，何其驕傲、何其不易。鯨魚，幫助地球降溫？大型鯨魚在漫長的一生中，體內累積大量碳匯，當死去便沉入海底封存，平均可吸收 33 噸二氧化碳。當鯨魚到海面上換氣呼吸，隨著排便富含鐵、氮元素也成為海洋浮游植物完美的養分來源，而海洋浮游植物則貢獻地球至少 50% 的氧氣，並吸收全球 40% 的二氧化碳排放量。

不論海洋保育、鯨豚研究等，並非只限科學領域，科學研究成果普及與資訊共享，更能擴大大眾對海洋的關注。展示鯨豚的外觀特徵以及骨骼結構，讓參觀者有了動物醫生的角色扮演感。

Like humans, cetaceans are mammals, not fish.

Taiwan' s waters are home to over 30 species of whales and dolphins, accounting for one-third of the world' s cetaceans. Such a high proportion is truly a source of pride. What? Whales help cool the Earth? Large whales accumulate a significant amount of carbon in their bodies over their long lives. When they die, they sink to the ocean floor, each sequestering an average of 33 tons of carbon dioxide. Still alive, when they surface to breathe and defecate after feeding, they release a lot of iron and nitrogen. These are the perfect nutrients for phytoplankton, which contribute at least 50% of Earth' s oxygen production and absorb 40% of global carbon dioxide emissions.

Whether it' s marine conservation or cetacean research, the results are not just for the scientific community. The dissemination of scientific research findings and information sharing can further expand public awareness of the ocean. The displays of the physical characteristics and skeletal structures of cetaceans allow visitors to feel like they' re playing the role of an animal doctor.



座頭鯨之歌

Song of the Humpback Whale

https://archive.org/details/songsofhumpbackw00payn/01_Side_1.mp3

9

《傾聽地球之聲》作者大衛·喬治·哈思克筆下的鯨魚歌聲令人神往，抹香鯨用連串喀嗒聲彼此溝通，有時像啞呀響的舊鏈條，也像節拍器嗒嗒響，一整群聚在一起時，又像幾十隻發狂啄木鳥又敲又啄；小鬚鯨叫聲柔軟有彈性，自帶回音，時而顫動，時而重擊，時而彈撥，有如打擊樂；北大西洋露脊鯨悶哼聲，也會發出像大口徑來福槍般的「槍聲」；灰鯨震顫的牢騷，像鬱悶的公牛或發狠咆哮的貓咪...座頭鯨節奏、頻率、韻律和音色，與人類的語言和音樂有足夠的共通點，牠們的叫聲能引發移情作用。鯨聲音檔內建於打擊板上，打擊敲響自己的鯨之歌。

David George Haskell's evocations of whale songs in *Sounds Wild and Broken* are enchanting. "Sperm whales use streams and clusters of clicks both to communicate with one another and to explore their world through echolocation. They creak like old door hinges, clack like metronomes, and, when gathered in groups, hammer and peck like dozens of frenzied woodpeckers. Minke whales boing, pulse, thump, and twang, their calls rubbery and percussive. The North Atlantic right whales' groans sound ... [like] 'gunshot,' like a large-caliber rifle. The gray whales' wavering complaints are croaks and bellows like those of distressed bulls or fierce growling cats.... The tempo, frequencies, cadences, and timbres of the humpback whales' sounds overlap enough with those of human speech and music that their sounds evoke empathy." In this exhibition, a digital percussion board plays their songs.



許願樹

The Wishing Tree

10

面對未來許多不可期，人們都需要許願，在生日時許下願望、在聖誕前夕向聖誕老人許願、在一株許願樹上掛上寫著心願的小紙條、在無人的地方，只有你與自然獨處之時。

人們需要許願，許願可以讓人更確立目標、增加動力、表達情感，同時在心理上得到滿足與希望，甚至對願望的實現更具信心。海洋未來式以海扇造型作為海洋的許願樹，珊瑚貼標可以寫上心願，如復育種珊瑚般的形式，許個心願，埋一顆行動的種子。

Confronting an uncertain future, people need to make wishes—on birthdays, to Santa Claus before Christmas, by hanging notes on a wishing tree, or in a secluded place where you are alone with nature...

People make wishes. Wishing helps clarify goals, boost motivation, express emotions, and provide psychological fulfillment and hope, even fostering greater confidence in the realization of the wish. The Ocean Will exhibition uses a branched sea fan shape as the ocean's wishing tree, with coral tags where wishes can be written, where hopes can grow like a replanted coral sprout. So come make a wish and plant a seed of action!



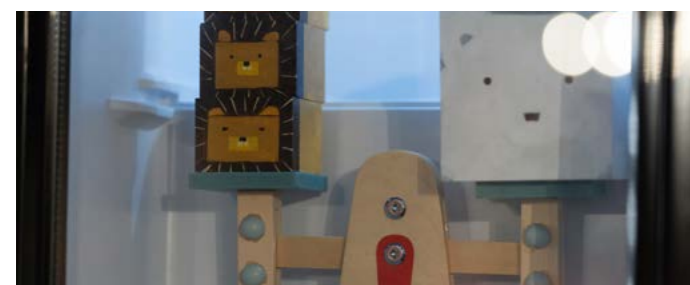
北極熊的冰箱

Polar Bear's Fridge

11

北極熊是地球上唯一依賴海洋生態系生存的熊科動物，同時被歸類為海洋哺乳類動物，一生多生活在北冰洋的海冰上。本展以冰箱作為展箱，呼應北極熊所處低溫環境，分別呈現北極熊各種特性。

北極熊屬獨居性動物，活動範圍直徑 150~300 公里，四肢著地肩高 1.5 公尺，站立身高可達 3 公尺，體重可達 800 公斤。短距奔跑時速可達 40 公里，游泳時速約 9 公里。環斑海豹、髯海豹是牠的主食，一身狩獵技能，但成功率卻不到 2%，氣候變遷帶來海冰消退、覓食困難...，都讓北極熊面臨空前危機。



Polar bears are the only bear species on Earth that rely on marine ecosystems for survival and are classified as marine mammals. They spend most of their lives on the ice of the Arctic Ocean. This exhibition uses a refrigerator to evoke the polar bear's frigid environment, showcasing various characteristics of polar bears.

Polar bears are solitary animals with a range of 150-300 kilometers. They stand 1.5 meters tall on all fours and can reach 3 meters in height standing on their hind legs. They weigh up to 800 kilograms. They can sprint up to 40 kilometers per hour and swim at approximately 9 kilometers per hour on the hunt for ringed seals and bearded seals. They possess exceptional hunting skills, but their success rate is less than 2%. Climate change has led to an unprecedented crisis: the retreat of sea ice makes it harder for polar bears to find food.



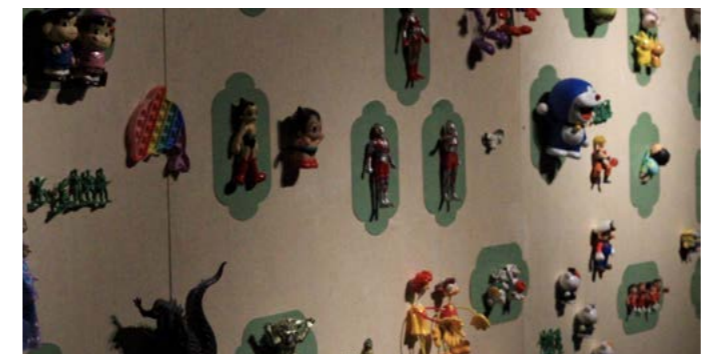
嬰兒潮與玩具潮

The Baby and Toy Booms

12

每個小孩成長過程中，都有玩具陪伴，玩具產業的蓬勃，與戰後嬰兒潮有密切的關係，塑膠產業更加速了玩具的大爆發，琳瑯滿目令人眼花繚亂，不同年代的童年，各有不同玩具主角與主流，相同的是，這些玩具幾乎都是塑膠製品。玩具市場暢旺，也加速了上游塑膠產業的茁壯。

據研究統計，每個兒童平均擁有 300 件玩具，一天平均會玩 2 件，一件玩具受青睞壽命約 6 個月。這些遠離了童年的玩具，不只是美好童年的記憶，卻也是地球可觀塑膠廢棄物負擔。



Every child grows up with toys. The booming toy industry is closely tied to the post-war baby boom, and the plastic industry further accelerated the explosive growth of toys, creating a dazzling array of options. Different eras have their own iconic toys and trends, but one thing remains the same: nearly all these toys are made of plastic. The thriving toy market has also lifted the upstream plastic industry.

According to research statistics, each child averages 300 toys, plays with an average of 2 toys per day, and a toy's "attention lifespan" is approximately 6 months. These plastic toys, now distant from childhood, not only carry memories but also burden our planet.



海洋選歌 & 氣候選書

Oceanic Playlist & Climate Bookshelf

13

不論是 Sailing 英國老歌

One ocean-themed song is the British golden oldie "Sailing,"

I am sailing, I am sailing, home again 'cross the sea.
I am sailing, stormy waters, to be near you, to be free.

還是鄭華娟《漂泊的心停泊在基隆港》、陳建年《海洋》、電影《碧海藍天》配樂，海洋是靈感的寶藏庫，永遠取不盡、用不竭，因為海洋，所以啟迪了創作，因為海洋的深奧，我們知之甚微，所以選了有關海洋的書，開卷讓人更知海洋更近海洋，更懂海洋。

Others are by famous Taiwanese singers, "A Wandering Heart Anchors in Keelung Port" by Cheng Hua-juan or "Ocean" by Chen Jien-nien. The ocean is also an endless treasure trove of inspiration, never to be exhausted, in the soundtrack of the French movie *Le Grand Bleu*. The ocean not only inspires our minds with its breadth; it also humbles us with its depth. That's why we have chosen a selection of books about the ocean, to help readers get to know it better.



氣候選書



海洋選歌



海洋 / 氣候 / 環境
播放清單 (Suno)

藻藍碳

Algae Blue Carbon

國立臺灣海洋大學海洋中心人工養殖海藻品種
The seaweed species for artificial culturing in NTOU.



14

因應國內 2050 淨零排放政策，在藍色碳匯研究上屢傳捷報，海洋委員會委請研究紅樹林與海草床生態服務的國立中興大學林幸助團隊，提出了紅樹林與海草床方法學，紅樹林可貢獻碳匯是森林的 2.5 倍，海草床與鹽沼是森林的 1.5 倍。

而國立臺灣海洋大學在海藻生產力實驗中估計，每年每平方公尺種植溼重 10 公斤的海藻，則每公頃每年可額外貢獻 20 公噸當量二氧化碳。本展特別模擬海洋大學藻類保種中心，展示所育活藻，也是藍色碳匯的明日之星。

In response to Taiwan's 2050 Net-Zero emissions policy, there have been encouraging developments in blue carbon research. The Ocean Affairs Council recently commissioned a research team led by Lin, Hsing-Juh from National Chung Hsing University to study the ecological services of mangroves and seagrass beds.

The team found that mangroves can provide 2.5x more carbon storage than forests, while seagrass beds and salt marshes provide 1.5x more.

A team at National Taiwan Ocean University estimated that planting seaweed with a wet weight of 10 kilograms per square meter could contribute an additional 20 metric tons of carbon dioxide equivalents per hectare annually. This exhibition simulates the university's algae conservation center, showcasing cultivated algae as a blue carbon sink.

提供單位：國立臺灣海洋大學海洋中心藻類實驗室、財團法人旭日教育基金會

Organization Name: Marine Algae Lab, Center of Excellence for the Oceans, National Taiwan Ocean University
Rising Sun Education Foundation



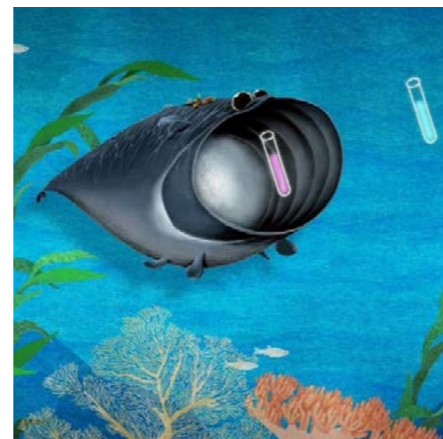
碳的終結者

The Carbon Terminator

15

在海洋未來式特展動線的終點，企圖誘發參觀一些行動的想像力。假如我是一個碳的終結者，我要如何養成、訓練自己成為一個效率、精準、具行動力與判斷力的戰士，本站可以自由選擇 5 個方案，得出終結者的戰鬥能力指標。49 個方案、5 個選擇，可以得出非常多樣的結果，帶來遊戲感與使命感及樂趣。

The final stop of The Ocean Will... is intended is to get you thinking about taking action, by asking: If I were a Carbon Terminator, how would I train myself into a warrior, effective and decisive? At this stop, you choose your own Terminator with any five options out of forty-nine and see how powerful you are. That's a lot of possibilities for fun and games, and a sense of mission.



熱浪

Heatwave

16

熱浪是天氣在某段時間內持續出現異常高溫，並可能伴隨較高的空氣濕度。

世界氣象組織 (WMO) 定義，熱浪是連續 5 天最高氣溫，皆超過該地區平均最高氣溫 5°C 以上。全球各地每年紛傳熱浪事件。

聯合國政府間氣候變遷專門委員會 2018 年報告預測：全球暖化 1.5°C 將導致全球 70% 至 90% 的珊瑚礁消失。聯合國世界氣象組織 2025 年《2024 年全球氣候狀況報告》證實：2024 年可能是第一個氣溫比 1850-1900 年平均值高出 1.5°C 以上的年份，這將是 175 年來觀測記錄中最熱的一年。科學家 2022 年研究發表：全球升溫 1.5°C 熱浪，將使 99% 的珊瑚礁受害面臨消失的命運。

珊瑚礁的大災難：人類能做些什麼 - BBC 英倫網

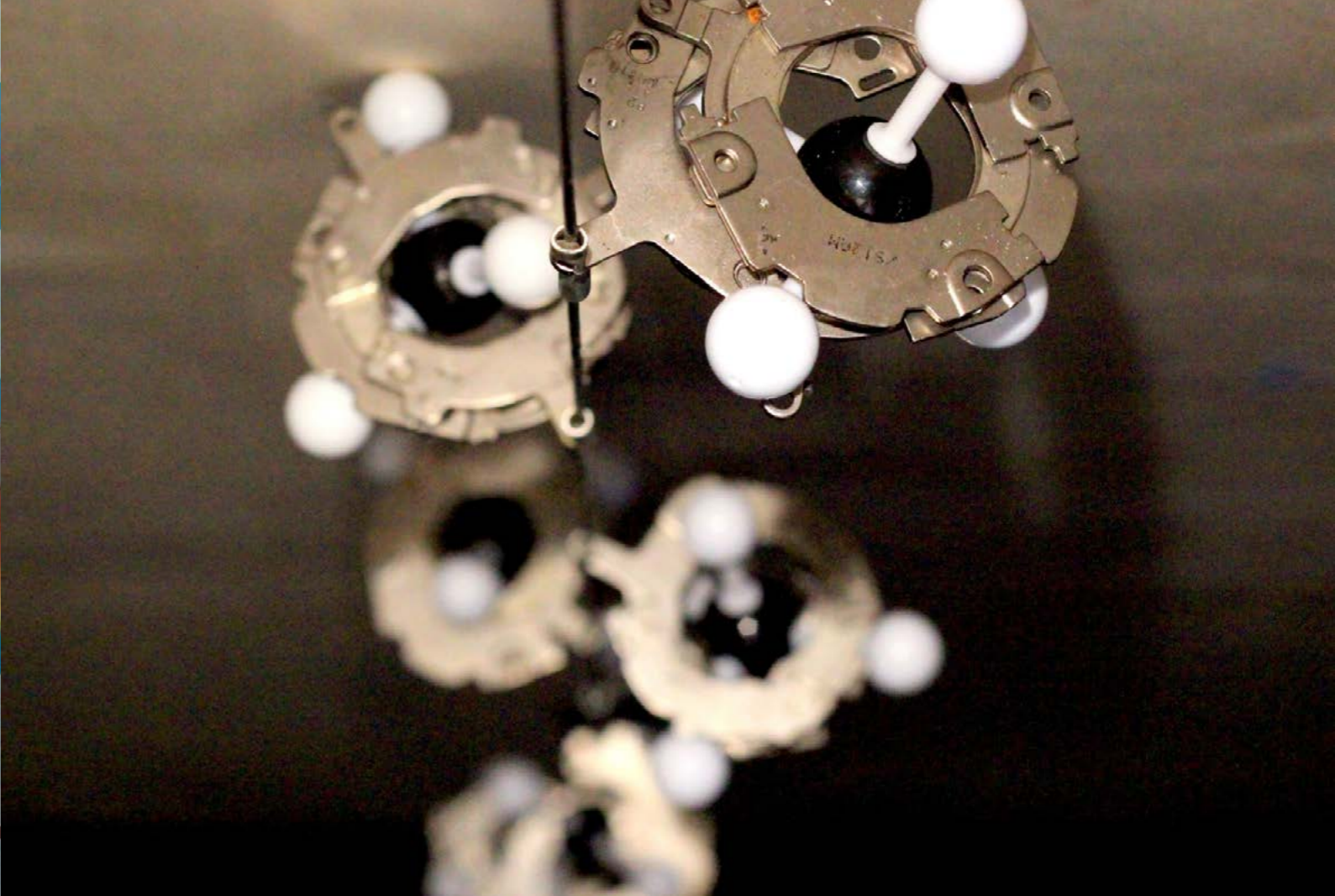
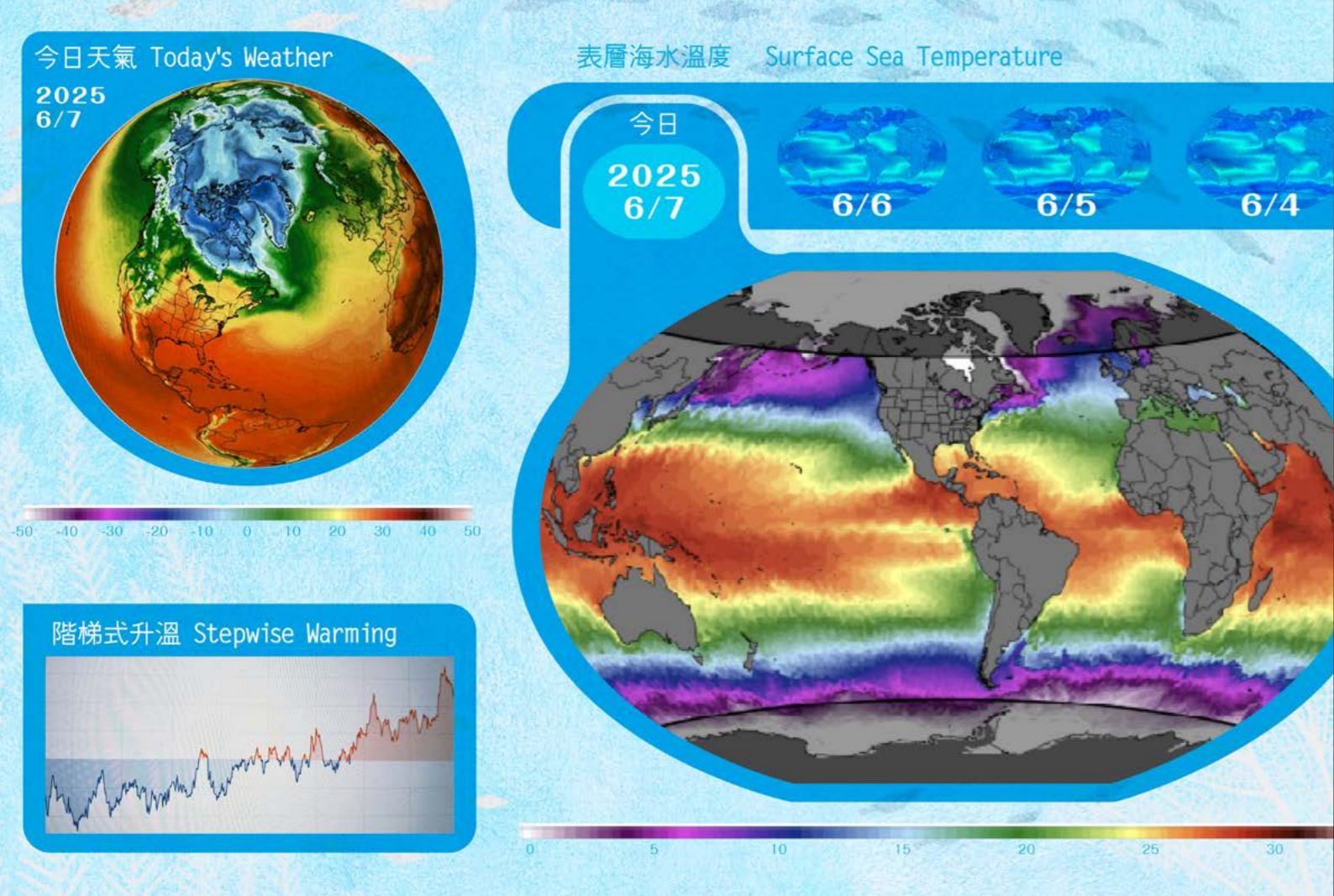
A heatwave is a period of abnormally high temperatures over a certain period, often accompanied by high humidity. The World Meteorological Organization (WMO) defines a heatwave as five consecutive days

<https://wmo.int/publication-series/state-of-global-climate-2024>
https://tccip.ncdr.nat.gov.tw/km_news_one.aspx?kid=20220209213834#!
<https://www.bbcearth.com/news/saving-coral>

with maximum temperatures exceeding the average maximum temperature for the region by more than 5°C. Heatwave events are reported annually across the globe.

The Intergovernmental Panel on Climate Change (IPCC) reported in 2018 that global warming of 1.5°C could lead to the disappearance of 70% to 90% of the world's coral reefs. The WMO's "State of the Global Climate 2024" report stated that 2024 "was likely the first calendar year to be more than 1.5 °C above the pre-industrial era, with a global mean near-surface temperature of 1.55 ± 0.13 °C above the 1850-1900 average. This is the warmest year in the 175-year observational record." A 2022 study by scientists found that a 1.5 °C global temperature rise could result in the destruction of 99% of coral reefs and the extinction of coral species.

The Coral Reef Catastrophe: What Can Humans Do? (Saving Coral, BBC EARTH)



氣候預估

Climate Projections

<https://climateranalyzer.org/>
<https://www.ipcc.ch/report/sixth-assessment-report-cycle/>

17

海洋熱浪階梯式升溫！聯合國政府間氣候變化專門委員會 2023 年報告：極端天氣事件頻率與強度，將隨全球氣溫升高而顯著增加。要完全避免升溫 1.5° C 有其可能：全球需要在 2030 年前將溫室氣體排放量減少 50%，並在 2050 年達到 100% 淨零排放。

由美國國家科學基金會、緬因大學及氣候變遷研究所所支持開發的 Climate reanalyzer 讓氣候與天氣預報模式可視化，讓我們以全球的視角，來看待每日地球上各種可視化的氣候資訊，本展顯示每日海面溫度 SST 等資訊，讓人切身有感今天海面溫度的全球現況。

Ocean heatwaves are escalating! According to the 2023 report by the Intergovernmental Panel on Climate Change (IPCC), the frequency and intensity of extreme weather events will significantly increase as global temperatures rise. Avoiding a 1.5 ° C temperature rise is still possible: global greenhouse gas emissions must be reduced by 50% by 2030, to reach 100% Net-Zero emissions by 2050.

Developed with support from the National Science Foundation, the University of Maine, and the Climate Change Institute, the Climate Reanalyzer visualizes climate and weather forecast models, allowing us to view daily climate information from around the globe. This exhibition displays daily sea surface temperature (SST) data from the seven seas.

去碳燃氫

Turquoise Hydrogen

18

在能源轉型的賽道上，不只在海洋能源開發，中央研究院也投入「去碳燃氫」技術研發，透過裂解，將甲烷中的碳鍵打斷，分離出固化的碳以及可燃的氫。這項技術成果也與臺灣電力公司合作進行燃氣機組混氫發電，為降低發電碳排再邁前一步。

展示主要係透過分子結構模型中，如何將一個碳原子與四個氫原子的鍵結打斷，同一科學原理，看似簡單的化學式，



卻有千百條技術通道與關卡，等待科學家的靈光乍現。In the race to the energy transition, Academia Sinica is involved in marine energy generation development and in the research and development of “turquoise hydrogen” technology, also called methane pyrolysis. This technology decomposes methane into solid carbon and combustible hydrogen. This achievement has been applied with Taiwan Power Company in turbines that can burn hydrogen-gas blends, taking another step toward reducing carbon emissions in this sector.

The demonstration primarily showcases how to break the bonds between one carbon atom and four hydrogen atoms in a model of methane, CH₄. While the underlying scientific principle may seem straightforward, the seemingly simple chemical formula involves numerous technical difficulties for scientists to overcome.



海洋記憶庫，漁業新聞 167

Ocean Memory Bank, 167 Fisheries Weather Report

https://www.cwa.gov.tw/V8/C/L/Fishery_index.html

19

臺灣雖為海島國家、海洋國家，但因過去歷史緣故，作家廖鴻基感慨說，我們是集體背對海洋的國家，對陸地思維的我們來說，海洋總是陌生、令人生畏，直到政府推動「向海致敬」海洋開放政策，彷彿國人對海洋的啟蒙運動。

海洋的神秘，過去有個管道可以稍填補國人對海洋的好奇，那便是漁業氣象播報，平易流利的臺語，悠遠地訴說著聽眾所不解的海面、海域，更想像大湧是何等驚濤駭浪，大湧之上還有猛湧...

本展以經驗播音員，重錄漁業氣象播報，重溫人聲的溫暖，並深覺是臺語教材，也是近海海象的第一線描述。

Although Taiwan is an island state, and a maritime nation, for historical reasons, lamented writer Liao Hung-Chi, we are a nation that has collectively turned its back on the ocean. For those of us with a land-based mindset, the ocean has always been strange and stern. It wasn't until the government promoted the marine openness policy that we started paying homage to the sea. It seemed almost like enlightenment.

The mystery of the ocean was once partially addressed through fishery weather reports, delivered in colloquial Taiwanese, which described the distant sea conditions to listeners, evoking images of towering waves and even more formidable surges...

This exhibition features rerecorded fishery weather reports by an experienced broadcaster. With the warmth of the human voice, the reports serve both as Taiwanese language learning materials and firsthand accounts of near-shore sea conditions.



復育之心

The Heart of Restoration

<https://www.bbc.com/ukchina/trad/vert-earth-47890492>

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珊瑚復育是水下的手工藝

珊瑚礁雖面積不大，只占全球海洋面積 1%，但卻是超過 1/4 海洋生物賴以為生的棲地，生物多樣性極高，被稱為「海洋雨林」。當珊瑚礁災難：我們能做什麼？德國建築師德國建築師沃夫·希柏茲 (Wolf Hilbertz) 於 1976 年發明 BioRock 人工珊瑚礁，將金屬通過微弱電流，促使海水中的礦物質析出沈澱，加速珊瑚沉降、生長、癒合、存活，以及抵抗高溫、沉積物和污染等環境壓力的能力。

珊瑚礁的大災難：人類能做些什麼 - BBC 英倫網



Coral reefs, though small in area—accounting for only 1% of the ocean surface—serve as habitats for over a quarter of all marine life, boasting extremely high biodiversity and earning the nickname “marine rainforests.” When coral reefs are on the rocks, what can we do? German architect Wolf Hilbertz invented the BioRock artificial coral reef in 1976. By applying a weak electric current to metal, minerals in seawater precipitate, accelerating coral settlement, growth, healing, survival, and resistance to environmental stresses such as high temperatures, sedimentation, and pollution.

The Coral Reef Crisis: What Can Humans Do? (Saving Coral, BBC EARTH)

提供單位：國立海洋科技博物館
Organization Name: National Museum of Marine Science and Technology

無塑未來式，
未來食物超市

Plastic Free Future
Supermarket



無塑未來式，未來食物超市

Plastic-Free Future Supermarket

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由 18 個國家組成的永續海洋經濟高層小組 (High Level Panel for a Sustainable Ocean Economy) · 結合許多專家與研究人員 · 不斷探討海洋經濟與挑戰 · 該組織出版的第一本藍皮書便是《The Future of Food from the Sea》· 主述海洋食物生產現狀和未來潛力 · 並如何透過海洋食物實現零飢餓 · 永續發展目標機會。

海洋食物能夠在永續糧食安全中發揮獨特作用 · 主要原因包括氣候變遷、飼料效率、生產潛力、營養、可獲取性等。未來食物的未來購物 · 似乎都有一些趨勢指標可循 · 如食物里程降低、過度包裝減少、性價比提高、對新鮮的要求提高...。The High Level Panel for a Sustainable Ocean Economy,



comprising 18 countries, brings together experts and researchers to continuously explore the challenges and opportunities of the ocean economy. The organization's first blue book, titled "The Future of Food from the Sea," outlines the current state and future potential of marine food production and how marine food can contribute to achieving zero hunger and without compromising sustainability.

Marine food can play a unique role in sustainable food security, primarily due to factors such as climate change, feed efficiency, production potential, nutrition, and accessibility. The future of grocery shopping is trending towards reduced food miles, decreased overpackaging, improved cost-effectiveness, and increased freshness.

氣候情緒
娃娃臉
Climate
Sentiment
Emoticon



氣候情緒娃娃臉

Climate Emoticons

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國際知名保育專家珍古德博士 2025 年 6 月訪臺時直言：年輕人一出生就面對被大人搞砸的世界。恰巧呼應當代兒童 · 透過娃娃臉表情 · 對大人們呼求世代正義的疑惑！？透過美術設計 · 各種兒童娃娃臉情緒表情 · 也比喻氣候變遷種種現象。

升溫、發燒、野火、暖化、強降雨、極端氣候、溫室氣體排放、海洋缺氧、酸化與優養化、洋流減弱、污染... · 因為人類無止盡地取用與缺乏了解 · 我們的環境與海洋呈現負債狀態。



聯合國兒童基金會警告：98% 非洲兒童是最受到氣候變化影響的高危人群
UNICEF Warns: 98% of African Kids Most at Risk from Climate Change

Dr. Jane Goodall, an internationally renowned conservationist, stated during her visit to Taiwan in June 2025: "Young people are born into a world that adults have ruined." This resonates with contemporary children, who, through emoticons, express their confusion and appeals for intergenerational justice! The artistic emoticons also metaphorically represent various aspects of climate change.

Rising temperatures, burning fevers, wildfires, warming, heavy rainfall, extreme weather, greenhouse gas emissions, ocean oxygen depletion, acidification and eutrophication, weakened ocean currents, pollution... Due to humanity's endless exploitation and lack of understanding, our environment and oceans are indebted.

海洋 THE OCEAN
WILL...

/ 新正常特展 /

未來式