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South African Network for Coastal and Oceanic Research

SANCOR'S CURRENCY AND STRENGTH IS INFORMATION

SANCOR Newsletter

Human activities account for less than a third of ocean nitrogen

By

Shannon Kelleher

Earth & Space Science News

Since the Industrial Revolution, humans have been releasing nitrogen into the atmosphere and, from there, into the ocean, where it acts as a nutrient but also poses dangers to aquatic ecosystems in high quantities. Now, new research finds that far less human-generated nitrogen is reaching the open ocean than previously thought.

Although atmospheric models suggest that up to 80% of the ocean's reactive nitrogen—that is, nitrogen that can be used by organisms—comes from anthropogenic sources, such as livestock production, agriculture, and coal-fired power plants, a recent series of observational studies indicates that only 27% can be traced to human activities.

The results may lead to future research that could alter how scientists view fundamental interactions between the ocean and the air. “We’re lacking important understandings of the nitrogen cycle because the traditional idea is that nitrogen coming in via rain and aerosol deposition is really anthropogenic in origin,” said Meredith Hastings, an associate professor of Earth, environmental, and planetary sciences at Brown University. “If it’s not, and the ocean is playing a significant role in recycling, then that’s something that’s been totally missing in our thinking.”

A Rigorous Analysis

Hastings participated in the new research, which was led by Katye Altieri, a senior researcher at the University of Cape Town in South Africa. At the time of the studies, Altieri worked as a National Oceanic and Atmospheric Administration postdoc jointly appointed

between Brown University and Princeton University.

The researchers spent 18 months collecting aerosol and precipitation samples from a National Science Foundation atmospheric sampling tower in Bermuda that rises 65 meters above sea level. Because the island is at times “downstream” from winds that blow over the North American continent, it has proven useful for atmospheric sampling in the past.

During its warm season, Bermuda receives air masses only from farther out in the ocean, whereas its cool season brings an influx of air masses directly from North America in addition to marine ones. Using weather modeling, the team could be sure where each air mass came from.

To gather rainwater, the team used a precipitation collector—basically a glorified bucket equipped with a sensor that opened its lid to collect new samples whenever it began to drizzle. Low-lying aerosol particles that hang from the air regardless of rain were pumped through filters. The samples were later analyzed for nitrate, ammonium, and organic nitrogen in what chemical oceanographer Angela Knapp of Florida State University in Tallahassee, who was not involved in the study, called “one of

the most rigorous analytical studies of atmospheric deposition that’s been done.” The researchers scaled up their results to represent the world as a whole so they could compare their findings with previous models.

Revisiting the Nitrogen Cycle

Human activities produce nitrogen mainly as ammonia, nitrogen oxides, and organic nitrogen-containing compounds. In the atmosphere, chemical reactions convert ammonia to ammonium and nitrogen oxides to nitrate. A lack of data about the fates of nitrogen compounds motivated the research, Hastings said, particularly with regard to ammonium and organic



Scientists used this precipitation collector on the top of a research tower in Bermuda to collect rainwater samples. Along with aerosols, they analyzed these samples for nitrate, ammonium, and organic nitrogen. Credit: Katye Altieri, UCT.

nitrogen deposition.

She and her colleagues found that approximately 60% of nitrate in their



Smoke stacks like these emit nitrogen oxides, which are converted to nitrate in the atmosphere. A recent series of studies found nitrate to be one of the primary anthropogenic sources of nitrogen in the ocean. Credit: [Tony Webster, CC BY-SA 2.0](#)

samples hails from human sources. The ammonium came entirely from evaporated seawater, although the researchers were able to use only precipitation, not aerosol, data for that compound. Although the nitrate data aligned with results Hastings had seen before, the ammonium data were unprecedented. “We would have thought we would’ve seen significant agriculture or industrial activity influence, but the ammonium seems to all be coming from the ocean itself,” she says. “That was a particularly big surprise.” The results of their analyses for these nitrogen sources were published in the [Journal of Geophysical Research: Atmospheres](#) in 2013 and [Global Biogeochemical Cycles](#) in 2014, respectively.

In a [third study](#) using the same samples, which was published on 6 January in the Proceedings of the National Academy of Sciences of the United States of America, the team found that only about 17% of the organic nitrogen originated from anthropogenic activities. Hastings said she would have expected a significant portion of it to be generated by humans, as with nitrate. “This is the most organic nitrogen data that really anyone has ever had for this type of data set over the ocean,” she said.

In this final study, the team also pooled

the data for all three nitrogen sources extracted from the precipitation and aerosol samples. They found that only about 27% of the total nitrogen deposition was anthropogenic in origin. Although Knapp considers the results somewhat surprising, she suspects that the discrepancy between the team’s results and past findings could be due to a paucity of research.

“This is a data-limited field and there just aren’t a lot of atmospheric deposition measurements,” said Knapp. “I don’t think it’s overturning a paradigm. I think it’s more that this is a new piece in the puzzle.”

Citation: Kelleher, S. (2016), Human activities account for less than a third of ocean nitrogen, *Eos*, 97, doi:10.1029/2016EO043963. Published on 20 January 2016. ☞

EOS



9TH INTERNATIONAL PENGUIN CONGRESS

Cape Town South Africa

5-9 September 2016

The congress provides a forum for all concerned with Penguins to create a strategic global effort on behalf of these threatened species. The International Penguin Congress is the primary gathering of the world’s leading scientists, research managers and policy makers working on penguin biology, ecology, health and behaviour to discuss ongoing research, identify current and emerging conservation issues and create action plans. fruitful and led to some exciting collaborations.

Visit

<http://ipc9.adu.org.za/>

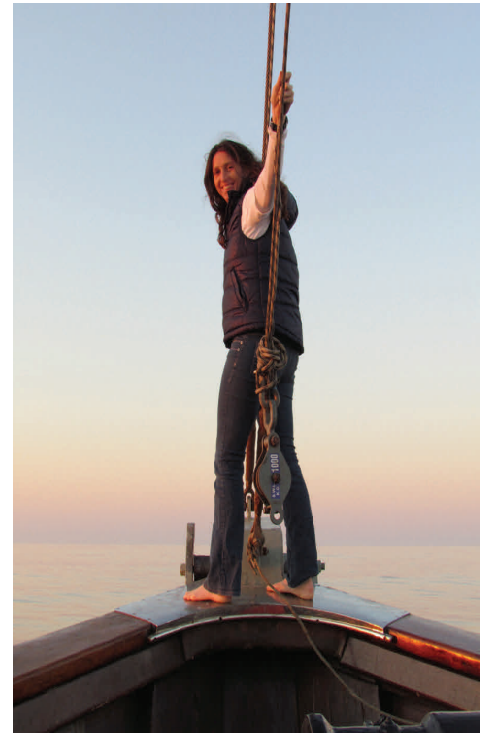
SA scientist awarded prestigious Pew Fellowship in marine conservation

Five distinguished scientists and conservationists from Costa Rica, South Africa, Sri Lanka, and the United States are the 2016 recipients of the [Pew fellowship](#) in marine conservation. The fellowships support research to improve ocean conservation and management. South African Pew Fellow and SANBI Marine Programme Manager, Dr Kerry Sink, is involved in designing 21 new marine protected areas in the waters off South Africa.

MPAs cover less than half of 1 percent of South Africa's mainland waters, and offshore pressures and ocean uses are

expanding. Still, there is support to create new offshore protected areas and to implement Marine Spatial Planning. A 2014 presidential initiative, Operation Phakisa, commits South Africa to safeguarding 5 percent of its marine waters by 2017. Twenty-one potential MPAs have been proposed, and the government has committed to identify an additional 5 percent of South Africa's waters for protection by 2019. The proposed declaration and regulations for these MPAs have been gazetted and is open for public comment until 3 May 2016. [For full details, click here.](#)

Kerry is using her Pew marine fellowship to help ensure that South Africa has a sound knowledge base to support MPAs design, management and delivery of benefits and is working with both government and key industry sectors to build the information needed to reach the goal of protecting 10 percent of South Africa's waters. She is also conducting collaborative and independent research to define, map, and make others aware of critical areas where MPAs would help conserve the nation's ocean biodiversity. In addition,



Dr Kerry Sink, South African Pew Fellow and SANBI Marine Programme Manager.

South Africa is also implementing Marine Spatial Planning and new biodiversity and other maps can help this process. Sink will add to and improve maps of sensitive ecosystems, threatened species, spawning and foraging areas and map key food production areas in the ocean. Maintaining ecosystem services such as sustainable fisheries is a key part of effective integrated ocean management.

Kerry also recently won an international



THE PEW CHARITABLE TRUSTS

professional award - the [Society for Conservation Biology's 2015 Distinguished Service Award](#) for outstanding leadership and self-sacrifice in mainstreaming marine biodiversity conservation research into South Africa's development planning, policy, management and industrial arenas.

Kerry works across the science-policy continuum, using scientific advice to achieve lasting conservation change. She has improved conservation of offshore ecosystems, with research and mainstreaming efforts across the biodiversity, fisheries, mining, shipping and petroleum sectors.

She is passionate about marine science and conservation, and invests heavily in mentorship and human capacity development in the marine sector, as well as in relationships to ensure that science supports sound decision-making.

✂

SA retailers making strides towards sustainable seafood

At the end of 2015, six South African retailers, restaurants and suppliers engaged in WWF's Southern African Sustainable Seafood Initiative (WWF-SASSI) Retailer/Supplier Participation Scheme reached a milestone when the target dates of their sustainable seafood commitments came to term.

A further three companies are also turning the tide on unsustainable fishing practices, bringing the total to nine participants that have made clear and time-bound commitments to sustainable seafood.

WWF-SASSI Retailer/Supplier Participation Scheme Report

As part of these companies' commitment to transparency, a detailed description of each of these companies' performance against their commitments is published in the [WWF-SASSI Retailer/Supplier Participation Scheme Report](#) which was launched on 2 March 2016 at the 2016 annual Marine Stewardship Council (MSC) and WWF-SASSI Sustainable Seafood Symposium in Cape Town.

The 2015 report illustrates how each of the nine participating companies has

progressed towards transforming their seafood procurement streams. Although the report shows that varying aspects of these six companies' commitments to sustainable seafood remain unmet, there are clear signs of progress made by these companies since the first edition of the report in 2014.

Between the 2014 and 2015, editions of the report there have been an overall average increase of 10% in species meeting the various companies' commitments to sustainable seafood. Even more encouraging is that an average of 9% of species procured is currently noted as "Under Improvement" which indicates strong market support for species originating from fisheries or fish farms that are actively addressing sustainability concerns in their operations.

Significant progress

Although some aspects of each of the six participants' with end 2015 targets (I&J, John Dory's, Pick n Pay, Fruit & Veg City/Food Lover's Market, Woolworths and the Spar Group Limited) must still be achieved, each of them made significant progress towards their goals.

“The progress to date is proof that the system works and WWF-SA will continue to support these retailers, suppliers and restaurants, provided that they are transparent on the progress they have made and, subsequently, make publically available the corrective actions they will take to transition all of the seafood they sell to meet their commitments to sustainable seafood” says Chris Kastern, manager of WWF-SA’s Seafood Market Transformation programme. “This will ensure that these companies stay committed and dedicated to employing best business practices to positively impact seafood market transformation in South Africa.”

“It is clear that they are committed to driving progress, however, it is also clear that change cannot happen overnight, and we recognise that there will be challenges on the road to seafood sustainability,” says Kastern.

Certified seafood only

“Many have made significant strides towards their goals and more importantly, have created the momentum needed to mobilise the broader retail sector to follow their lead in addressing this challenging issue of ensuring sustainable seafood for all,” says Dr Morne du Plessis, WWF-SA’s CEO.

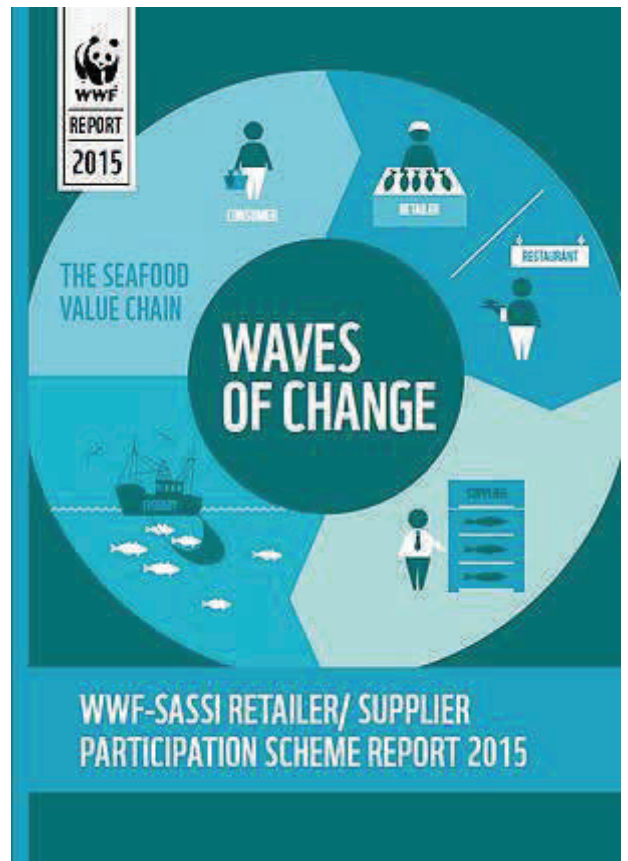
A vital requirement of joining the scheme is for a participating company to review their entire seafood procurement stream, with the ultimate aim of selling only WWF-SASSI Green-listed or Marine Stewardship Council (MSC) or Aquaculture Stewardship Council (ASC) certified seafood. However, there also needs to be recognition of the fact that many source fisheries and fish farms will require on-going market support as they work

towards this goal through credible improvement projects.

Apart from addressing seafood procurement, participating companies are also measured for progress against sustainability in their seafood operations in other areas, including sustainable seafood policies, product traceability, transparency and labelling, internal training, communication with suppliers, consumer awareness- raising activities and direct engagement in seafood sustainability initiatives with source fisheries and fish

Consumer buying power

The WWF-SASSI Retailer/Supplier Participation Scheme was established in



2008 in response to a growing number of consumers using the WWF-SASSI seafood guide to question retailers, suppliers and restaurants on sustainability issues. WWF-SA started to work with key retailers and restaurants as well as with their suppliers. This was done through an assessment process to help these companies understand what sustainable seafood practices entailed and how their operations measured up in relation to best practice.

WWF-SA encourages consumers to continue to use their buying power and their voices to send a clear message down the seafood supply chain and thereby create strong market incentives

for improvements at sea by continuing to hold all participants accountable to their public commitments to sustainable seafood.

“From many who make a living by fishing at sea to those of us who enjoy eating delicious seafood, everyone in the seafood supply chain needs to play their part if we are to ensure healthy oceans for this and future generations” concludes Du Plessis.

Source: Bizcommunity



EAT GREEN...Are you a sucker for salmon sushi or perhaps keen on a piece of kingklip, yet you're torn by the decision as both of these are on the orange-list? Did you know that South African rainbow trout is a perfect salmon sushi alternative, and that dusky kob is a delicious kingklip equivalent? For more sustainable alternatives visit <http://wwfsassi.co.za>

Seabird bycatch: longlines and seabirds on the high seas

By

Johan Kok, Bronwyn Maree and Ross Wanless

BirdLife South Africa

Because of this high demand and overcapacity among fishing fleets, tuna stocks are under constant pressure. If management of these fisheries does not improve, the food security, livelihoods and socio-economic development of those that depend on these fisheries are at risk.

Tunas are mostly highly migratory species, and are targeted by more than 85 countries. Tuna fisheries represent around 20% of all marine fisheries and make up 8% of internationally traded seafood, accounting for over US\$10 billion in exports each year. Tuna is in high demand!

While individual countries are responsible for fisheries management within their area of jurisdiction, generally their Exclusive Economic Zone (EEZ), 64% of our oceans are not covered by any one nation. These areas are referred to as “Areas Beyond National Jurisdiction” (ABNJ) which comprise the high seas and



Tuna for sale at Tsukiji fish market in Tokyo, Japan © Johan Kok

seabed beyond the continental shelf of coastal countries. Tuna fisheries in the ABNJ are managed by five tuna Regional Fisheries Management Organizations (t-RFMOs).

Fishing for tuna on the high seas is typically conducted using either longlines or purse seines (but there are a great many gear types, and within these two categories there is much variation). Besides hoiking hundreds of thousands of tons of the target species out of the sea each year, longline fishing also catches non-target species like sharks, turtles and seabirds – known as bycatch. Highly threatened seabirds, mainly albatross and petrel species, are attracted to baited hooks as gear is set, becoming hooked accidentally and drowning. This happens at unsustainable rates, and longline bycatch is the principle threat to many albatross species.

Sustainably managing and conserving both target species, which are apex predators in the marine realm, and the associated biodiversity, in such a vast and complex ecosystem is challenging. Impacts are wide-ranging, crossing multiple sectors and borders which make coordinating, disseminating and building capacity for best practice tough.



Numerous seabirds, including shy- and black-browed albatross, following a local fishing vessel off the coast of Cape Town, South Africa © Johan Kok

Common Oceans Program

The Global Environment Facility (GEF) is funding a program aimed at addressing the management challenges posed by the ABNJ called the Common Oceans Program (www.commonoceans.org). The Common Oceans Program, also known as the ABNJ Program is being implemented by the Food and Agriculture Organization of the United Nations (FAO). The program aims to achieve efficient and sustainable management of fisheries resources and biodiversity conservation in the ABNJ.

The program comprises four distinct projects:

- Sustainable management of tuna fisheries & biodiversity conservation

- Sustainable fisheries management and biodiversity conservation of deep-sea living resources & ecosystems
- Oceans Partnership for sustainable fisheries & biodiversity conservation
- Strengthening global capacity to effectively manage ABNJ

Common Oceans Tuna Project and Seabird Bycatch

The Common Oceans ABNJ Tuna Project, also known (in a rather less catchy moniker) as “Sustainable Management of Tuna Fisheries and Biodiversity Conservation in the Areas Beyond National Jurisdiction”, is the largest of four projects that constitute the Common Oceans Program.

The objective of the Project is to achieve responsibility, efficiency and sustainability in tuna production and biodiversity conservation in the ABNJ, through the systemic application of an ecosystem approach in tuna fisheries.

The Food and Agriculture Organization of the United Nations (FAO) is the implementing agency of the project. BirdLife International, through its local partner, BirdLife South Africa, is implementing the seabird bycatch component of the Common Oceans ABNJ Tuna Project.

The overall aims of this component are to:

- facilitate, support and strengthen the use of best practice seabird bycatch mitigation measures by fleets operating in critical fishing areas of the Atlantic and Indian Oceans and;
- to help improve the capacity of national institutions to manage and conduct analyses of seabird bycatch and associated data, and facilitate a joint assessment by tuna Regional Fisheries Management Organisations (RFMO's) of the current bycatch mitigation requirements contained in the relevant RFMO Conservation and Management Measures.

The seabird bycatch component consists of four elements that will work together to achieve the goals mentioned above, building on the great work of BirdLife's marine program and Albatross Task Force (ATF).

Element 1: National Awareness Workshops: Effective Seabird Conservation in Tuna Fisheries

The five t-RFMOs have introduced minimum requirements for seabird bycatch mitigation measures. These include bird-scaring lines (BSLs also known as tori lines), night setting and branch line weighting. Longline vessels fishing south of 25°S are required to use at least two of these methods.

Element 1 aims to improve awareness of, enhance and accelerate the use of best practice mitigation measures by all fleets operating in the critical areas of the Atlantic and Indian oceans. This objective will be achieved through 2-day, in-country workshops within the national observer programs and fishing industries of Namibia, China, Indonesia, Korea, Seychelles, Mozambique and the European Union.

Element 2: Observer Training Workshops: Seabird Bycatch Mitigation

So, the rules are in place within the RFMOs, but how do we take the paper

regulations and change practices on deck? Observer programmes are mandatory within each RFMO, so working through observers can give us a very powerful route to getting onboard and working with fishermen during production fishing. The workshops will target China, Indonesia and Namibia, with detailed training on seabird ID, scientific research methods, best practice seabird bycatch mitigation measures, and ecosystem considerations in tuna longline fishing.

Element 3: Port-based outreach pilot work: Seabird Bycatch Mitigation

Cape Town is frequented by a significant portion of the ABNJ tuna fleet that fishes in critical areas of the Atlantic and Indian Oceans. For this reason, Cape Town will host the port-based outreach (PBO) pilot project.

The PBO pilot aims to quantify levels of understanding about RFMO bycatch regulations by crew, provide materials and raise awareness where needed, and track how the whole project is changing practices onboard. As this is primarily an outreach and tracking exercise, there will be no compliance reporting on vessel practices.

The initiative will be introduced to government, industry and other key stakeholders during a one-day workshop to be held in Cape Town during the early

part of 2016. The workshop will be used to plan and agree on the approach and needs of the project.

Element 4: Seabird Bycatch Assessment Workshops

Currently, the state of play as regards countries reporting seabird bycatch rates and mitigation measure use to RFMOs is both variable and, in general, completely useless for any real assessments. This element is geared towards creating more understanding about what is needed, and why, within the group of government scientists/staff who actually curate data and develop reports for RFMOs, and to lead a collaborative process to develop statistical tools and basic reporting templates for standardizing seabird bycatch reporting to RFMOs. Then, once this is done, we plan to host a global seabird bycatch assessment workshop, with all t-RFMOs represented and all countries which catch seabirds during tuna fishing.

The assessment process agreed on during these workshops will undergo a

final review during a follow-up workshop toward the end of the project.

A growing team

With such a vast scope of work ahead, the BirdLife South Africa team in Cape Town has grown by three members. The new positions include a Project Output Coordinator, Port-Based Outreach Officer and Project Fleet-based Training Coordinator employed as National Project Personnel with the FAO and supported by BirdLife.


We look forward to the hard work ahead knowing that it will be worthwhile when we achieve the goals we have been set.

If you have any questions, please do not hesitate to contact BirdLife South Africa on +27 (0) 21 419 7347 or the Project Output Coordinator Bronwyn Maree at bronwyn.maree@birdlife.org.za

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Seabirds following a fishing vessel off the coast of Cape Town, South Africa © Ross Wanless



INTERNATIONAL MARINE CONSERVATION CONGRESS

30 July - 3 August 2016

St. John's,
Newfoundland and
Labrador , Canada

To conserve the world's oceans we must go beyond science, and use it to inform policy and management, and ultimately to catalyze change. The Society for Conservation Biology's International Marine Conservation Congress (IMCC) brings together conservation professionals and students to develop new and powerful tools to further marine conservation science and policy.

[Click here for the details.](#)

Minister Pandor launches marine research and exploration forum

On 29 January 2016 Science and Technology Minister Naledi Pandor launched the South African Marine Research and Exploration Forum (SAMREF), an initiative to exploit research opportunities in offshore oil and gas exploration in South Africa. The Department of Science and Technology (DST) and the Offshore Petroleum Association of South Africa (OPASA) signed a Memorandum of Understanding to establish SAMREF.



Minister Naledi Pandor (DST) and Mr Sean Lunn (OPASA) signed a Memorandum of Understanding to establish the South African Marine Research and Exploration Forum, marking the successful implementation of one of Operation Phakisa's initiatives. Credit:DST

The Forum will enhance cooperation between the public and private sectors and improve the exchange of information and data on a voluntary basis between all stakeholders. Its daily activities will be managed through a secretariat established within the National Research Foundation (NRF), one of the DST's entities.

SAMREF will include representatives from government, state-owned enterprises, research institutions, oil and gas industry associations and other private sector stakeholders. The launch of the South African Marine Research and Exploration Forum (SAMREF) marks

the successful implementation of Operation Phakisa B3 (Exploiting the broader research opportunities presented by offshore oil and gas exploration). The primary objective of SAMREF is to grow public sector research on the marine and oceanic environment through the exploitation of new opportunities presented by explorations and cruises undertaken on behalf of private sector extractive industries.

This objective will be pursued through the establishment of a brokerage service that will see partnerships established to enhance cooperation between the public and private sectors through the exchange of information and data on a voluntary basis.

For more information on SAMREF, visit <http://samref.dirisa.org/>



Best deal on the planet – 100% FREE ECOSYSTEM SERVICES

By
Rita Steyn
*South African Environmental
 Observation Network*

This just in – best deal of the year – just in time for ~~Christmas~~ ~~New Years~~ ~~birthdays~~ ~~weddings~~ Easter!

Are you wondering what to do for that difficult-to-please Great Aunt? Or is your favourite grandchild coming to town and you want to get them something extra-special, even though you have no favourites? Well then look no further than this GUARANTEED absolutely free-for-life deal on all the services and goods that the ecosystem provides.

All you have to do is, well, live here for the rest of your life! Signing up for that Mars mission you say? Planning on joining Elon Musk in private space exploration? Don't worry – this deal is ALSO - for the limited time of your entire life - extended to your friends, parents, offspring, on-spring, in-laws, out-laws and by-laws – everyone is eligible!

Now that I have your attention, let me explain the full range of services and options available to you. And did I mention it's free, free, FREE?

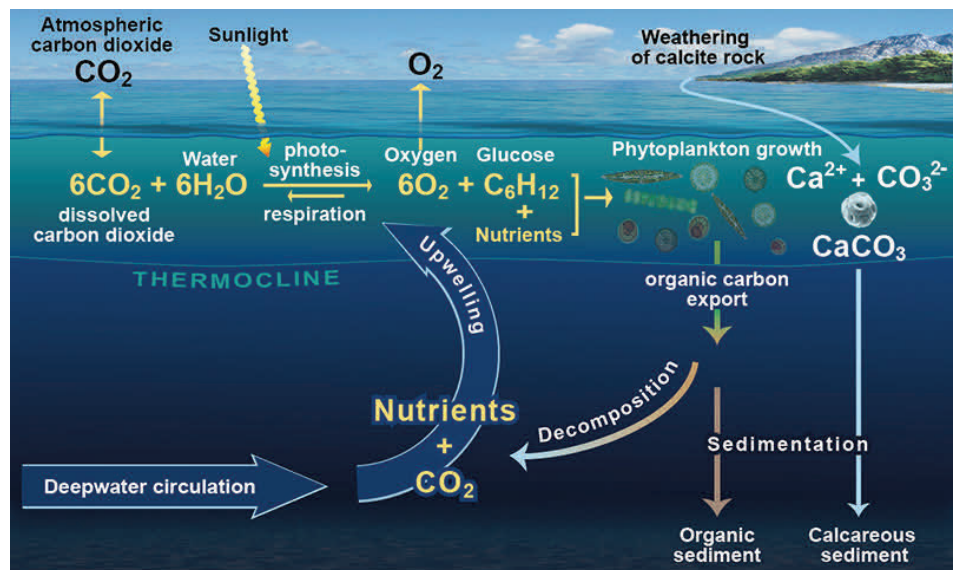


Oxygen

There were many that thought those air-breathing lungs wouldn't catch on, but wouldn't you know it, even if you DON'T have lungs, you probably use oxygen at some point.

You might doubt the role oxygen plays in our atmosphere because of its minority status (21% of the atmospheric gases), but spend some time on high mountains or in the upper reaches of the stratosphere (with Elon) and you will very quickly connect your shortness of breath and tightly squeezed lungs with the lack of oh-so wonderful O₂.

Over 50% of the world's oxygen is produced by tiny, free-floating organisms (plankton for you science types) in the ocean that tirelessly produce oxygen during the biological process of photosynthesis ($6CO_2 + 12H_2O + \text{Light} \rightarrow C_6H_{12}O_6 + 6O_2 + 6H_2O$), and for the sole purpose of consumption by others! Trees do it too! Most green leafy things make oxygen as a by-product of making more of themselves, you know, like manufacturers that use the oil-refining process to make plastic oh, wait – that's not the same at all! Plastic isn't necessary for basic survival, but you know that good old oxygen is!



The 'biological carbon pump' (BCP) contributes to the ocean's role in taking up and storing carbon dioxide from the atmosphere. Without the BCP the atmospheric concentration of CO₂ would be much higher. Credit: NOC/V.Byfield. Source <http://www.rapid.ac.uk/abc/bg/bcp.php>

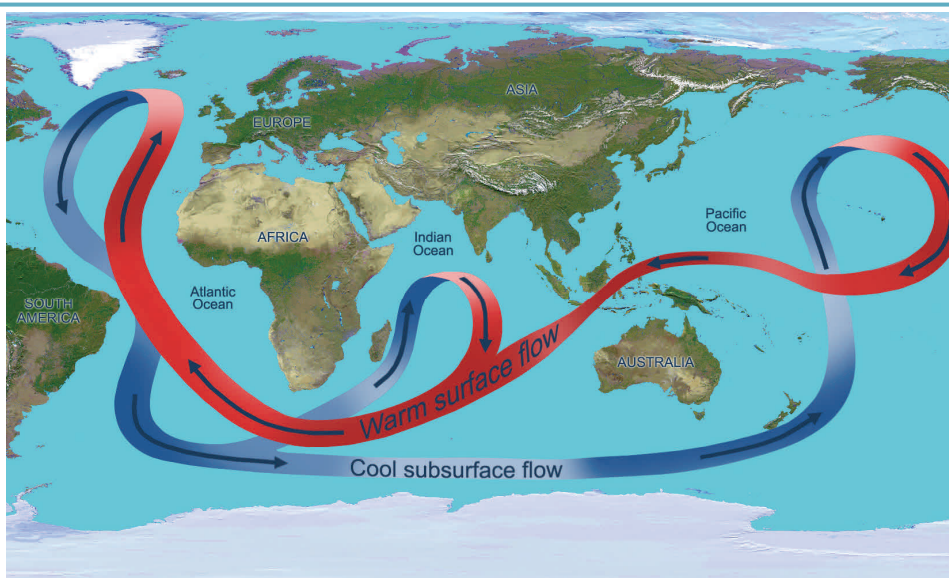
Unfortunately, these land-and-sea dwelling oxygen producers don't charge any fees for their services, and so their factory (this planet) is changing in ways that make it difficult to continually produce oxygen at the rate they do right now. Warmer oceans hold less oxygen, natural disasters increase with unstable temperatures, human beings cut down trees for so many terrible reasons, and all of this while we pump chemicals and gases into the atmosphere, resulting in global climate change. I hope this deal doesn't turn into a fire-sale any time soon!

Climate

Weather is not climate. Weather is taking an umbrella to work and thinking you are clever, but climate is investing in a raincoat and knowing you are wise. Or like the difference between going viral or making history – weather is 15 minutes of fame but climate is a legacy.

Speaking of climate (change), the average temperature of the earth and the regularity of the seasons is based on an intricate and inter-connected system that is anchored in the large, global, oceanic current systems that circulate around the continents like conveyer belts at airports.

Water (I'll give you a hint – you'll see that later on the list) has what the scientists like to call a high heat capacity, which



The global ocean conveyor belt is a constantly moving system of deep-ocean circulation driven by temperature and salinity. The blue arrows indicate the path of deep, cold, dense water currents. The red arrows indicate the path of warmer, less dense surface waters. It is estimated that it can take 1,000 years for a "parcel" of water to complete the journey along the global conveyor belt. Image source: [NASA](#)

means it takes a lot of energy to change the temperature of water! So all day long, the largest bodies of water on earth (oceans, duh) lie around in the sun, taking it easy and absorbing all the heat they can get, and then sharing little bits of that heat with the air and MAKING RAIN, and moving that heat around to other parts of the world with the airport conveyer current system. No moving costs or broken vases!

Climate is also what I like to call the great connector, and not just because of the conveyer belts. Climate change is experienced world over, but right now we here in South Africa are suffering a perishing drought because of the large El Nino system occurring in the Pacific Ocean, half a world away. Five of the

nine provinces are in a drought disaster, and if climate change continues to increase in strength and severity, so will the losses and impacts of these events.

Climate change connects us all, and affects us all, and the service of making this planet a habitable one falls squarely between climate and the next list item:

Water

You know what I said about oxygen and that pesky business of not being able to live without it? Well same here! I have already told you about some of the amazing chemical properties of bodies of water, but did you know it regulates your internal temperature too?

First we floated, then we swam, then we

slithered, then we crawled out of the ancient oceans and finally came out of the trees that we now chop down, but all that time water was in us. Asking for nothing in return, water transports nutrients, flushes waste, and lubricates joints, and that's just in YOUR body! It does the same on a large scale for the planet too!

Water is the universal solvent, i.e. it dissolves things, and has a slightly polar (charged) attractive force, and it also has this unique (weird) molecular shape that makes it just right for all the amazing stuff it does – and we go and wash our dirty clothes in it!

The hydrologic cycle begins in the oceans (made of water) where evaporation causes the H₂O molecules to pack their bags and go on holiday in the clouds for free – the ocean and winds also don't charge for services provided. After the trip into the atmosphere and a ride, short or long, on the wind, water returns in the form of rain and seeps through the earth, eventually returning to the ocean and starting the cycle once again.

If we remove water from that cycle, if we dam our rivers, if we pollute our streams and our ground and our air, we severely impact the ability of the hydrologic system to deliver clean, safe, life-giving water. 94% of LIFE ON EARTH is aquatic (that's almost 100). And, did you know

that your body, in a mirror of the earth, is also 70% water? Your organs are like the continents, slushing around in the sea of your body (sorry, that's gross). Let's rather talk about nice things, like sunshine!

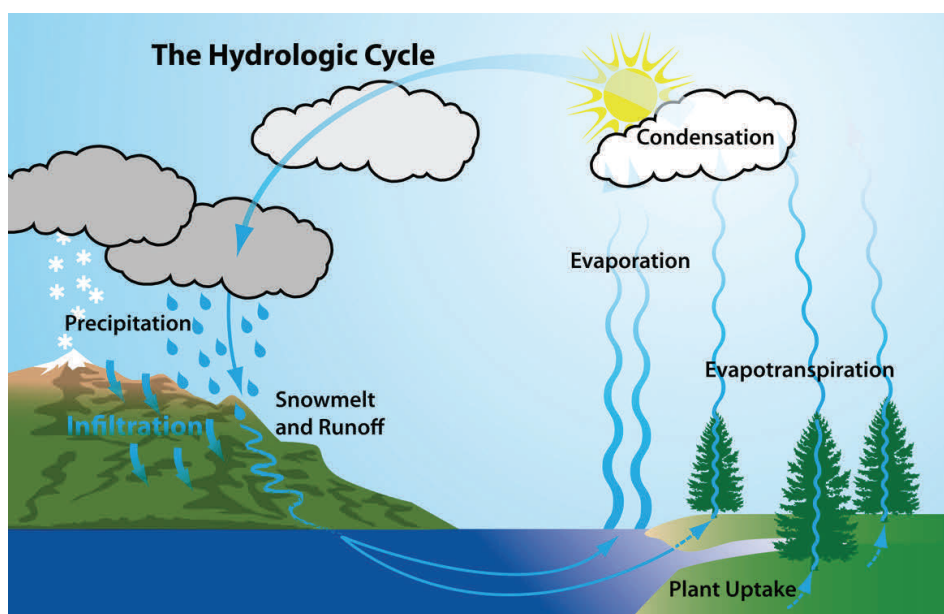
Light (Sunshine)

Evaporation (in the hydrologic cycle – see above) is caused by heat. And heat is a free service provided – everyday – by the giant burning but not combusting ball of flaming hydrogen gas we call the sun. Through the process of fusion, hydrogen becomes helium, and our G2 type star emits light energy in both a particle and wave form AND in the process heats our planet and provides energy needed to drive biological processes like photosynthesis (see equation in section 1). Sounds like

an engine of that magnitude would need some maintenance or something, but no, all free of charge. Every day. Plus, your life includes an annual (that's once a year folks) trip around said star. A space trip! Every year!

By harnessing that emitted light energy FOR FREE we can use it to do all kinds of things like power our homes, grow our vegetables, keep our planet warm (but not too warm please!) and make all these spaces that we find ourselves in habitable. Plus, sunsets are pretty cool too.

Some might argue though, that most importantly, the sun keeps the planet (and us) from hurtling out of orbit and freezing in the depths of open space only to be revived and enslaved by giant aliens! The sun is big enough to hold



The water cycle, also known as the hydrological cycle, describes the continuous movement of water on, above and below the surface of the Earth. Source: <http://www.state.nj.us/drbc/hydrological/>

even Jupiter in check, luckily far away from us, and for the extended warranty period of about the next 5 BILLION years (that's a pretty good warranty!). This fact of keeping us not too close, not too far, but just right in terms of distance is important enough that we named the zone after the notorious smash-grab-sleep criminal Goldilocks.

Is it not amazing that we have somehow found ways to take stuff that the planet makes FOR FREE and make it into other stuff and then sell that stuff (not for free) to other people and still NEVER PAY THE PLANET BACK. I would get all eco-economics on you and talk about the direct and indirect costs but I think you

get my point.

So, the recipe for a healthy, vibrant ecosystem goes: Oxygen (enough) PLUS Climate (non-anomalous) PLUS Water (clean) PLUS Light (but not too much, or too hot) PLUS (very importantly) the BIOLOGICAL components of the system (you, me, the dog, snails, sharks, butterflies, rhinos, trees, plankton, even whales) all EQUALS functioning ecosystems, and these functioning ecosystems provide invaluable, life-giving services FOR FREE just as a part of being there, just for existing.

Have you gotten your ecosystem services contract yet? Available for

free, for the rest of your life, in whatever form you (and your neighbours and your relatives in Bloemfontein and the politicians in Pretoria and the rest of the world) choose to deliver them in. Ecosystem services might be free, but the delivery is up to us. If we break the planet, we break the system, and we stop the service delivery. Be nice to the planet. Make a difference. Be a part, not apart.

- Rita Adele Steyn

Doctoral Fellow, SAEON (The South African Environmental Observation Network – where we observe, um, the environment). ☞

UNDERSTANDING MARINE SOCIO-ECOLOGICAL SYSTEMS: INCLUDING THE HUMAN DIMENSION IN INTEGRATED ECOSYSTEM ASSESSMENTS

30 May - 3 June 2016
Brest, France

MSEAS 2016: The focus of the symposium will be on integration and assessment across multiple ocean uses and sectors, including: fisheries, renewable energy, coastal development, oil and gas, transport, and conservation. There will be a particular emphasis on the methodological and empirical challenges involved in including human dimensions in integrated ecosystem assessments. The symposium will be global in scope, with a focus on regions in which integrated ocean management policies have been developing in the last two decades.

Ocean literacy - 7 principles everyone should understand

Understanding the ocean is key to comprehending and protecting this planet on which we live. In 2004, ocean scientists, ocean educators and ocean policy makers came together to create that definition of ocean literacy and identified 7 essential principles and 44 fundamental concepts. While the ocean literacy campaign and guide was developed for use in the United States, it has inspired several other countries and geographic regions to engage in similar processes to develop their own approaches to achieve ocean literacy.

Ocean literacy is defined as an understanding of the ocean's influence on you and your influence on the ocean.

An ocean-literate person understands:

- the essential principles and fundamental concepts;
- can communicate about the ocean in a meaningful way; and
- is able to make informed and responsible decisions regarding the ocean and its resources.

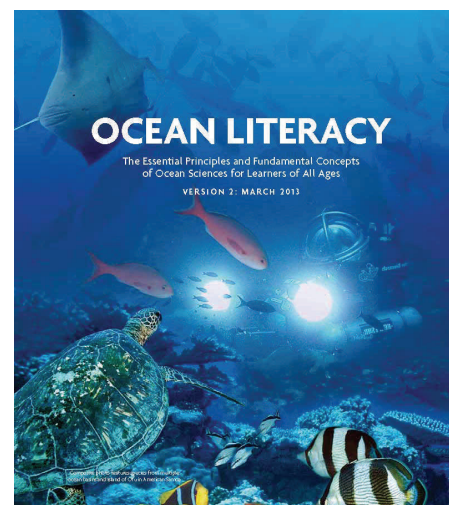
An important component of the Campaign is the education of K–12 students in ocean sciences through development of the Ocean Literacy Framework. These consensus documents provide formal and informal educators and curriculum and program developers with a “roadmap” that helps them build

coherent and conceptually sound learning experiences for students from Kindergarten (Grade R equivalent for South Africans) through 12th grade.

This guide presents a vision of an ocean-literate society. Along with the more detailed Ocean Literacy Scope and Sequence for Grades K-12, it outlines the knowledge required to be considered ocean literate. These two documents are a practical resource that educators and policymakers use to influence teaching and learning about the ocean throughout our schools, museums, aquariums, science centers, parks, and other informal learning environments.

Here are the essential principles and fundamental concepts of ocean sciences:

1. The Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean made Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.



The Ocean Literacy Network is valuable and relevant to the scientific community. Scientists can use the Ocean Literacy Framework to:

- develop university courses
- inform scientists' broader impact activities
- and provide the rationale for grant proposals.

Educators can use these Fundamental Concepts to provide coordination, consistency, and coherence for ocean sciences education and to transform the vision of ocean literacy into reality.

Further Information

Please visit www.oceanliteracy.net to find an online version of this document as well as obtain updates, correlations to education standards, and links to related educational resources.

Marine and Coastal Systems Fieldwork for inland students

By
Gavin Snow, Graham Alexander and Stuart Sym
School of Animal, Plant and Environmental Sciences, University of Witwatersrand, Johannesburg



Students identifying rocky shore organisms in the Clansthal Conservancy.

The School of Animal, Plant and Environmental Sciences, University of the Witwatersrand, held their annual Marine and Coastal Systems Fieldwork course at Rocky Bay on the KwaZulu-Natal south coast from 21 to 29 January 2016. The course introduced twenty 2nd year students to the marine and coastal habitats of eastern South Africa; rocky shores, sandy beaches, mangrove forests, and coastal streams and wetlands. The students gained experience in identifying organisms and putting into context the behaviour, distribution and ecology of the organisms found in these diverse habitats.

development and reproductive transect techniques, and plankton and strategies, frogs and frog collection, symbiotic relationships. The lectures freshwater biology, quantitative were presented by Professors Graham

The course included lectures and practical sessions on photography techniques, biological classification and rocky shore biota, mangroves and sandy beach environments, urchin



Students conducting a *Bullia* sp. experiment along the Isipingo sandy beach. Inserts are of ghost crabs that were abundant on the beach; horn-eyed (*Ocypode ceratophthalma*) and pink (*O. ryderi*) ghost crabs at top and bottom, respectively.

Alexander and Stuart Sym, Dr Gavin Snow, and teaching assistants Ms Mimmie Kgaditse, Mr Etienne Smit and Ms Ash Miller.

The students had the opportunity to identify organisms from the diverse range of coastal habitats; including macroinvertebrates in a pristine stream in the Vernon Crookes Nature Reserve, mangroves in the Beachwood Mangroves Nature Reserve, ghost and mole crabs at Isipingo Beach, and frogs in a wetland near Park Rynie. The rocky shore communities of three different geologies were sampled at Rocky Bay (granite), Clansthal Conservancy (Dwyka tillite) and Reunion Rocks (sedimentary rock). The students also tested zonation theory using transects at Rocky Bay to determine if the rocky shore organisms were present in distinct zonation patterns. The course participants enjoyed the opportunity to have a guided behind the scenes tour of uShaka Marine World. The fieldwork was concluded by examining the students on the information that they'd learned in the field and during presentations. ✂



A colourful painted reed frog (*Hyperolius marmoratus*); one of a number of frog species found in the reeds of the temporarily closed and fresh Rocky Bay Estuary and nearby farm dam.



ECSA 56 Coastal systems
in transition
From a 'natural' to an 'anthropogenically-modified' state
4-7 September 2016 Bremen, Germany

Humans are drivers of and affected by global change. Human-induced global climate and regional environmental change dramatically modify the structures and functions of coastal systems driving them into a new system state. The altered resource potentials and ecosystem services then, in turn, significantly affect the livelihoods of the population.

Distinguishing between natural and anthropogenic control factors and quantifying their impacts is a major challenge in the investigation of hydrodynamic, sedimentological, biogeochemical, ecological and socioeconomic processes in the coastal zone.

Inter- and transdisciplinary efforts are required to gain a profound understanding of these "novel" systems, which provides the basis for a sustainable management.

ECSA 56 brings together a global multi-disciplinary community of researchers and professionals to discuss and address issues of outstanding scientific importance in the science and management of estuaries and coastal seas in this rapidly changing world.

[Click here for the conference website.](#)



Russell Stevens, Head of Education at the Two Oceans Aquarium, presented an Ocean Literacy Workshop at the conference. Credit: Arno Munro.

Educators host 2016 MCEN Conference

The Marine and Coastal Educators Network (MCEN) hosted their annual national conference in Hermanus in January 2016 and brought together science communicators and environmental educators from marine organisations all over South Africa. The conference explored practical and innovative ways of bringing oceans into the classroom programme or educational facility. It provided participants with a forum to learn, share and exchange ideas, techniques and information. MCEN is a SANCOR coordinating group which aims to facilitate collaboration between educators, assist marine educators in their activities, and co-ordinate national marine education initiatives and to identify future opportunities for marine education in South Africa.

Comment invited on proposed network of MPAs



The Minister of Marine Protected Areas (MPAs) as part of the Operation Phakisa Initiative. The Minister of Environmental Affairs, Mrs Edna Molewa, has published (03 February 2016) in the Government Gazette no. 39646, draft notices and regulations to declare a network of 21 new proposed Members of the public are invited to submit written representations or comments in connection with the proposed declaration and regulations.

[Full details are available here.](#)

Closing date:

3 May 2016

[Click here for information on the public participation workshops.](#)



Free online access to early volumes of the [South] African Journal of Marine Science

The co-publishers of the predecessors of the African Journal of Marine Science, NISC and Taylor & Francis, have provided free online access to all volumes of the journal that were published in-house by the Department of Agriculture, Forestry and Fisheries. The period in question is 1983-2004 and it encompasses volumes 1-26, inclusive. The digitised volumes, which were published originally in print form only, are available at <http://www.tandfonline.com/loi/tams>.

Training opportunities and courses for students and early career scientists

Boost your career, travel the world and explore your options with these exciting training opportunities posted on the [SANCOR website](#) for early and mid-career professionals in fields relating to marine science.

[Call for SA students](#)

Building your career in ecosystems and socio-ecological research? This one's for you! Participate in the 1st International Long-Term Ecological Research Open Science Meeting, Skukuza, Kruger National Park 9-13 October 2016. This event is hosted by SAEON, ILTER, DST. Closing date for applications: 15 March 2016.

Applications are now open for the [IMBER ClimEco5 summer school](#) - Towards more resilient oceans: Predicting and projecting future changes in the ocean and their impacts on human societies - that will be held in Natal, Brazil from 10-17 August 2016. We invite students and early career researchers (<10 years post PhD) working on global change issues, and interested in working at the interface of



human and natural systems to apply to attend. Closing date: 31 March 2016.

[MSc in marine larval fish connectivity](#)

This ACEP project will focus on mesoscale dynamics of larval transport with an emphasis on ichthyoplankton. In addition to the biological component of this project, physical data will also be collected to further clarify the pattern of larval distribution. The successful candidate

will be based in Grahamstown, at the South African Institute for Aquatic Biodiversity (SAIAB) and will be registered at Rhodes University (RU). Applications close 31 March 2016.

[POGO-SCOR Visiting Fellowships](#) -

training in oceanographic observations: Offers early career scientist (at PhD or postdoc level) the opportunity to visit other oceanographic centres for a short period (1 to 3 months) for training on any aspect of oceanographic

observations, analyses, and interpretation. Closing date: 15 April 2016.

Research themes: environment; sustainability; climate change; natural resource management; energy provision.

Hosted by Future Earth Norway and the University of Oslo. No closing date, course starts on 1 Aug 2016.

Desmond Tutu Doctoral Scholarships

The following two themes will be key areas for research projects:

1. Prosperous Societies:
Research themes: food industry; HIV; identities; reconciliation; security; service delivery; development of high potentials; culture and communication; corporate social responsibility.
2. Sustainable Energy:

Closing date: 22 April 2016.

PhD bursary funding for Aquaculture/ Aquaculture Nutrition at Stellenbosch University. Closing date: 30 April 2016.

PhD Summer School in Comparative Social Science Studies 2016: Climate Change Adaptation and Transformations towards Sustainability

1 - 5 August 2016, Oslo Norway.

PhD or MSc Studentship on raggedtooth shark population genetics. University of Johannesburg. No closing date specified.

MSc Opportunity in Marine Linefish Population Genetics at SAIAB and Rhodes University. No closing date specified. ✂

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