Human activities are putting dugongs and their habitats at risk.

LETTERS

Edited by **Jennifer Sills**

Dugongs under threat

The dugong (*Dugong dugon*), one of four extant herbivorous marine mammal species in the order Sirenia, is listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (*1*) and listed as Vulnerable by the International Union for Conservation of Nature (IUCN) (*2*). Dugongs and their habitats—coastal waters in limited areas of the Indian and western Pacific Oceans—are threatened by environmental pollution, fishing, habitat destruction, and coastal economic development, putting the species at risk of extinction (*3*–*6*).

Environmental degradation and human activities affect dugongs throughout their territories. Heavy metals have been found in dugongs in Australia, Indonesia, and Japan (*4*). On the Queensland coastline of Australia, organic pollutants such as dibenzofurans and polychlorinated biphenyls were found in dugong tissue (*7*). In the Philippines and Indonesia, dugongs must evade fishing tools such as artisanal gillnets (*5*, *8*). Large-scale coastal development projects in Malaysia pose serious threats to seagrass beds (*9*), the dugongs' primary food source (*10*). In the Arabian Gulf, oil spills caused by offshore drilling and transportation pollute the dugongs' habitat (*6*).

Saving the dugongs, the only surviving member of the family Dugongidae, is important to marine mammal biodiversity (*11*). Although many countries have protected the fragile species by establishing nature reserves or passing legislation (*12*), the population of dugongs has continued to decrease (*2*, *11*). To ensure the safety of dugongs, countries should employ specialized personnel to scientifically manage nature reserves and strictly implement relevant laws and regulations. These personnel should receive incentives to maximize and sustain their enthusiasm. Governments of countries that are home to dugong habitats should also strengthen international cooperation and conduct strict environmental impact assessments before the construction of the coastal economic development projects near dugong conservation areas. Finally, these governments should help coastal fishermen to broaden their income sources and decrease their reliance on sea aquaculture and seine fishing, thereby reducing the threat to dugongs and their habitats.

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Brazil unwisely gives pesticides a free pass

Since ex-president Rousseff's impeachment in 2016, agrochemicals registered for use in Brazil have increased dramatically. The 2018 interim government was responsible for a record 450 new licenses in 1 year (*1*), and this permissiveness has worsened during the tenure of the newly elected Bolsonaro government. In the first 5 months of his mandate, 201 new products (*1*) have been made available. If this rate of approval continues, the government is on track to grant 480 licenses in a year, which would be a new record.

Instead of boosting production as intended (*2*), the extensive use of agrochemicals—some of which are prohibited elsewhere (*3*)—hurts human health, the environment, and the Brazilian economy. Pesticide overuse erodes ecosystem services, such as pollination (*4*), that depend on biodiversity (*5*). This service alone underpins Brazilian food production, valued at US$11 billion for 2018 (*6*). The Brazilian economy also relies heavily on exporting food products worldwide (*7*), making this political decision a potential liability. For example, Russia, Brazil's fifth-largest soybean importer, is considering suspending grain imports from Brazil if no corrective measures are taken to avoid the contamination by agrochemicals (*8*). Brazil's willingness to make more agrochemicals available has contaminated the water supply of one in four Brazilian cities (*9*), which could generate substantial health costs for Brazilian society (*10*).

The Brazilian government should reconsider the usefulness of legalizing these substances, given that sustainable agricultural systems are available (*5*). The wide-open door to agrochemicals will lead to long-term damage to environmental and human health, as well as the economy. It is imperative that the Brazilian government realize that short-term production gains may not outweigh the collateral damage that agrochemicals bring to the nation.

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TECHNICAL COMMENT ABSTRACTS

Comment on "Observation of alkaline earth complexes $M(CO)_8$ (M = Ca, Sr, or Ba) that mimic transition metals"

Clark R. Landis, Russell P. Hughes, Frank Weinhold

Wu *et al.* (Reports, 31 August 2018, p. 912) claim that recently characterized octacarbonyls of Ca, Sr, and Ba mimic the classical Dewar-Chatt-Duncanson bonding motif of transition metals. This claim, which contradicts known chemistry and computed electron density distributions, originates in the assumption of a flawed reference state for energy decomposition analyses.

Full text: dx.doi.org/10.1126/science.aay2355

Response to Comment on "Observation of alkaline earth complexes $M(CO)_8$ (M = Ca, Sr, or Ba) that mimic transition metals"

Lili Zhao, Sudip Pan, Mingfei Zhou, Gernot Frenking

Landis *et al.* claim in their Comment that Ca does not bind like a transition metal in $Ca(CO)_8$. We reject their statement, which is based on a misconception of bonding models and misleading application and interpretation of quantum chemical methods for analyzing chemical bonds.

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LIFE IN SCIENCE

Coffee chemistry: Not your average joe

The judges of the World Barista Championship silently tasted the signature beverage we had created, and we waited nervously as they reduced all of our hard work to a single number. At this curious competition, the best baristas from each country prepare a variety of coffee drinks, including the formidable signature beverage: a unique concoction of espresso and any noncoffee ingredients except for alcohol. The alcohol prohibition ruled out our inspired pairing of a washed Ethiopian espresso featuring tannic, fruity, and tea-like flavors with a rotary evaporated bottle of 2014 Château du Santenay Pinot Noir (a lovely wine with flavors similar to the espresso). Instead of giving up, we prepared to meet the challenge by leveraging our backgrounds in chemistry.

Call for submissions
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As our first strategy, my partner—Maxwell Colonna-Dashwood, the 2015 UK barista champion—and I decided to scientifically test the Pinot reduction. Using high-performance liquid chromatography–mass spectrometry and nuclear magnetic resonance, we showed that the 60 mL wine concentrate contained no detectable ethanol. However, officials told us that the concentrate was still inadmissible and that our tests showing it to be alcohol free were merely "pieces of paper."

Undeterred, we turned to our next tactic: recreating the amazing flavor of the Pinot concentrate by mixing nonalcoholic ingredients. After reading hundreds of analytical chemistry studies, we approximated the wine with only four ingredients: a water extraction of the skins of black grapes (for color and grape flavors), cranberries (for mild tannins, fruity acids, and tartness), pomegranate (for fruity flavors and a source of natural sugars), and the key ingredient: the second wash of the white, flaky skin of walnut, a source of extremely high levels of tannins. We presented our unusual recipe to the judges in a tulip glass.

Our meticulous research into flavor profiles paid off: We took home the title of Best Signature Beverage and came in fifth overall. As my research has long indicated, coffee and chemistry are the perfect pairing.

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The author creates a coffee concoction in the lab.

PHOTO: CHRISTOPHER H. HENDON, UNIVERSITY OF OREGON

Coffee chemistry: Not your average joe

Christopher H. Hendon

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