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News

Blue whales re-establishing former migration patterns

Scientists have documented the first known migration of blue whales from the coast of California to areas off British Columbia and the Gulf of Alaska since the end of commercial whaling in 1965.

According to a recent article in the journal *Marine Mammal Science*, researchers from Cascadia Research Collective in Washington State, NOAA's Southwest Fisheries Science Center in California, and Canada's Department of Fisheries and Oceans identified 15 separate cases where blue whales were seen off British Columbia and the Gulf of Alaska. Four of the whales were identified as animals previously observed off the coast of California, suggesting a re-establishment of a historical migration pattern.

Researchers made this identification by comparing photographs of blue whales taken in the north Pacific Ocean since 1997 with a library of nearly two thousand photographs of blue whales off the West Coast. A positive match was determined based on pigmentation patterns in skin color and shape of the dorsal fin.

Blue whales were severely depleted during commercial whaling activities during the early 1900s in the north Pacific and along the West Coast as far south as Baja California. Formerly large populations of blue whales in the north Pacific never rebounded after commercial whaling ended while those animals off southern California have apparently fared much better.

Scientists are still not certain exactly why blue whales are now beginning to migrate from southern California to the north Pacific Ocean although changing ocean conditions may have shifted their primary food source of krill further north.

Blue whales are thought to be the largest animal ever to have existed on earth, reaching lengths of nearly 30 m. They were nearly hunted to extinction throughout the world and are currently listed as endangered under the US Endangered Species Act and as endangered on the red list of the International Union for the Conservation of Nature. There are an estimated 5000 to 12,000 animals remaining today, with the largest population of approximately 2000 off the US West Coast.

Source: NOAA

Naturally produced oil slicks dwarf the *Exxon Valdez* spill

Twenty years ago, the oil tanker *Exxon Valdez* was exiting Alaska's Prince William Sound when it struck a reef in the middle of the night. 35,000 tons of crude oil spilled into the pristine Alaskan waters, eventually covering 11,000 square miles of ocean. However, according to research by scientists from UC Santa Barbara (UCSB) and the Woods Hole Oceanographic Institution (WHOI), 8–80 times the amount of oil spilled in the *Exxon Valdez* accident has made its way into sediments offshore from petroleum seeps near Coal Oil Point in the Santa Barbara Channel. Here, there is an oil spill everyday, as 20–25 tons of oil have leaked from the seafloor each day for the last several hundred thousand years.

The research documents how the oil is released by the seeps, carried to the surface along a meandering plume, and then deposited on the ocean floor in sediments that stretch for miles northwest of Coal Oil Point. In addition, the research reveals that the oil is so degraded by the time it gets buried in the seabed that it is a mere shell of the petroleum that initially bubbles up from the seeps.

The research team sampled 16 locations in a 90 km^2 grid starting 4 km west of the active seeps. To be certain that the oil measured in the sediments came from the natural seeps, two-dimensional gas chromatography was used, that allowed the team to identify the specific distinct biomarkers or chemical fossils in the oil, which can differ depending on where the oil originates. These markers were a perfect match for the oil from the reservoir, the oil collected leaking into the ocean bottom and oil from the seep on the sea surface. The oil that remained in the sediments represented what was not removed by "weathering" dissolving into the water, evaporating into the air, or being degraded by microbes.

The next step for the research team will be to investigate why the microbes consume most, but not all, of the compounds in the oil. All the oil appears to be biodegraded to the same point and then microbe activity stops. The results from such research could have applications for oil spills.

Source: UCSB

Detrimental effects of anti-infectives on aquatic microbiota

Anti-infectives have become environmental contaminants of growing concern, as they are transported from landfills, agriculture and urban centers into waterways and drinking water, according to a review article recently published in the journal *Environmental Health Perspectives* (EHP). Anti-infectives comprise several classes of biologically active compounds such as antibiotics, synthetic sources such as antimicrobials and some antifungals. Anti-infectives are constantly discharged at trace levels into natural waters near urban centres and agricultural areas. They represent a cause for concern because of their potential contribution to the spread of anti-infective resistance in bacteria and other effects on aquatic biota.

Available data concerning three classes of antibiotics (macrolides, quinolones and sulphonamides) and the individual compound trimethoprim in urban wastewater in three geographic areas (East Asia, Europe and North America) indicated significantly higher concentrations of these products in raw wastewater compared with treated wastewater.

The authors cite research suggesting that the current tendency toward concentrated animal feeding operations means the occurrence of anti-infectives in agricultural wastewater may increase in the near future. Moreover, urban water conservation strategies,

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while critical for ensuring adequate water supplies, also mean lower wastewater volumes and thus an increase in anti-infective levels because of lower dilution.

According to the review, more research is necessary, especially for low- to middle-income countries, which may be more impacted by anti-infective contamination than high-income countries because of less extended public sewage infrastructures, higher rates of self-prescription and often less strict industrial emissions legislation. The cumulative effects of anti-infectives in wastewater are not yet known.

Source: National Institute of Environmental Health Sciences

Contaminants in marine mammals' brains

Marine mammals' brains are exposed to a hazardous cocktail of pesticides such as DDTs and PCBs, as well as emerging contaminants such as brominated flame retardants, according to an extensive study carried out by researchers in Woods Hole Oceanographic Institution-MIT Joint Graduate Program in Oceanography and Ocean Engineering.

Eric Montie, the lead author, analyzed both the cerebrospinal fluid and the gray matter of the cerebellum in eleven cetaceans and one grey seal stranded near Cape Cod. His analysis included many of the chemicals that environmental watchdog groups call the dirty dozen, a collection of particularly ubiquitous pesticides that were banned in the 1970s because of their hazards to human health.

The chemicals studied include pesticides like DDT, which has been shown to cause cancer and reproductive toxicity, and PCBs, which are neurotoxicants known to disrupt the thyroid hormone system. The study also quantifies concentrations of polybrominated diphenyl ethers or PBDEs, a particular class of flame retardants, which are neurotoxicants that impair the development of motor activity and cognition. This work is the first to quantify concentrations of PBDEs in the brains of marine mammals.

The results revealed that concentrations of one contaminant was surprisingly high. Concentrations of parts per million of hydroxylated PCBs were found in the cerebrospinal fluid of a grey seal, an unusually high level for any accumulation in the brain.

The particular hydroxylated PCB found at these concentrations, called 4-OH-CB107, has some serious side effects as it has been shown to disrupt thyroid hormone transport in rats. Thyroid hormone plays a key role in the development of the brain, as well as sensory functions, in particular hearing in mammals. Hearing is clearly a key sensory system in marine mammals.

Source: Woods Hole Oceanographic Institution

Study reveals decline of Caribbean's big fish

Sharks, barracuda and other large predatory fishes disappear on Caribbean coral reefs as human populations rise, endangering the region's marine food web and ultimately its reefs and fisheries, according to a recent study by researcher Chris Stallings of The Florida State University Coastal and Marine Laboratory.

While other scientists working in the Caribbean have observed the declines of large predators for decades, the comprehensive work by Stallings documents the patterns in far more detail at a much greater geographic scale than any other research to date. Twenty species of predators, including sharks, groupers, snappers, jacks, trumpetfish and barracuda from 22 Caribbean nations were examined in the study. It was found that nations with more people have reefs with far fewer large fish because as the number of people increases, so does demand for seafood. Fishermen typically go after the biggest fish first, but shift to smaller species once the bigger ones become depleted. In some areas with large human populations, only a few small predatory fish remain.

Large predatory fish such as groupers and sharks are vitally important in marine food webs, but predicting the consequence of their loss is difficult because of the complexity of predator-prey interactions. Shifts in abundance to smaller predators could therefore have surprising and unanticipated effects. One such effect may be the ability of non-native species to invade Caribbean reefs. The ongoing invasion by the Pacific lionfish, which were introduced by aquarium releases is a case in point.

Lionfish are minor players on their native Pacific reefs, yet they are undergoing a population explosion and over consuming small fishes in the greater Caribbean region. Preliminary evidence suggests that lionfish are less invasive where large predatory native fishes are abundant, such as in marine reserves.

Given that about half the world's populations live near coastlines and that the world population is growing, demands for ocean-derived protein will continue to increase, Stallings warned. Meeting such demands while retaining healthy coral reefs may require multiple strategies, including implementation of marine reserves, finding alternative sources of protein, and increased efforts to implement family-planning strategies in densely populated areas.

The study also demonstrates the power of volunteer and community research efforts by non-scientists. Stallings used data from the Reef Environmental Education Foundation's (REEF) online database, which contains fish sightings documented by trained volunteer SCUBA divers, including more than 38,000 surveys spanning a 15-year period.

Source: Florida State University

Cruise liners' pledge to keep sewage out of Baltic Sea

Major cruise ships will stop dumping sewage in the Baltic Sea if ports will put in place facilities allowing them to remove the waste, according to the European Cruise Council (ECC), a cruise-liner organization. The organization stated that it would abandon the damaging practice if adequate port reception facilities operating under a no special fee system, is made available.

The Baltic Sea receives more than 350 cruise ship visits with over 2100 port calls each year. The wastewater produced in these vessels is estimated to contain 113 tons of nitrogen and 38 tons of phosphorus, substances that add to eutrophication of the sea. Until now, most of this sewage has been discharged into the Baltic Sea. According to the world Wide fund for Nature (WWF), the dumping of untreated waste water straight out into the Baltic Sea poses an unnecessary threat to the sensitive nature of the Baltic Sea environment. In addition to excess nutrients, the waste water also contains bacteria, viruses and other pathogens, as well as heavy metals.

Eutrophication is considered by many to be the main environmental problem of the Baltic Sea, causing both biological and economic damage to marine environment and coastal areas. It is caused by an overload of nutrients, such as phosphorus and nitrogen, into the ecosystem and causes many problems, including unusually strong and frequent summertime blooms of algae such as the toxic cyanobacteria.

So far only three out of more than 20 cruise ships ports around the Baltic Sea, Helsinki, Stockholm and Visby meet ECC's conditions. The normal sewage storage capacity for a cruise ship is between one and three days.

According to WWF, the announcement by ECC is a step in the right direction. They are now calling on the cruise lines to work with them to put pressure on the ports and their owners to establish sufficient port facilities. They consider it to be the responsibility of any country or city that wants to receive these cruise ships, to offer adequate sewage reception facilities.

Source: WWF