

Drowning in a sea of plastic

Micro-plastics accumulating not too far away from HK's beaches are harmful to a wide range of marine organisms including plankton, fish and seabirds. Human beings are not immune either. Wang Yuke reports.



Stand on Chung Hom Kok beach and look at the litter of plastic bottles, cracked wooden barrels, beer cans, soda cans, old clothes, orphaned socks, muddy boots, frayed fishing nets and on and on and it is not hard to be disgusted at what slob people can be.

But the mess left by these lovers of the outdoors cannot compare to the environmental menace lurking just offshore, threatening to overwhelm the plankton that form the indispensable foundation of our food chain.

Science has identified micro-plastics as a growing threat building up over decades in the oceans, from floating debris and synthetic fibers shed from articles of clothing during washing.

You can't see micro-plastics. They're too small, being typically defined as less than five millimeters in diameter. Many originate from larger pieces of plastic junk, weathered and broken down by the photochemical effects of ultraviolet rays from the sun.

It has been calculated that the volume of micro-plastics offshore from Chung Hom Kok beach is six times the volume of plankton there.

"(Zooplankton and small fish) ingest micro-plastics. The particles may block their digestive systems and kill them outright, lead them to starve to death, or poison the animal with plastic polymers, from the plastic or from chemicals (sucked up by the plastics)," said Peter Ross, director of Vancouver Aquarium's ocean pollution research program.

In July 2012, at the height of Typhoon Vicente, six containers full of plastic pellets were tossed into the sea off Beaufort and Lamma islands. More than 150 tons of pellets, destined for Chinese mainland manufacturing plants, were left bobbing in the ocean, just offshore from Hong Kong.

Micro-plastics are small enough to elude the ordinary mechanisms of tertiary sewage treatment. They are like magnets, attracting harmful chemicals and other pollutants. As the plastic fibers get slowly saturated with

these highly toxic pollutants, they lose their buoyancy and sink beneath the surface, landing on the ocean floor, evading trawls used to clean up the ocean.

"Studies clearly found that PCBs (polychlorinated biphenyls), DDT (a highly toxic and widely proscribed insecticide) and dioxins dominate the toxic chemicals," said Ross. All are chemical compounds used in industrial procedures.

Not easy to remove

Environmental groups were among the first to respond to the disaster offshore from Hong Kong. Government agencies followed soon after. "Even though we removed possibly 100 tons from the beaches, it still left many, many tons of the pellets out there in the sea, trapped by rocks or lying on beaches," said Tracey Read, founder and CEO of Plastic Free Seas, an advocacy group based in Hong Kong. "Hong Kong still has significant amounts of plastic pellets washing up after the pellets spill," she said.

Cheung Ma-shan, scientific affairs manager of the Eco-Education and Resources Centre in Hong Kong, told China Daily that "there are still 50 tons of spilled plastic pellets left in Hong Kong's waters, harmful to a wide range of marine organisms including pelagic and demersal fish, and seabirds."

To make matters worse, "the longer those

There are still 50 tons of spilled plastic pellets left in HK's waters, harmful to a wide range of marine organisms including pelagic and demersal fish, and seabirds. The longer those micro-plastics stay in the water, the more toxins they can absorb.



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micro-plastics stay in the water, the more toxins they can absorb," said Patrick Yeung, project manager for WWF Hong Kong.

Micro-plastics are carriers of pollutants invading the food chain. Plankton, which form the foundation of the marine ecosystem, are the first to be hit. Zooplankton stuffed with polluted plastics are consumed by other marine life, invertebrates, shellfish, mollusks and fish, thus allowing toxins to rise further up the food chain.

Less than three weeks after the 2012 plastic spill, the Agriculture, Fisheries and Conservation Department (AFCD) collected samples to look for traces of plastic in the digestive systems of fish.

Among 10 live fish samples from Po Toi and Cheung Sha Wan fish culture zones, 0.3-gm minute plastics were found in the stomach of a red drum weighing 1.6 kg and 0.1 gm in a cobia weighing 2.35 kg.

Toxins from micro-plastics were discernible not only in the guts but also in intestinal cell tissues. Ross adds that fingerlings feeding on stuff rich in fats are at greater risk, as those foods, bathed in the contaminated marine environment, create high concentrations of toxic substances in the fatty tissues of the young fishes.

"Micro-plastics are more troubling than we expect," Ross noticed, since they can damage a healthy reproductive system. The hard truth is the reproductive system of shellfish and mollusks has gone awry already.

Field research by Eco-Education and Resources Centre revealed mutations in the reproductive systems of male mud snails in Sai Kung Port in New Territories and Lung Mei Beach in Tai Po. Ninety percent of female nassa mud snail had grown male genital organs.

Laboratory research on the Thais snail, in which the University of Hong Kong cooperated, was even more startling. "Female genital organ was seen in all the male sample species," Cheung emphasized.

At the receiving end

"Hong Kong is at the receiving end of micro-plastics more so than other coastal cities, due to its geographic location. We are downstream from the Pearl River Delta. Poor regulation and dumping of plastics from

manufacturing or recycling plants upstream will result in micro-plastics being released in Hong Kong's seas," Read said.

But the mainland cannot be held completely responsible for Hong Kong's polluted waters, Read added. "Locally used polystyrene, local industries like recycling and plastic processing plants, and plastic molding facilities are equally to blame." The rainy season, May to September, augments the transportation of micro-plastics to Hong Kong's waters. The drainage system is overwhelmed. Micro-plastics could elude the filtration process as a result.

John Kellett, an engineer from Maryland, United States, is the co-inventor of a 50-foot-long waterwheel, which he insists could help clean up Hong Kong's pollution problem. He says the device does not allow micro-plastics to elude net trawls or normal sewage treatment. The waterwheel uses solar panels as substitutes for traditional nets, and, according to Kellett, is capable of collecting up to 50,000 pounds of debris per day.

"We found that some difficult-to-reach beaches were covered with polystyrene fragments," said Cheung from Eco-Education and Resources Centre, which plans to launch a sustained campaign to raise public awareness.

A micro-plastic clean-up program called Coastal Watch, launched by WWF Hong Kong in June this year, aims to increase public awareness. The program has mobilized 1,000 volunteers and is scheduled to continue for two years.

Coastal Watch's project manager Patrick Yeung said, "by identifying the sources and the black spots of marine litter and micro-plastics, using scientifically-sound methodologies, we will provide year-round monitoring for Hong Kong's valuable intertidal coastal habits, and offer recommendations to the government in order to address the problem at the source."

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Coastal Watch, WWF HK's micro-plastic clean-up initiative, has mobilized some 1,000 volunteers to raise public awareness about micro-plastic pollution.



EDMOND TANG / CHINA DAILY

Some 50 tons of micro-plastic pellets are estimated to remain in HK's waters, after a major pellet spill just offshore from HK due to Typhoon Vicente in 2012.