

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

#163 July 26, 2014

More Salt from the Sea

If not on our minds, drought is right there in front of us in the news most days. We had visitors from the southern California city of Manhattan Beach this past weekend and were comparing our water conservation measures. I asked, how much rain did you get this past winter, and was surprised to hear the response- “It didn’t rain last winter in Manhattan Beach!”

In this time of extreme drought in California, we don’t really have a water shortage, we just have a fresh water shortage. Unfortunately for us, 97.2% of all of the water on Earth is salty and is in the oceans where it is not particularly useful to people. Once separated from sea water, however, salt, or more precisely, halite or table salt, has always been a valued commodity. Saltiness is one of the most basic human tastes, and as a result, salt has long been one of the most widely used seasonings. It has also been used for preserving food for centuries.

Virtually all of the earliest civilizations harvested, traded or used salt; whether the Chinese, Hebrews and Hittites, Greeks and Romans, or Byzantines, they all valued salt. The earliest evidence of salt ponds or extraction date back about 8000 years. Salt was traded across the Mediterranean by ships, carried across the desert by camels, and even used as currency in parts of Africa.

Those peoples or regions that had salt deposits grew wealthy from the trade or use of salt, and many governments throughout history have taxed salt as a way of generating income and subjugating people. It is believed that funds generated by salt production in southern Spain financed the voyages of Christopher Columbus, and the salt tax in France was one of the causes of the French Revolution.

Interestingly, the word “salary” came from the Latin word “salarium”, which referred to money paid to the Roman soldiers to purchase salt. Even more bizarre, the word salad, literally means “salted”, and originated from the ancient Roman practice of salting leafy vegetables.

In India in 1930, Mahatma Gandhi led a 24-day, 240-mile Salt March (usually known as the Salt Satyagraha) as a nonviolent protest of the British salt monopoly and tax in colonial India. This march drew worldwide attention to the Indian independence movement. Along the march, Gandhi and his followers made salt from seawater.

About 30% of all of the world's table salt used today is extracted directly from seawater, usually from solar evaporation in coastal salt ponds. This is most effective in hot dry climates where evaporation rates are high. Evaporation allows the water to move into the atmosphere in a vapor phase while all of the dissolved salts are left behind, ultimately producing a concentrated brine that contains several different "salts". Through a refining process, sodium chloride or table salt is separated from the other salts.

At the other extreme, where the climate is cold, salt can be extracted by the freezing of seawater in coastal ponds. Just as salt doesn't evaporate with the water, when ice forms from seawater, the salt ions don't fit comfortably in ice crystals and are squeezed out and concentrated beneath the ice as a salty brine.

I think most of us probably think of table salt as the primary use of the salt in the sea, but in fact a number of other elements are extracted from ocean water as well. About 70% of the global supply of bromine comes directly from seawater, as does 60% of the magnesium.

Magnesium was extracted from the waters of Monterey Bay for decades by Kaiser Refractories, which operated the industrial complex immediately south of the Moss Landing power plant. These are the large tanks that you can see from Highway One driving through Moss Landing. The magnesium was used during World War II for making bombs, and later magnesium oxide was used for manufacturing high temperature bricks for use in steel furnaces. Imports of lower cost magnesium from China led to the closure of the Kaiser plant some years ago, however.