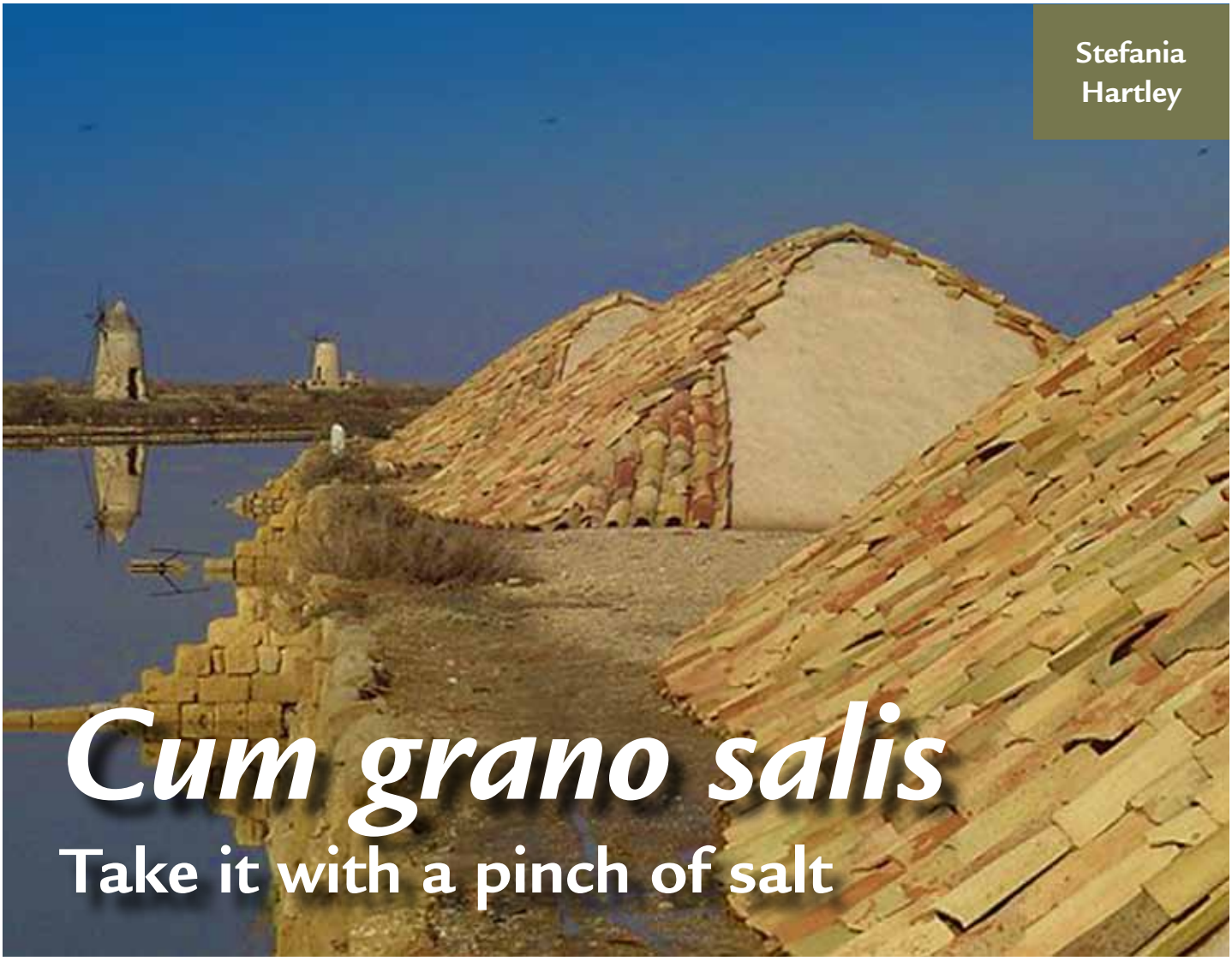
Stefania Hartley



Cum grano salis

Take it with a pinch of salt

WWF Italia

Ever wondered where you would like to have your wedding photo shoot? A popular choice among Italian newlyweds is the salt factories of Trapani in Sicily. Located on the west coast of the island, the saline (salt ponds) were probably started by the Phoenicians about 3000 years ago. Why in Trapani? Because of Trapani's strong sunshine, constant winds and scarce rain, and the Mediterranean Sea's high salinity.

Sicily lies off the toe of mainland Italy.

A (very) brief history of salt

If you were a Roman soldier you would probably pray to Jupiter, god of the sky, that he wouldn't send any rain on pay day. According to the Roman historian Pliny the Elder, soldiers' wages were paid in salt ('salary' derives from the Latin *salarium*). Salt was a very precious chemical as it allowed people to preserve food well before the advent of the refrigerator. Salt trading made populations wealthy and salt routes gave their names to roads (Via Salaria, from Rome to the Adriatic sea) and towns (Salzburg, Austria).

This aerial view of the saltpans at Trapani shows areas at different stages of drying out.

Salt under terracotta tiles awaiting transport out of the salt pans at Trapani

Key words

salt extraction

sodium chloride

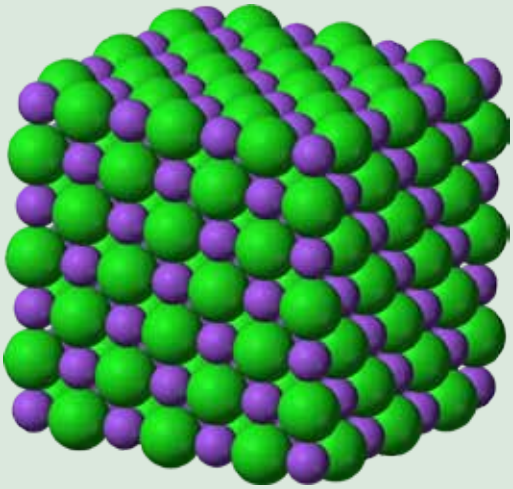
ionic solid

lattice

The Italian word *saline*, meaning salt ponds, is pronounced as three syllables, sa-lee-nay.

Sodium chloride

Sodium chloride is an ionic compound. It contains positive sodium ions and negative chloride ions which are held together in a lattice.



The sodium chloride lattice. The sodium ions are shown in purple, chloride ions in green.

There isn't a covalent bond holding the sodium to the chloride – each ion is attracted to all the oppositely charged ions in the lattice. The ions join together in a consistent pattern which results in crystals which are cubic. You can see this if you look closely at grains of salt. When the salt dissolves in water the ions no longer form a large crystal but instead are each surrounded by water molecules and act independently of each other.

This is what a saline (salt) solution is: water with sodium and chloride ions dissolved in it. Sodium chloride is very soluble – more than 350g can dissolve in one litre of water. As the water evaporates in the salt ponds, the sodium and chloride ions join together to form salt crystals which have the lattice structure shown here. This salt is collected, stored and sold.

Conditions which speed up the evaporation of the water will obviously speed up the collection of the salt. Salt could not be easily collected in the way shown here in the UK, but conditions in Sicily are ideal.

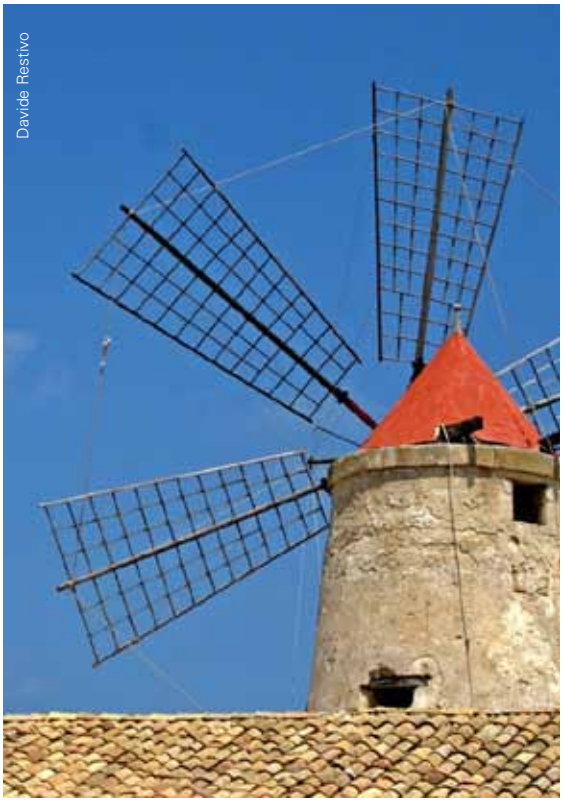
Crystals of sicilian sea salt

Extracting salt from the sea

As you would expect, the process of extracting salt from the sea in Trapani's saline is a seasonal one: it starts in March and finishes in September, with harvesting in June, August and September. The idea behind it is very simple: the sea water is trapped in square shallow ponds; the Sun's heat with the help of the wind causes the water to evaporate and crystals of NaCl are formed at the bottom of the pond.

There are several ponds that the seawater passes through. The first pond, also called 'cold', is the closest to the sea. There the water from the sea comes in through a narrow entrance and the water starts to evaporate. This pond is the biggest because it contains all the seawater that will be used during that season. A system of canals connects the different ponds, where the concentration of sodium chloride increases steadily. The last ponds are called *vasche salanti* where the salt is collected into heaps by teams of twenty men. The heaps containing 200 to 400 tonnes of salt are then covered with terracotta tiles and await the boat which will come to collect it through the canals. This work is still carried out today by 27 different saline in the area of Trapani.

Instead of the old baskets carried by men and mules, now a conveyor belt is used; instead of windmills, diesel pumps push the water from one pond to another. The windmills were used both to lift the water from the sea (using an Archimedes' screw) and to mill the salt. Some windmills have been restored and are still active. With full wind, a windmill can produce as much as 100 times the power of a horse.



A windmill used for pumping seawater at Trapani

Nature reserve

A nature reserve under WWF's management since 1995, the saline are a unique place where history and traditions live together with nature. As well as their beautiful landscapes (used by some people for their wedding photos!) and their architecture, the saline host a number of birds, fish, arthropods and vegetation which are well-adapted to the various levels of salinity of the different ponds. The saline are also a convenient stopover in autumn and spring for many migratory birds on their way to and from Africa. 208 different species of birds have been counted.

Growing in the corridors between the ponds we find many plants of the family Chenopodiaceae. These are halophytes (they tolerate high salinity) which can live in this extreme environment thanks to their ability to either expel the excess salt (*Limonium* species) or to accumulate it inside vacuoles. On the 7th of February 2011 the saline with all the area surrounding them were declared a Ramsar (protected) site, under the Ramsar Convention on Wetlands.

All in all, I think we can say that the saline of Trapani are 'worth their salt'!

Stefania Hartley grew up in Sicily. She teaches science at Westonbirt School, Tetbury, UK.

The saline attract migrant birds (including flamingos and egrets) and are home to halophyte plants.

Salt cod is a popular food in southern Europe.

Salt and food

Salt has been traditionally used as a food preservative. Salt cod from North Atlantic fisheries was the main source of protein for slaves working on the sugar plantations of the southern United States.

Salt added to food can enhance its flavour. Sodium and chloride ions dissolve in saliva and increase its electrical conductivity, stimulating the nerve cells of the taste buds.

While we need some salt in our diet, processed foods may contain large amounts. Excess salt contributes to high blood pressure and heart disease.