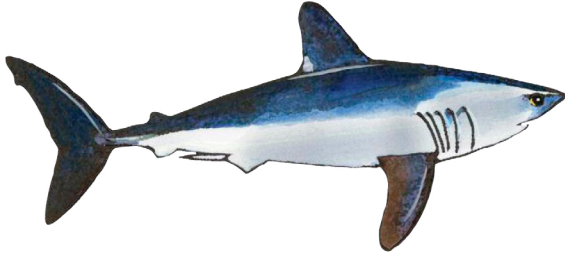


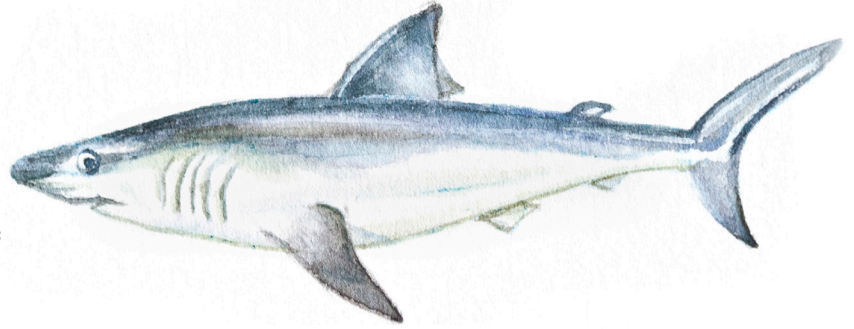
SECRETS STOLEN FROM THE SEA

Many secrets stolen from nature were then exploited in various ways by man. Some, in particular, are derived from the observation and study of sea creatures.



Emery sandpaper

In ancient times, shark skin was called **shagreen** and was used by carpenters, cabinetmakers and carpenters to smooth and grind very hard surfaces. It is no coincidence that **Emery** is also the common name of a shark: the *Lamna nasus*.



Swim like a shark

Shark skin is characterized by the presence of very hard denticles that amplify the hydrodynamic effectiveness of the animal in swimming.

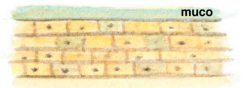
In fact, collagen micro-denticles scales reduce water resistance, increase propulsive thrust and reduce energy



Epidermis of cartilaginous fish

consumption (**Harvard University** study on the mako shark), because they have thin longitudinal grooves that form lines running through the shark's body through which water is channeled by reducing friction (**riblet effect**).

The skin of sharks inspired the production of the so-called riblet surface, now studied in fluid dynamics and used to cover super-fast planes and ships, racing boats or suits and costumes for Olympic swimmers.



Epidermis of bony fish

Sliding like a fish

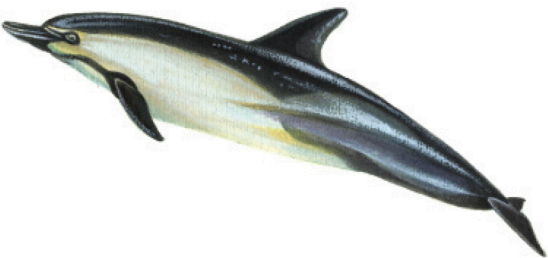
In bony fish, friction is reduced differently, through special epidermal glands that secrete mucus that decreases more than half the friction. This finding has been applied, for example, in pipes used by firefighters, into which a special slippery substance is inserted that reduces the pressure needed to spray water.



Hagfish (*Myxiniidae*) are very ancient fish, still existing, which exude a particular substance from the skin glands. In contact with sea water this exudate transforms into a mucus with extraordinary properties: in fact, if it is "pulled" for a few minutes it releases a series of fibers with a robust, rigid and at the same time elastic, soft and mouldable structure which could replace fibers currently derived from petroleum such as **Kevlar** (bulletproof vest fabric) or capable of absorbing large impacts and giving flexibility and resistance in objects such as safety helmets or car parts.

The sonar

Dolphins use a sophisticated pulse acoustic communication system to spot obstacles or even recognize different species of fish. From the study of this mode of communication was born **sonar**, an instrument used to move in the sea by analyzing the refractive waves of sounds in water.



Special packaging

Helmets for motorcyclists or safer shockproof packaging have been designed by observing the growth and formation methods of some animal coatings, such as turtle shells, sea urchins, eggs, single-celled algae caps, head scales of reptiles.



Weld-iron glue

From the study of sea squirts, marine animals that live firmly anchored to rocks, Australian scientists have isolated a molecule of "**ferroascidin**", an indestructible glue capable of joining two metal bars forever.