

SILK-PRODUCING FISH.

IN a previous number of the 'Penny Magazine' (vol. vii., p. 143) details have been given respecting the production of silk by the silk-worm, and of substances closely resembling silk by other insects. A slight allusion was at the same time made to a fish called the *Pinna*, which also produced a kind of silk. The costliness of this latter material has prevented it from attaining a commercial importance, but the circumstances connected with its production are highly deserving of a notice more extended than was compatible with that article.

The *pinna* belongs to the same order of shell-fish as the well-known muscle, but is very much larger, sometimes attaining so great a length as two feet. The fish is furnished with an organ which serves various purposes at different times. When the animal is about to change place (which is but seldom), the extremity of this organ, which then acts as a leg, is fixed to some solid body, and being then contracted in its length, the whole fish is drawn towards the spot where the end of the organ has been fixed; these movements repeated as often as may be necessary, the animal succeeds in changing its place.

But the more frequent employment of this organ is as a sort of *tongue*, by which the fish spins, or rather moulds, a beautifully fine fibrous substance. The manner in which it acts, according to a late writer on the silk-manufacture, is as follows:—Although the tongue is flat, and somewhat similar in form to a human tongue through the greater part of its length, it becomes cylindrical near the base or root, where it is much smaller than in any other part; at this lower end are several ligatures of a muscular nature, which hold the tongue firmly fixed against the middle of the shell; four of these cords are very apparent, and serve to move the tongue in any direction, according

to the wants of the fish. Through the entire length of this tongue there runs a slit, which pierces very deeply into its substance, so as almost to divide it into two longitudinal sections; this slit performs the office of a canal for the liquor of which the threads are formed, and serves to mould them into their proper form; this canal appears externally like a small crack, being almost covered by the flesh from either side, but internally it is much wider, and is surrounded by circular fibres. The channel thus formed extends regularly from the tip to the base of the tongue, where it partakes of the form of the tongue, and becomes cylindrical, forming there a close tube or pipe, in which the canal terminates. The viscid substance is moulded in this tube into the form of a cord, similar to the threads produced from it, but much thicker, and from this tube all the minute fibres issue and disperse. The internal surface of the tube in which the large cord is formed is furnished with glands for the secretion of the peculiar liquor employed in its production, and which liquor is always in great abundance in this muscle.

The *pinnae* live on the shores of the Mediterranean, usually on sandy banks five or six toises below the level of the sea. They support themselves and their shells in a vertical position, by means of the silken fibres which are protruded in the manner just described. These fibres, called collectively the *byssus*, they attach to any surrounding bodies, or even to grains of sand, in a manner sufficiently firm to enable them to resist the motion of the sea, for they are ill-content with locomotion.

The common edible muscle has the power of producing filaments in a similar way. That they affix themselves to rocks has been long known; but it was not till Reaumur investigated the subject, that it was found how this fixation was attained. He put some muscles into a vessel containing sea-water, and watched their progress. They opened their shells and protruded an organ which we may call a tongue, and moved it about in various directions, as if to find a place whereon to fix itself. After some time one of them was observed to attach the tongue to a particular place, and on drawing it away again with some quickness, Reaumur perceived a very fine thread adhering to the vessel; this, once begun, was repeated several times, until a cluster of fibres was produced. Reaumur afterwards found, that on tearing a muscle away from a rock to which it is attached, it will, if left to itself, speedily repair the damage by spinning some more fibres.

The fibres produced by the muscle are manifestly too short to be woven into a useful fabric; but it appears that the *byssus* of the larger *pinna* was early employed for this purpose, as a costly and rare ornament. The word *byssus* is frequently employed in early writings, and it has been supported by some that it was the *byssus* of the *pinna* alluded to. It is said that a robe composed of *byssus* of the *pinna* was presented to the satraps of Armenia by one of the Roman emperors.

But be this as it may, it is certain that the *byssus* of the *pinna* has been employed by the Sicilians for a long time as a material for light clothing. It existed among them more than a century ago, and has continued more or less ever since. The Sicilians not only eat the fish, but make use of the *byssus*. In order to collect the *pinnae* they go out in boats, provided with an iron instrument called a *cramp*, with two prongs or teeth about a foot long projecting from it, and with a handle long enough to reach from the boat to the place where the fish is stationed. The instrument is let down, and the prongs placed beneath the shell, so as to catch it between them. By the muscular force of the man (or sometimes of two or three men) the fish is dragged away from its hold of the rock, by a fracture of the filaments of the *byssus*, at some part of their length. The fishermen then cut close to the shell those fibres which are sufficiently long for spinning, and these, after being combed or carded,

to remove impurities, are spun into yarn or thread, just as silken filaments would be; and from this yarn are woven or knitted garments of various kinds, such as gloves, stockings, caps, and other light articles. As the filaments of byssus are extremely fine, of a perfectly equal diameter throughout their length, and of some strength, it is found that the fabrics woven from them are supple, strong, and warm; in fact, the combination of extreme lightness with warmth seems to mark this substance in an especial degree.

We must now speak of a circumstance connected with the pinna, which has attracted a great deal of notice among the early naturalists. The pinna is said to be destitute of the organs of sight, and therefore but ill prepared to defend itself from hostile attacks when its shell is open. It is also said to have a deadly foe in the cuttle-fish. Lastly, a little fish of the crab kind has been frequently found sheltered in the shell of the pinna. All these circumstances combined gave rise to much speculation among early naturalists, in which truth appears to have been somewhat confounded with fiction. Aristotle spoke of a little fish with claws like a crab, which keeps guard for the pinna, grows to her mouth, and acts as her caterer. Pliny describes the pinna as a shell-fish that is found in muddy waters, always erect, and never without a companion of the crab kind. Oppianus, a Greek poet, celebrated the friendship of the two fishes in a stanza, which has been thus rendered in English:—

“The pinna and the crab together dwell,
For mutual succour, in one common shell;
They both to gain a livelihood combine;
That takes the prey, when this has given the sign:
From hence this crab, above his fellows famed,
By ancient Greeks was Pinnatores named.”

Lamarck has represented the ancients, generally speaking, as having entertained the idea that the pinnatore or crab was the natural sentinel, guardian, companion, and caterer of the pinna; that he took birth with him; that he was essential to the pinna's existence; that the pinna, having no eye-sight, and not much energy of sensation generally, opened his shell in order that small fish might enter; and that the crab advertised him, by a gentle bite, that he had a sufficient quantity, and that he should close his shell; and that they both then shared the booty, the crab having brought eye-sight, and the pinna strength of shell, as their respective contributions to the joint-stock partnership.

Let us now come down to more recent times. In 1749, Hasselquist, the distinguished naturalist, made a voyage to the Levant, and wrote to Linnæus on many of the natural objects which engaged his attention. In one of his letters he says: “Amongst others they sell here (Smyrna) a sepia or cuttle-fish, which by them is called *οκτωποδια*; it has only eight tentacula, all of equal length; the whole animal is a foot long, and thick in proportion. Of this the Greeks have related me an anecdote, which I think remarkable. The Pinna muricata, or great silk muscle, is here found in the bottom of the sea in large quantities, and is a foot long. The cuttle-fish watches the opportunity, when the muscle opens her shell, to creep in it and devour her; but a little crab, which has scarcely any shell, or has at least only a very thin one, lodges constantly in this shell-fish. She pays a good rent, by saving the life of her landlady, for she keeps a constant look out through the aperture of the shell, and on seeing the enemy approach, she begins to stir, when the *πινα* (for so the Greeks call the shell-fish), shuts up her house, and the rapacious animal is excluded. I saw this shell-fish first at the island of Milo, and found such a little crab in all I opened: I wondered not a little what was her business there; but when I came here I was first informed of it by the secretary of our consul, M. Justi, a curious and ingenious man, who has travelled much, and lived long in this place. This was afterwards con-

firmed by several Greeks, who daily catch and eat both these animals.”

But the researches of more recent naturalists, particularly those of France, have led to doubts as to some part of these statements. Some of the details are, in all probability, due to romance, but a recent writer says that the following is a probable version of the real state of the case:—That whenever the pinna ventures to open its shell, it is immediately exposed to the attacks of various of the smaller kinds of fish, which, finding no resistance to their first assaults, acquire boldness and venture in; that the vigilant guard, by a gentle bite, gives notice of this to his companion, who, upon this hint, closes her shell, and having thus shut them in, makes a prey of those who had come to prey upon her,—sharing the booty with her companion. If this be the case, it is sufficiently curious, without venturing into the field of romance.

With respect to the employment of the pinna as a source whence silk might be produced, many naturalists think it might be greatly extended. M. Bosc (*Dict. des Scien. Nat.*) says: “It would seem, from the knowledge we possess, that the capture of the pinna might be regulated, and the product prodigiously increased. A certain number of pinnæ might be caught, not with the cramp, for that generally wounds them mortally, but by severing their byssus. These pinnæ might be placed in ponds of moderate depth, where persons might go from time to time to cut the filaments. Their numbers, as is common with the bivalves, would rapidly increase, and a considerable revenue might be thereby derived. But it is not from people so little industrious and so ignorant as the Calabrians that we must look for improvements in the arts: it is necessary, before they effect such an object, to conquer prejudices and to have a better form of education.”

M. de Blainville also thinks that by keeping the pinnæ in ponds they would multiply greatly, and that they could be collected conveniently and at the proper times for cutting off the byssus.