Swarm of Velella.

The brief note from Alassio by Mr. Isaac Thompson on the extent and density of a swarm of Velella off that coast this month recalls to my mind seeing a similar scene on each of two occasions when staying at that place in April. On each occasion of the swarm there was, as I well remember, a strong wind from the east; on each the shore became so thickly strewn with the organisms as to become unpleasantly odorous from their decay. Ch. S. Sherrington.

Felixstowe, April 19.

Referring to your correspondent's letter on the swarms of this little marine animal that strewed the shores of the Riviera di Ponente early in April, I was at Alassio and remarked that the wind had been easterly for some days before the advent of the swarm. Alassio is situated on a sandy bay facing the east; on the western side of the bay, two miles away, lies a fishing village called Laiguelia; here the Velella were in far greater numbers, thickly piled on the shore, thinning off gradually towards Alassio, while beyond Alassio, at the extreme eastern end of the bay, the Velella were comparatively thinly scattered on the sand. The clear horny oval disc over the little colony of polypes, with its diagonally-set, triangular sail, places Velella at the mercy of the winds; a shoreward wind blowing for several days must end in the wreck of the little "Barca di San Giovanni" (boat of St. John), as the Alassian fishermen call it. I am told it is usually in early June that the swarms are swept ashore, and then in immense numbers—far more than strewed the bay this April. The prevailing wind in summer at Alassio is easterly. Rose Haig Thomas.

Hotel Palais d'Orsay, Paris, April 21.

Habits of the Gar-fish and Mackerel.

Beyond the fact that the bodies of other fish are occasionally pierced by them, no evidence seems to exist concerning the special function of narrow elongated jaws of the gar-fish (*Belone vulgaris*, Fleming). These fish are usually captured in drift nets along with mackerel, and there appears to be some vague idea among fishermen that they either guard or guide the mackerel shoals. In the cases on record where a mackerel or other fish has been pierced by the gar-fish, the upper jaw of the latter has usually been found broken off and remaining in the wound. This fact is inconsistent with the supposition that the normal function of the elongated beak is to be used as a spear, and there is no evidence that the gar-fish feeds on the flesh of large fishes.

Examination of the beak itself shows that the end of it is formed by the tip of the lower jaw, which is about half an inch longer than the upper. This tip is not hard and sharp, but soft and blunt; the upper jaw is narrower, and ends in a harder and sharper point. Thus the lower jaw is by no means adapted for use as a piercing weapon. Recently I opened the stomach of one of these fish landed at Newlyn, and found in it the partly digested remains of a slender silvery fish, which at the time I could not identify. The next day I opened a number of mackerel and found in some of them copepods and amphipods, but in nearly all remains of fish food, and in one, two specimens of the smaller sandeel (*Ammodytes tobianus*) only slightly digested. I was then able to satisfy myself that the fish on which the Belone had been feeding was also the sandeel, and I was impressed with the similarity in the structure of the jaws between the Belone and its prey. It then occurred to me that the proper function of the beak of the Belone was to penetrate the sand in pursuit of sandeels. The latter fish burrow into sand by means of the projecting lower jaw, and it is evident that the beak of the Belone is as well adapted for probing the sand, finding and seizing the sandeel, as is the beak of the woodcock for probing soft ground in search of worms and burrowing insects. The flexible tip of the fish's beak is doubtless a sensitive tactile organ, while the narrow toothed upper jaw is eminently fitted for seizing and holding the slippery and agile prey.

It seems very probable that special adaptation for the pursuit of sandeels in the sand explains, not only the peculiar beak of Belone, but also the elongation and structure of the whole body. Narrowing and elongation of the body are related in fishes and many other animals to creeping or burrowing habits. Probably, not merely the beak, but the greater part of the body of Belone also is thrust into the sand in pursuit of its prey, and this would explain why the dorsal and ventral fins are placed far back, so that the propelling apparatus remains in the water, and why the abdominal region is nearly cylindrical, with a somewhat flattened ventral surface, without dorsal or ventral ridges.

The fact that the mackerel were also feeding on sandeels further suggests a special reason for the association between mackerel and gar-fish. It is true that many predaceous fish eat sandeels when they can get them, but the jaws of the mackerel are not specially fitted for dislodging sandeels from the sand. In the early part of the year mackerel feed largely on copepods and other pelagic animals, having long, close-set gill-rakers through which they can strain the sea-water, like clupeoid fishes. In summer and autumn mackerel feed chiefly on small fishes which swim near the surface, such as the young of sprats, herring, gadoids, &c. But it seems probable that mackerel accompany the gar-fish in order to feed on the sandeels which leave the sand in their efforts to escape from their special enemy.

I have not yet made any observations on the food or habits of the saury-pike (*Scomberesox saurus*), but it is probable that, as in the case of Belone, injury to pilchards or other fishes by the beak of this fish is rather accidental than intentional. Couch and Matthias Dunn believed that the saury-pike was the enemy of the pilchard, and that it attacked the latter. When a number of both kinds of fish were enclosed in a seine, many of the pilchards had their eyes or bodies pierced by the beaks of the saury-pikes, but the latter are very active and violent in their movements, and if they were rushing about among a dense crowd of pilchards, the beaks could scarcely fail to pierce the latter. J. T. Cunningham.

Flinr Implements at Chelsea.

While planting in the garden of this house last Wednesday, I turned up a small flint implement, an inch and a half long and an inch wide in the widest part. It is so thin and transparent, that it is possible to read large print through it. This is the second I have found, the previous one being angular and pointed. A. B. Marshall.

Belle Vue House, 92 Cheyne Walk, S.W., April 18.

The Misuse of Coal.

Prof. Perry, in his manifesto in Nature of March 20 (with which, subject to a reservation in respect of the following extract, I venture reapectfully to agree) says (p. 464):—

"For the heating of buildings Lord Kelvin pointed out long ago that the very law of thermodynamics which makes a heat-power engine inefficient makes it possible to obtain from one unit of energy the effect of 50 or 100 units by direct heating. . . Discover the energy engine and you multiply your power to heat buildings from coal, seventy and seven times."

May I ask if Prof. Perry adheres to the foregoing statement, and if so, ask him through you to kindly add some elucidation of it? Subscriber.

Derby, April 15.

"Subscriber" may be referred to § 196 of my book on "Steam," where I explain Lord Kelvin's suggestion and give a numerical example. I assume no better utilisation of coal than one gets from a gas engine using Dowson gas and practical conditions, and yet here are the two answers for one pound of coal:—

(1) By direct heating, all the heat of the coal being given to the air (it is unusual to give nearly so much), the air gets 8300 units (Centigrade pound) of heat.

(2) By using a gas engine and reversed heat engine, 37,620 units of heat are given to the air. This is only four and a half times and not the seventy-and-seven of which I somewhat rhetorically spoke. But with the perfect energy engine of the future we may get nearly six times what we get from the gas engine now. Also I considered an atmosphere at 10° C., the air to be heated to 20° C. for the warming of a building. If the rise of temperature is only 5 degrees we get twice the benefit.

It looks at first sight like a creation of energy, but this is not so. The reversed heat engine (some refrigerating machines work on this principle) receives work energy 1422 (specified in heat units); this work is converted into heat 1422, and the extra heat 36,198 is merely *transferred* from air at 10° C. to air at 20° C.

What is disadvantageous in the heat engine becomes advantageous in the reversed heat engine, whether it is used for heating or refrigerating. J. P.