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The Portuguese Man-of-War

BY AILSA MCGOWN CLARK

(British Museum (Natural History))

The Portuguese man-of-war (Latin name *Physalia*) is an oceanic animal, related to the jellyfishes, living generally within 35°N or S of the equator, sometimes in very extensive shoals. For instance, in mid-summer 1969 a huge shoal was observed in the vicinity of Cape Verde, reported on 18th May and again on the 27th by the m.v. *Mabel Warwick*, on the 30th by the m.v. *Clan MacDougall*, on 5th June by the m.v. *Port Caroline*, on 16th June again by the *Mabel Warwick*, on 8th July by the s.s. *Mawana* and on the 9th by the m.v. *Port Townsville*. On 27th May the *Mabel Warwick* took an hour at 11 knots to traverse the main part of the shoal. The summer of 1969 with its long spells of good weather in British waters, presumably coupled with sustained south-westerlies, brought quite a few specimens of *Physalia* into the English Channel, which only happens about one year in five.

The name Portuguese man-of-war is thought to have originated from the extensive use of caravels with fore-and-aft lateen rig by the Portuguese in the fifteenth and sixteenth centuries. Unlike the true jellyfishes, *Physalia* is a colonial animal consisting of numerous individual polyps modified for catching and stinging the prey (fishes and plankton), or for engulfing and digesting it through their numerous mouths or for reproducing the species. These polyps are linked together under an inflatable pink- or purple-tinted semi-transparent flotation bladder, shaped something like a Cornish pasty, bulging on one side and flattened on the other, the join in the pastry having its equivalent in the extensible vertical crest running longitudinally and often rather puckered in appearance (Fig. 1). There is an internal gas-gland for re-inflating the bladder and crest. Most of this float projects above the surface of the water, unlike the bell of a jellyfish which is normally submerged. In fact the crest is not perfectly longitudinal but is angled to right or left relative to the submerged part of the animal so that it takes up an attitude about 45° offset from the wind direction. In the largest specimens the longest tentacles may be as much as 70 feet long when extended, corresponding to a float length of about 12 inches, though most specimens seen are much smaller than this with floats about six inches long. The great extent of the submerged part acts as a drogue and the general direction of drift is more than 90° to leeward of the angle of the crest, resulting in a course offset from the wind direction by about 35–40°. For instance, if the wind was due north a 'left-handed' animal would take up a position with the crest aligned from north-west to south-east, on starboard tack as it were, with the submerged part trailing from the bulging side approximately towards the north-north-east and the line of drift would be about south-south-west. Inevitably all these angles are subject to modification by variations in the direction of the current relative to the wind as well as differences in the rate of drift, larger specimens usually travelling faster and further off the wind than smaller ones. Each specimen seems to be permanently biased to right or left so that there is no question of tacking. The origin of the right- or left-handed condition is thought to date from an initial bias given when the young animal first starts to project above the surface as the float develops, followed by asymmetrical growth of the submerged parts. Most shoals seem to consist of specimens on the same tack since the wind inevitably tends to separate them out, left-handed ones travelling south-south-west in the northerly wind given in the example above, while right-handed ones would go south-south-east. Very few observations on Portuguese men-of-war from ships include any mention of which tack they are sailing on, so this has had to be estimated by examination of specimens netted or stranded on shore. The information obtained in this way indicates that there are more right-handed specimens in the

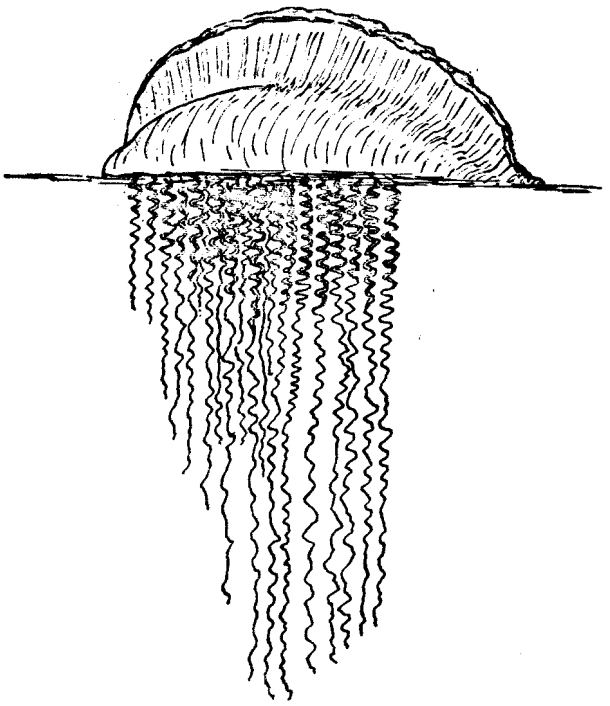

Fig. 1. The Portuguese man-of-war, *Physalia.*

northern hemisphere and more left-handed ones in the southern, although both forms have been observed in places like the Canary Islands and Sydney, New South Wales. The anticyclonic wind systems in the North Atlantic and North Pacific must drive right-handed men-of-war (on port tack) in directions centrifugal to the circulation, while the same result is achieved by the cyclonic wind systems acting on left-handed specimens south of the equator. This is clearly helpful in bringing about a dispersal of the species and would also tend to prevent the *Physalia* population of the North Atlantic from congregating in the Sargasso Sea, where the weed might foul up their tentacles. It has been suggested that natural selection operates to encourage segregation of right- and of left-handed specimens in the north and south hemispheres respectively, the corollary of which is that the direction of the asymmetry could be inherited. However, attractive though this theory might seem, it is not generally accepted. Wind fluctuations, especially in the doldrums, must bring about an appreciable amount of transequatorial migration and random dispersal of both forms while there is a much greater risk of mass mortality by stranding if all the specimens in each hemisphere were driven centrifugally. Also the bias to right or left can be attributed to environmental factors during growth. Even so, there is still considerable uncertainty about the life history of *Physalia* which can only be resolved by more information from sightings in the open sea. This is where watch-keeping officers of merchant ships could be of immense help if they know what is needed. Even though individual observations may not seem very important, they could be assembled into a mass of data of considerable significance. Ideally, observations should include not only position, wind direction and speed, as well as an estimate of the size and density of the shoal (factors which have usually been included up to now), but also the tack adopted by the men-of-war, whether any are on the opposite tack, the usual angle of their crests to the wind, the angle of drift and an estimate of the size range of the floats. This may be asking a lot of observers

standing thirty feet or more above sea level, moving at ten to fifteen knots in half a gale but there must be times when some of these features could be detected. Yachtsmen are obviously much better situated to do this but the whole project is very much a cumulative one.

Apart from jellyfishes which differ in not projecting above the surface and in having pulsating bells, almost the only marine animal likely to be confused with the Portuguese man-of-war is its smaller relative the 'by-the-wind sailor', *Velella* (Fig. 2). It also has a float but this rarely exceeds three inches in length and the crest is like a thin semi-rigid fin; its colour is blue rather than purple. Oceanic observations on *Velella* are needed just as much as for *Physalia.*

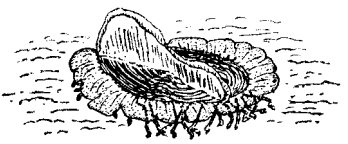

Fig. 2. The 'by-the-wind sailor', *Velella.*

The stinging properties of the Portuguese man-of-war are well known but may have been over-exaggerated owing to confusion with some of the more toxic kinds of jellyfish. No authentic cases of fatality in man have been recorded, though the tentacles can inflict extensive and very painful weals. Their countless minute stinging cells have been known to eject their threads with sufficient force to penetrate heavy-gauge surgical gloves. These threads are associated with poison sacs, the toxin from which, when tested on laboratory animals, produced somnolence, anaesthesia, paralysis—especially of the respiratory centres, digestive disturbances, anaphylactic shock and, in small animals, even death. The recommended treatment is by anti-histamines, either applied in the form of a cream to the part stung or taken by mouth.

Although it feeds mainly on fishes swimming near the surface of the sea, there are certain species of fishes which habitually live in close association with the Portuguese man-of-war, swimming around among the tentacles where attack by larger predatory fishes is unlikely. It used to be thought that these small fishes were immune to the toxin in the tentacles but, when caught in a net with *Physalia*, they can be fatally stung. In life they may be protected by a surface coating of mucus or perhaps they are just artful dodgers.

Being near the bottom of the evolutionary scale, *Physalia* has a very simple nervous system and its behaviour is correspondingly limited in scope. Apart from the feeding reactions of the tentacles and associated organs it is capable of little else but manœuvres of the air bladder and crest. In a calm the crest is usually allowed to collapse but, when stimulated by the wind getting up, it is quickly inflated and erected to adopt the sailing attitude. It is not unusual for the float to be capsized by sudden variations in the wind or by the bow wave or wake of a boat. The considerable drag of the tentacles on the windward side counteracts overmuch heeling to leeward so that capsizing tends to occur towards the wind. It is corrected almost immediately by muscular contractions on the leeward side of the float.

Although its capabilities are clearly limited, *Physalia* can be counted as a successful animal, judging from its wide distribution in the warmer seas of the world and the vast numbers that exist. Its adaptations to utilize the wind and the parallels it shows with sailing ships devised by man are of particular interest.

Editor's note. Many other ships, not named in Miss Clark's article, sent in reports of shoals of Portuguese men-of-war encountered in the Pacific and the Atlantic last summer. Full details (and sketches) were forwarded to the Natural History Museum.

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