

A mass stranding of the asteroid *Asterias rubens* on the Isle of Man

J.P. Thorpe and E.L. Spencer

Port Erin Marine Laboratory, University of Liverpool, Port Erin, Isle of Man, IM9 6JA

Over the period 1–4 April 1999 a large number of dead asteroids were washed ashore at the northern end of the Isle of Man. The area is commonly used for public recreation and the stranding prompted numerous alarmed telephone calls to various bodies. Initially, disease or pollution were suspected, but a more detailed examination of the circumstances indicated that the mass stranding was probably a result of tides and weather conditions. The stranding occurred on the east coast of the Isle of Man from about 100 m to the south of the Point of Ayre, which is the northernmost point of the Isle of Man, and extended southwards for ~600 m. This is a highly exposed shore with a strong tidal flow, subtidally it is shallow, with coarse gravel and exposed bedrock, and extensive mussel (*Mytilus edulis*) beds, which may be expected to attract large numbers of predatory starfish.

The stranded asteroids were almost entirely *Asterias rubens* L., a major predator of *Mytilus edulis* (Picton, 1993), although two individuals of *Luidia sarsi* Duben & Koren were also noted. On the steeply sloping shingle beach the dead asteroids were mostly concentrated in a narrow zone, about 1–2 m wide, along the strand line at the top of the shore. Average density of the asteroids was estimated at 15–20 ind m⁻¹ along most of the length of shore affected, but with fewer towards the southern end. The total number of stranded asteroids was estimated at 6–10,000. A notable feature of the dead *A. rubens* was that the great majority were particularly small (about 5–10 cm diameter), with very few (perhaps 1%) of the larger sizes (15–25 cm) which are normally common around the Isle of Man (Bruce et al., 1963; personal observations).

There was no sign of oil or any other pollutant in the area affected; this was in any case unlikely in an area far from industry and subject to strong currents. The period concerned, however, coincided with major spring tides (9.3 m at Liverpool) and these occurred in conjunction with prolonged north-easterly then easterly winds up to force 5 (data from Isle of Man Government Meteorological Office, Ronaldsway), blowing onto this exposed area of shore. Over the period the winds caused a considerable swell to build-up.

It appears likely, therefore, that fresh onshore winds in conjunction with particularly low tides would have caused exceptional turbulence in the shallower inshore areas and this turbulence may have resulted in many of the smaller *A. rubens* becoming detached from the subtidal substratum and being swept up onto the shore. Presumably larger *A. rubens* would have been better able to hold on to the seabed or possibly most of these would have been further offshore in deeper water. Alternatively the starfish on the shore may have come from one of the huge single-age swarms of *A. rubens*, which are known to occasionally invade shallow coastal areas (see Hayward & Nelson-Smith, 1996). Some invertebrates apparently incur heavy stranding mortalities following spawning in shallow water (e.g. horseshoe crabs, *Limulus polyphemus*, in North America; Penn & Brockman, 1995), but this is not a likely cause of the mortality described, since, although it occurred within the usual spawning season (Hayward & Nelson-Smith, 1996), the *A. rubens*

concerned were probably too young to reproduce and ten which were cut open apparently lacked mature gonads.

Although there is a vast literature on the stranding of marine vertebrate species, particularly cetaceans, there appear to be surprisingly few published accounts of mass strandings of marine invertebrates. Such occurrences among pelagic, planktonic or nektonic species are to be expected and there are records for, e.g. hydrozoans (Kemp, 1986), euphausiids (O'Brien et al., 1986) and cephalopods (Ueno et al., 1996). Benthic invertebrates such as crustaceans (Maynard & Chiasson, 1988) or bivalves (Schwartz, 1994) are known to be occasionally cast ashore in strong onshore winds. A mass stranding of asteroids has been previously recorded by Berger & Naumov (1996) in the White Sea (north-west Russia). Interestingly the species concerned was also *A. rubens* and the strandings also occurred in spring.

Whatever the causes of the mass stranding on the Isle of Man, it is unlikely to have had any long-term effects on the population size. The species is very widespread and abundant throughout the shallower (<600 m) areas of the North Atlantic and has a long-lived pelagic larva, which is considered to be widely distributed (Clark & Downey, 1992).

REFERENCES

- Berger, V.Y. & Naumov, A.D., 1996. Effect of salinity on the substrate attachability of starfishes, *Asterias rubens*. *Biologiya Morya Marine Biology*, **22**, 99–101.
- Bruce, J.R., Colman, J.S. & Jones, N.S., 1963. *Marine fauna of the Isle of Man*. Liverpool: Liverpool University Press.
- Clark, A.M. & Downey, M.E., 1992. *Starfishes of the Atlantic*. London: Chapman & Hall.
- Hayward, P.J. & Nelson-Smith, A., 1996. *Collins pocket guide to the sea shore*. London: Harper Collins.
- Kemp, P.F., 1986. Deposition of organic matter on a high energy sand beach by a mass stranding of the cnidarian *Velella velella* (L.). *Estuarine, Coastal and Shelf Science*, **23**, 575–579.
- Maynard, D.R. & Chiasson, Y., 1988. Storm related mortality of lobsters, *Homarus americanus*, on the northern shore of Prince Edward Island, Canada. *Journal of Shellfish Research*, **7**, 169.

- O'Brien, D.P., Ritz, D.A. & Kirkwood, R.J., 1986. Stranding and matting behaviour in *Nyctiphanes australis* (Euphausiidae: Crustacea). *Marine Biology*, **93**, 465–473.
- Penn, D. & Brockman, H.J., 1995. Age biased stranding and righting in male horseshoe crabs, *Limulus polyphemus*. *Animal Behaviour*, **49**, 1531–1539.
- Picton, B.E., 1993. *A field guide to the shallow water echinoderms of the British Isles*. London: Immel.
- Schwartz, E., 1994. All washed up: clam strandings on the Jersey shore. *Underwater Naturalist*, **22**, 30–31.
- Ueno, S., Kawano, M. & Mitsutani, A., 1996. Shell size of the paper nautilus *Argonauta argo*, (Cephalopoda, Octopoda) stranded on a beach at the southwest part of the Japan Sea in early winter. *Journal of the National Fisheries University*, **45**, 25–27.

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