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SHORT COMMUNICATION

"Starballing": a potential explanation for mass stranding

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Abstract The common starfish *Asterias rubens* has a long-lived pelagic larva that is considered to be the driver for the wide dispersal of this species, as adult A. rubens are thought to be limited to slow movement. Unexplained mass beach strandings of *A. rubens* have been witnessed during strong wind and tide conditions. Here, we describe a new observation, "starballing," where adult *A. rubens* were observed being transported with a strong tidal flow, which might explain how mass stranding occurs.

Keywords *Asterias rubens* · Dispersal mechanism · Mass strandings · Behaviour · Benthic

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The wide distribution of *Asterias rubens* (Linnaeus, 1761) throughout the North Atlantic (<600 m) is considered to be the result of its long lived pelagic larva (Clark and Downey 1992). Adult *A. rubens* movement is thought to be limited to the slow movement (average 67 cm per minute (Castilla and Crisp 1970)) of thousands of tube feet that navigate the heterogenous benthic terrain, while feeding on sessile and sedentary prey (Clark and Downey 1992). *A. rubens* are associated with mass beach stranding events (Thorpe and Spencer 2000), an unexplained phenomenon that is thought to be associated with strong wind and tide conditions (Thorpe and Spencer 2000). A new observation that we call "starballing" where adult *A. rubens* were observed being transported with a strong tidal flow might explain how mass stranding occurs.

"Starballing" was observed (by E. Sheehan and S. Cousens) throughout one video transect in September 2013 while undertaking a benthic survey (Sheehan et al. 2016) in Kingmere Marine Conservation Zone (designated under the UK Marine and Coastal Access Act 2009) in 20 m water depth, 5 km off the south coast of England. As the tidal flow increased to 0.5 mps, *A. rubens*, which typically crawl over the seabed, were observed rolling over the seabed, transported by the tidal flow, with their arms curled over into a spheroid (Fig. 1). The video survey was conducted using a HD video array, towed behind a boat. The array floats above the seabed, using a chain for stability (Sheehan et al. 2010). This survey method

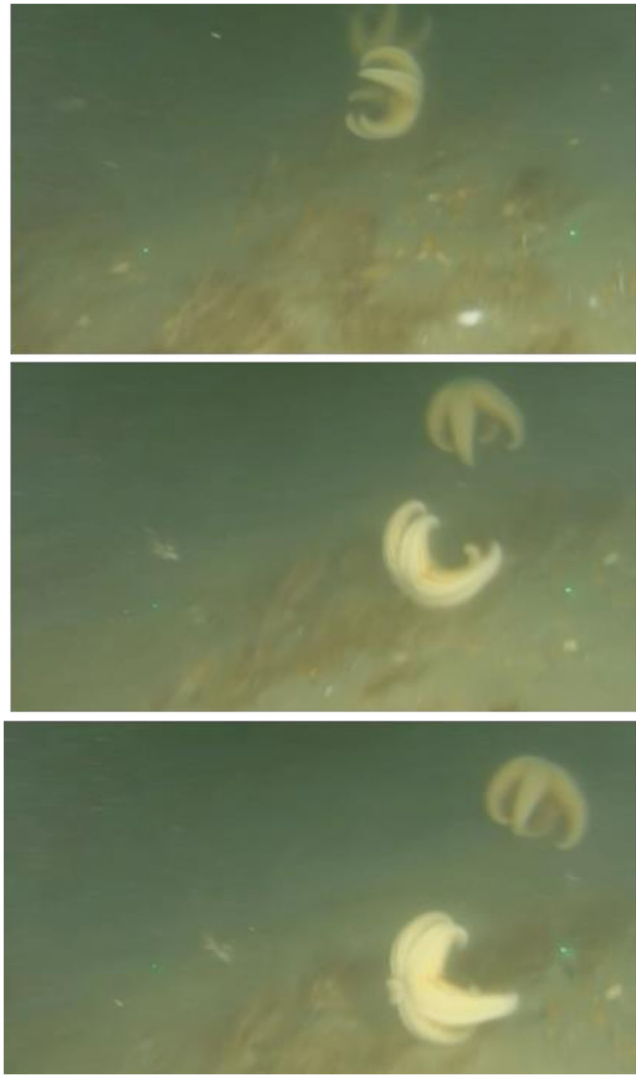

Fig. 1 Sequence of "starballing" where *Asterias rubens* has curled over their arms, assuming a spheroid position to be transported by the current

allows heterogenous terrain to be surveyed during strong tidal conditions. Traditional benthic sled surveys and scuba diving surveys tend to avoid such conditions for safety and to avoid poor visibility, which would explain why this behaviour of such a common organism has not yet been observed. Within a three minute video clip 30 (30 %) *A. rubens* were curled over and rolling across the seabed, while 69 (70 %) remained attached to the seabed. A few of the attached *A. rubens* were lifting a single arm into the water column as if to test it. It is unknown whether the "starballing" individuals were swept off the seabed by the strong tidal flow, or if the individuals allowed themselves to be transported as an adult dispersal mechanism. This hypothesis could be tested in a laboratory flow tank or with further field observations.

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