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1 **Quacks snack on smacks: mallard ducks (*Anas platyrhynchos*) observed**
2 **feeding on hydrozoans (*Velella velella*)**

3

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14

15 **Running page head**

16 Mallard ducks observed feeding on hydrozoans

17

18 **Abstract**

19 *This study presents new evidence of the extensive trophic role of gelatinous zooplankton by*
20 *documenting typically non-marine predators, mallard ducks, feeding on hydrozoans in*
21 *shallow, coastal environments.*

22

23 **Keywords**

24 Avian; cryptic trophic linkages; gelatinous zooplankton; predator-prey; trophic pathways;
25 *Velella velella*

26 Far from being trophic dead ends, gelatinous zooplankton are now known to play a host of
27 diverse roles in ecosystem functioning (Doyle et al. 2014); from mass “jelly falls”
28 following jellyfish blooms that act as carbon sinks (Sweetman & Chapman 2015), through
29 to the provision of shelter for developing invertebrate and fish communities (e.g. Lynam &
30 Brierley 2007, D’Ambra et al. 2014, Fleming et al. 2014). Moreover, aside from
31 specialised obligate gelatinivores such as leatherback turtles (*Dermochelys coriacea*
32 Vandelli, 1761; Brongersma 1969), growing evidence suggests that a vast array of taxa
33 also consume gelatinous prey periodically (see reviews: Arai 2005, Ates 2017). Predators
34 of note include juvenile bluefin tuna (*Thunnus thynnus* Linnaeus, 1758; Cardona et al.
35 2012), Atlantic bumper (*Chloroscombrus chrysurus* Linnaeus, 1766; D’Ambra et al.
36 2014), spiny lobsters (*Panulirus interruptus* Randall, 1840; O’Rorke et al. 2014), deep-sea
37 7-armed octopus (*Haliphron atlanticus* Steenstrup, 1861; Hoving & Haddock 2017) and
38 other gelatinous species (e.g. Purcell 1981, Purcell 1991).

39 By contrast, episodic feeding on gelatinous species by avian predators has only been
40 described recently, with initial reports of scyphozoan jellyfish acting as fish aggregation
41 devices (e.g. Richardson et al. 2009, Sato et al. 2015) which can be exploited by birds.
42 With the advent of animal-borne cameras there is also evidence of penguins *Pygoscelis*
43 *adeliae* (Hombron & Jacquinot, 1841) feeding directly on gelatinous prey throughout the
44 Southern Ocean (Thiebot et al. 2016). Here we build on this growing body of evidence by
45 providing observational evidence of an unreported trophic pathway; the ingestion of the
46 hydrozoan *Verella verella* (Linnaeus, 1758) by mallard ducks *Anas platyrhynchos*
47 (Linnaeus, 1758).

48 Following a period of unsettled weather in the Italian district of Liguria in late May 2016,
49 two individuals (one male, one female) were observed browsing and feeding on a large

50 patch of *V. veleva* (Fig 1) which had been washed into the shallow harbour of Santa
51 Margherita Ligure (44°20'1.1"N, 9°12'50.7"E on 30th May 2016, see Fig 2).

52 The ducks were seen feeding on *V. veleva* within the hydroid patch (Fig 3); but poor
53 lighting at the time prevented any estimates of ingestion rate or prey handling duration.
54 Since we are not proposing that ducks feed routinely on such prey, the simple finding that
55 such trophic links even exist is not hindered by a lack of empirical data. More explicitly,
56 although predation on *V. veleva* has been noted in a variety of oceanic vertebrate predators
57 (Purcell et al. 2012) including several other avian species such as fulmars (*Fulmarus*
58 *glacialis* Linnaeus, 1761; Williams et al. 1991), predation by typically non-marine species
59 illustrates that the trophic role of gelatinous zooplankton can, on occasion, extend further
60 than previously thought.

61

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71

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111

112 **Figure legends**

113 **Fig. 1** A by-the-wind-sailor or *Verella verella* washed up on Santa Margherita Ligure

114 beach

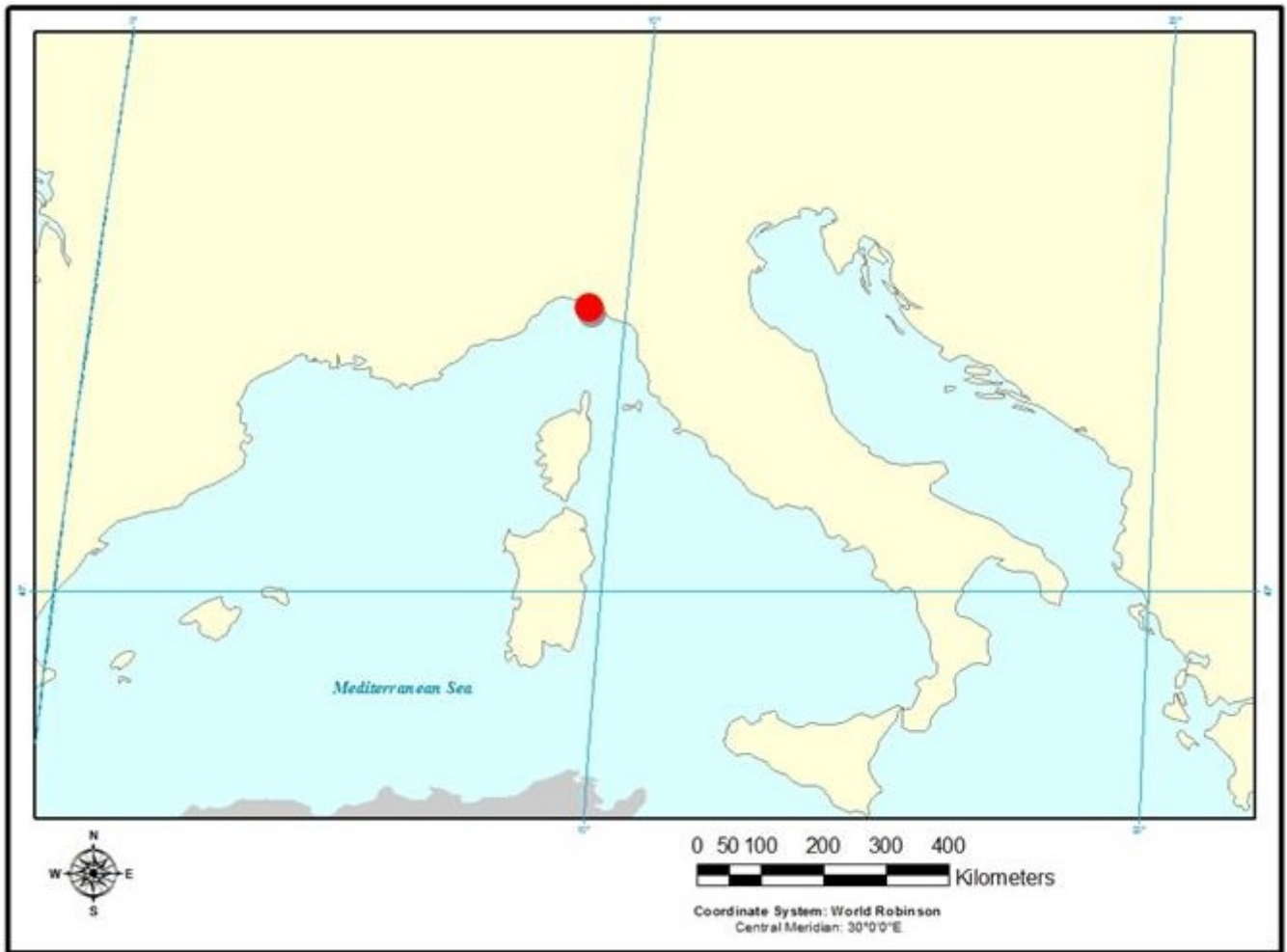


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116

117 **Fig. 2** Map showing location of Santa Margherita Ligure, Italy produced using ARCGIS

118 10.3.1 (ESRI, California, USA)



119

120 **Fig. 3** Mallard ducks feeding on *Verella verella* in Santa Margherita Ligure harbour



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