

Potential impacts of the occurrence of blooms of *Blackfordia virginica* in the Mira estuary, SW Portugal

Maria Manuel Angélico¹, Filipa Marques^{1,2*}, Paula Chainho², Isabel Domingos^{2,3}, Alexandra Teodósio⁴ & José Lino Costa^{2,3}

¹ Instituto Português do Mar e da Atmosfera - IPMA, Lisboa, Portugal
² Centro de Oceanografia, FCUL, Universidade de Lisboa, Portugal
³ Departamento de Biologia Animal, FCUL, Universidade de Lisboa, Portugal
⁴ Centro de Ciências do Mar, Universidade do Algarve, Faro, Portugal
 * filpacostamarques@gmail.com



Jellyfish species have been accidentally introduced worldwide and some have caused tremendous ecosystem disruptions and economic losses.

Blackfordia virginica >>

Surveying

- Sept 2012 - Dec 2013: plankton tows (200µm mesh) and environmental variables
- Quarterly along the estuarine gradient - spatial distribution, environment, diet
- Monthly at a fixed location (Casa Branca) - temporal distribution, environment, diet

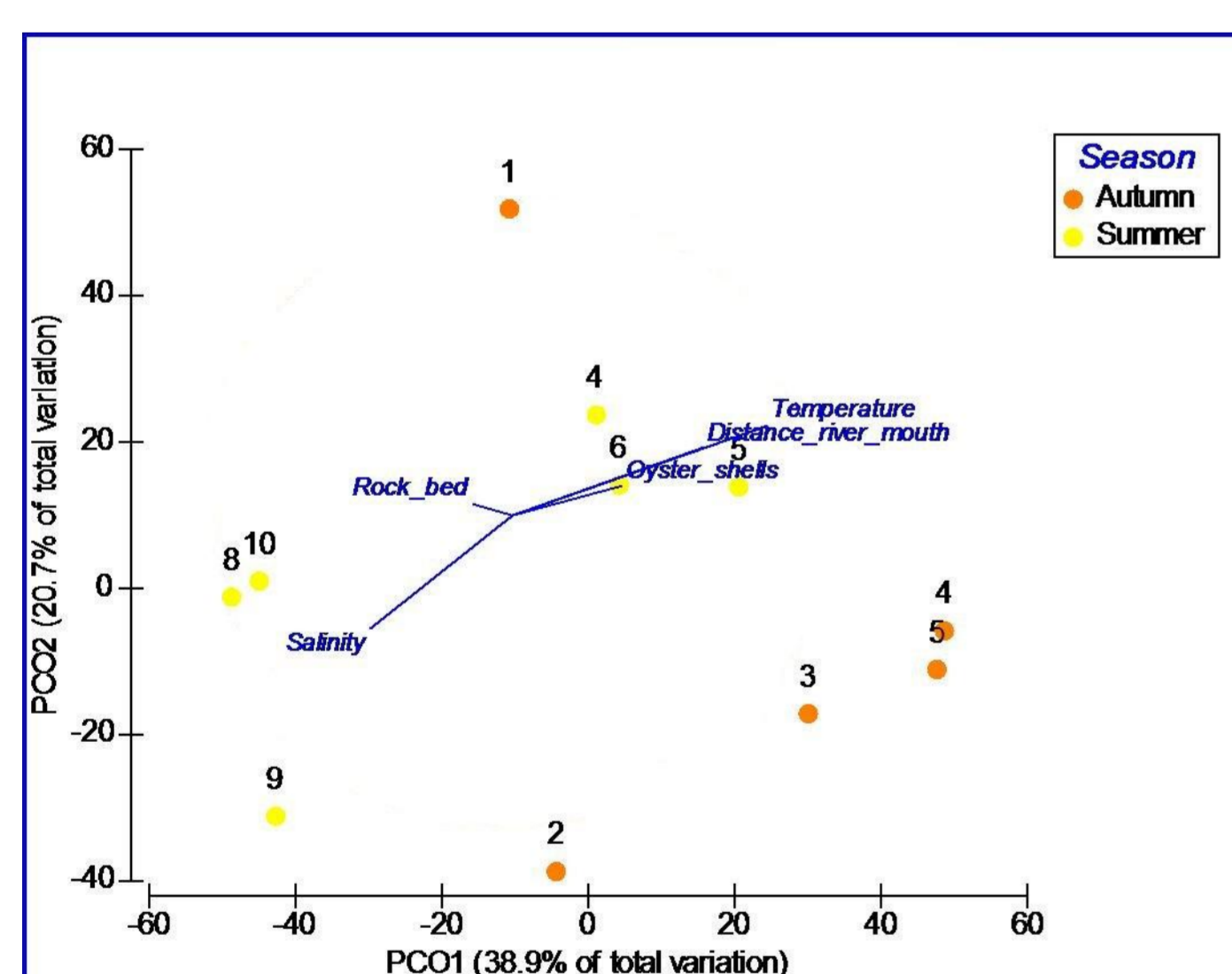
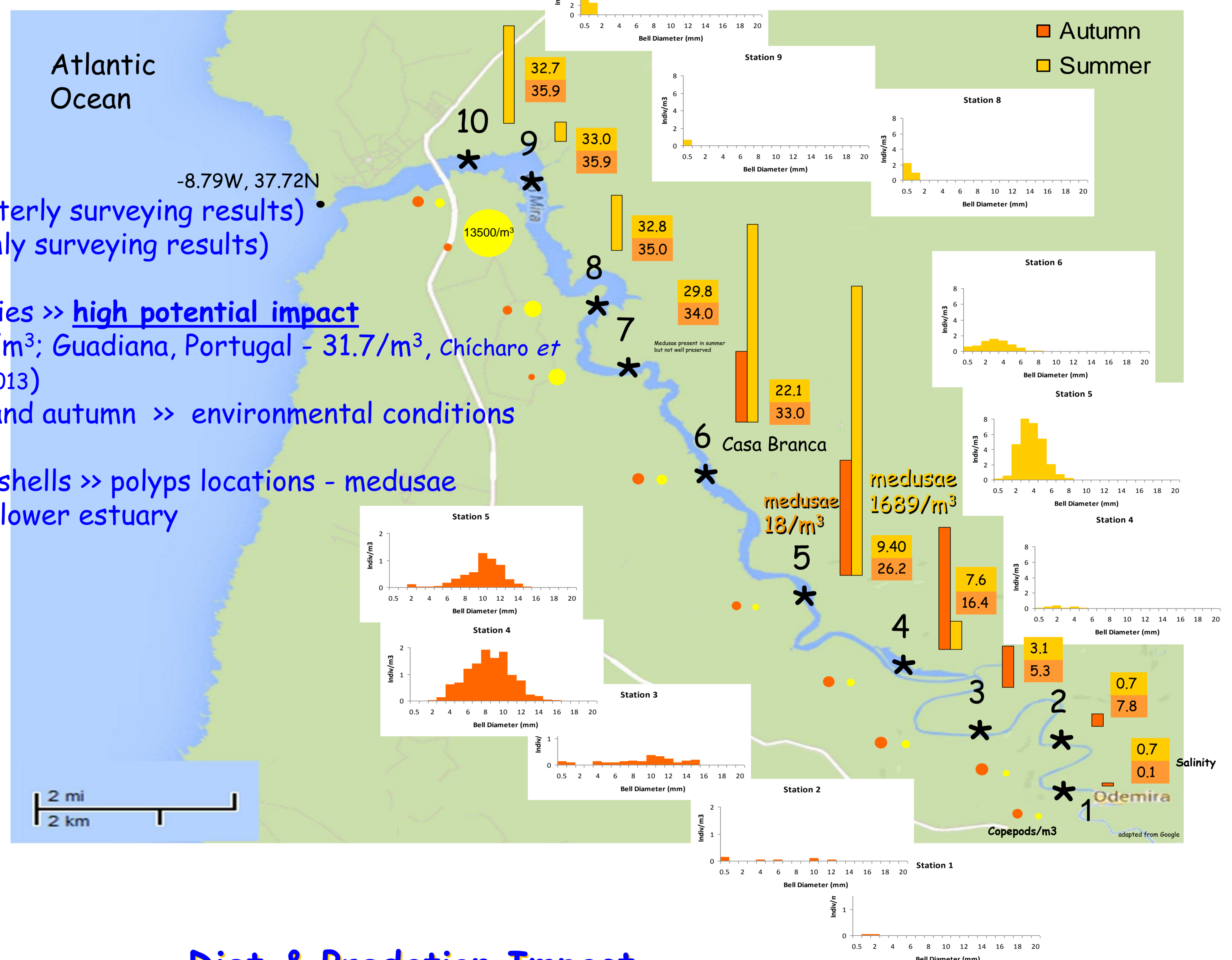


Blackfordia virginica is a small hydrozoan with sessile polyps and planktonic medusae (max. bell size ~ 20 mm) which are produced during the warmer period of the year and may cause blooms. Feeds on plankton.

An established population of this non-indigenous species has been observed in the Mira estuary since 1984 but impacts over fish and zooplankton communities have not been reported.

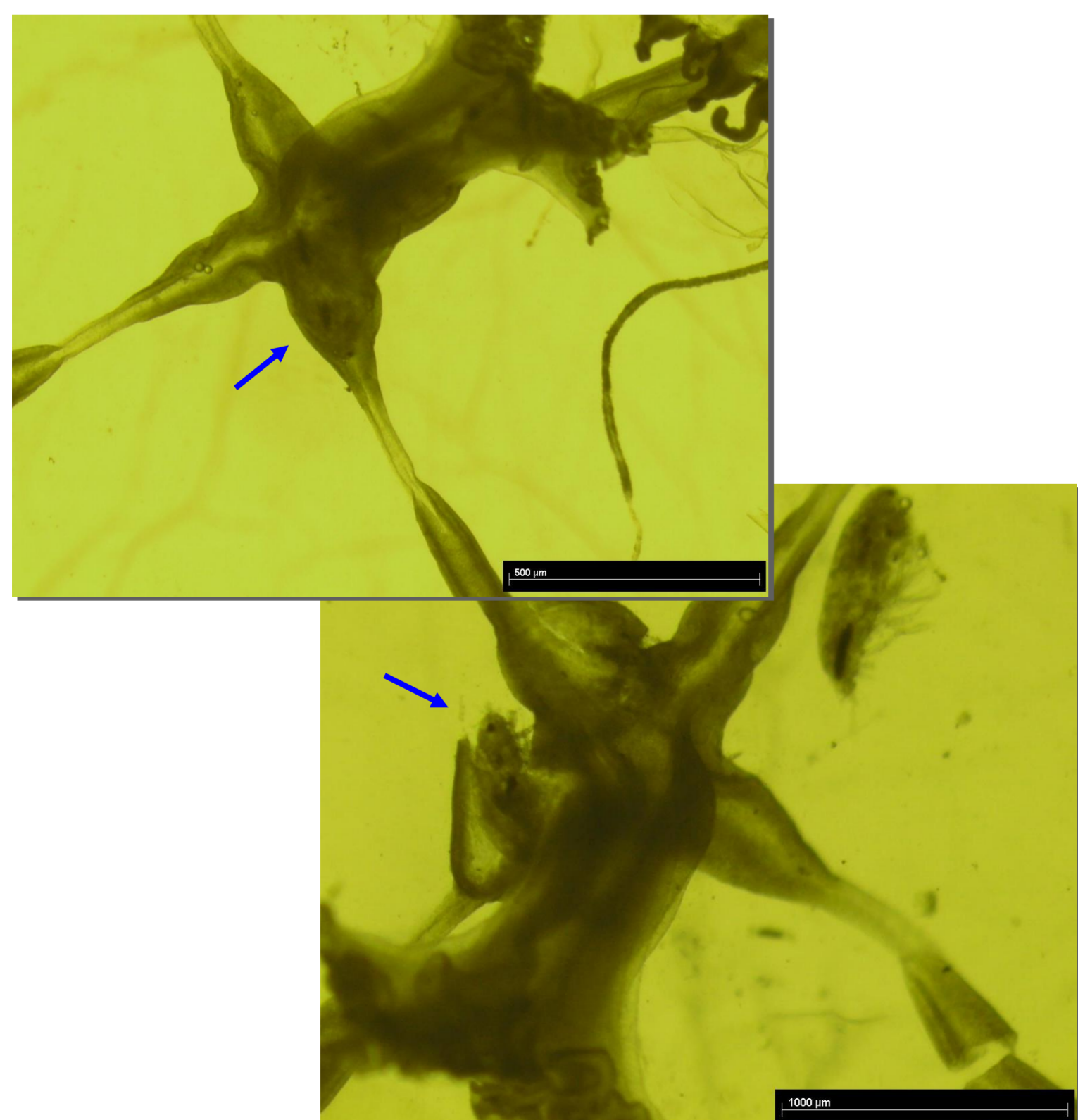
Abundances Distribution Size Composition Environment

- Medusae present in summer and autumn (quarterly surveying results)
- Higher abundances during May-August (monthly surveying results)
- More abundant in mid-estuary
- Abundances much higher than in other estuaries >> **high potential impact** (maximum abundances: this study - 1689 indiv/m³; Guadiana, Portugal - 31.7/m³, Chicharro *et al.*, 2009; Petaluma, USA - 232/m³, Wintzer *et al.*, 2013)
- Size distribution pattern distinct in summer and autumn >> environmental conditions (salinity) and food availability (plankton)
- Small medusae associated to rock and oyster shells >> polyps locations - medusae emission more likely to occur in the middle and lower estuary



Ordination using medusae size distribution data during summer and autumn (PERMANOVA factor season, summer vs autumn, p=0.03)

Diet & Predation Impact



- Preys were only registered in 6% of the medusae observed (4884) >> possible discontinuous feeding rhythm or potential feeding on smaller microorganisms and/or suspended organic matter.
- The diet included copepods, cirriped nauplii, decapod larvae and anchovy eggs (*Engraulis encrasicolus*)
- Copepods, mainly copepodite developmental stages, were the dominant prey (>97%)
- 1 to 12 preys were counted per individual
- Potential predation impact (copepod mortality rate) estimated between June and October higher than estimations for San Francisco estuary (0.7 day⁻¹, J. Donald, *pers. comm.*)

Blackfordia virginica
induced copepod mortality rate

Sampling	Day ⁻¹
28May13	0.02
04Jun13	4.66
12Jun13	4.90
10Sep13	2.44
08Oct13	1.47
07Nov13	0.82
16Dec13	0.09

Predation Impact: $\mu = D \times F$
 D = Density of medusae (indiv/litre)
 F = Clearance rate (litre/indiv/day)
 (Hasson *et al.*, 2005, digestion time from A. Wintzer *pers. comm.*)