

# Where do aliens come from?

## The case of *Thalia orientalis*

Mirna Batistić<sup>1</sup>, Rade Garić<sup>1</sup> and Katja Peijnenburg<sup>2</sup>

<sup>1</sup>Institute for marine and coastal research (University of Dubrovnik), Dubrovnik, Croatia

e-mails: mirna.batistic@unidu.hr, rade.garic@unidu.hr

<sup>2</sup>Naturalis Biodiversity Center, Vondellaan 55, Leiden, The Netherlands

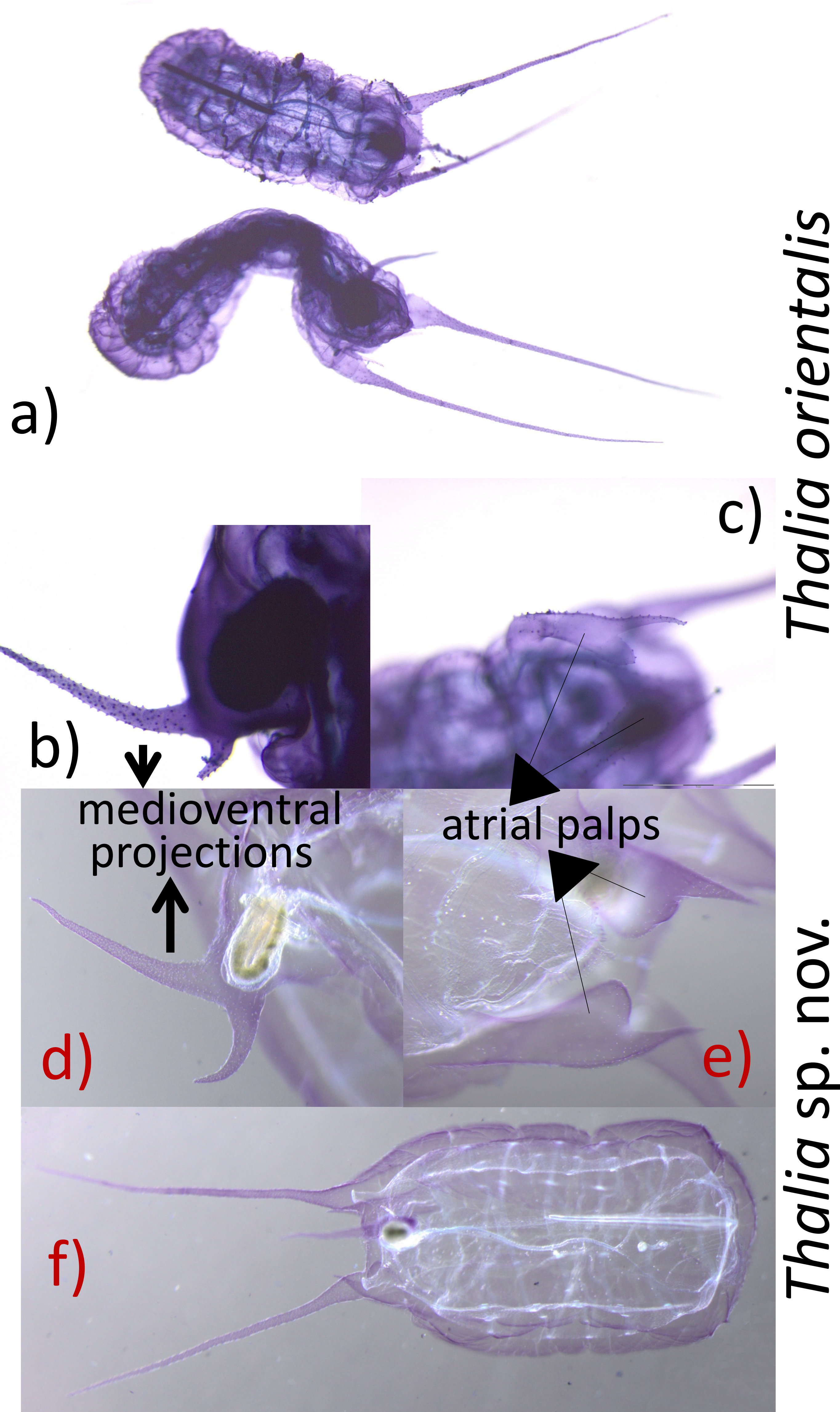
e-mail: K.T.C.A.Peijnenburg@uva.nl



AdMedPlan



A planktonic tunicate determined as *Thalia orientalis* Tokioka, 1937 was recorded for the first time in the Adriatic in 2007, when prevalent circulation pattern in the North Ionian Gyre was changing from cyclonic to anticyclonic, thus starting to bring more of western Mediterranean waters into the Adriatic Sea. Since *T. orientalis* is present in Red Sea as well as in Atlantic, it was hard to determine where from exactly did it arrive. In order to determine the origin of the Adriatic specimens we sequenced 757 nucleotide long fragment of 18S rRNA gene from the Adriatic and Pacific (Hawaii) specimens of the *T. orientalis*. **Uncorrected p-distance between sequences was 1.98 %**, which suggests that the specimens are of separate entities. The Adriatic and Pacific specimens differ also morphologically in the shape of atrial palps and medioventral projections. As *Thalia orientalis* was described based on specimens from the Pacific, Adriatic specimens should be considered as a new, still undescribed species. Our results emphasize importance of DNA methods in determining the origin of alien species as well as the mechanisms of their dispersal.



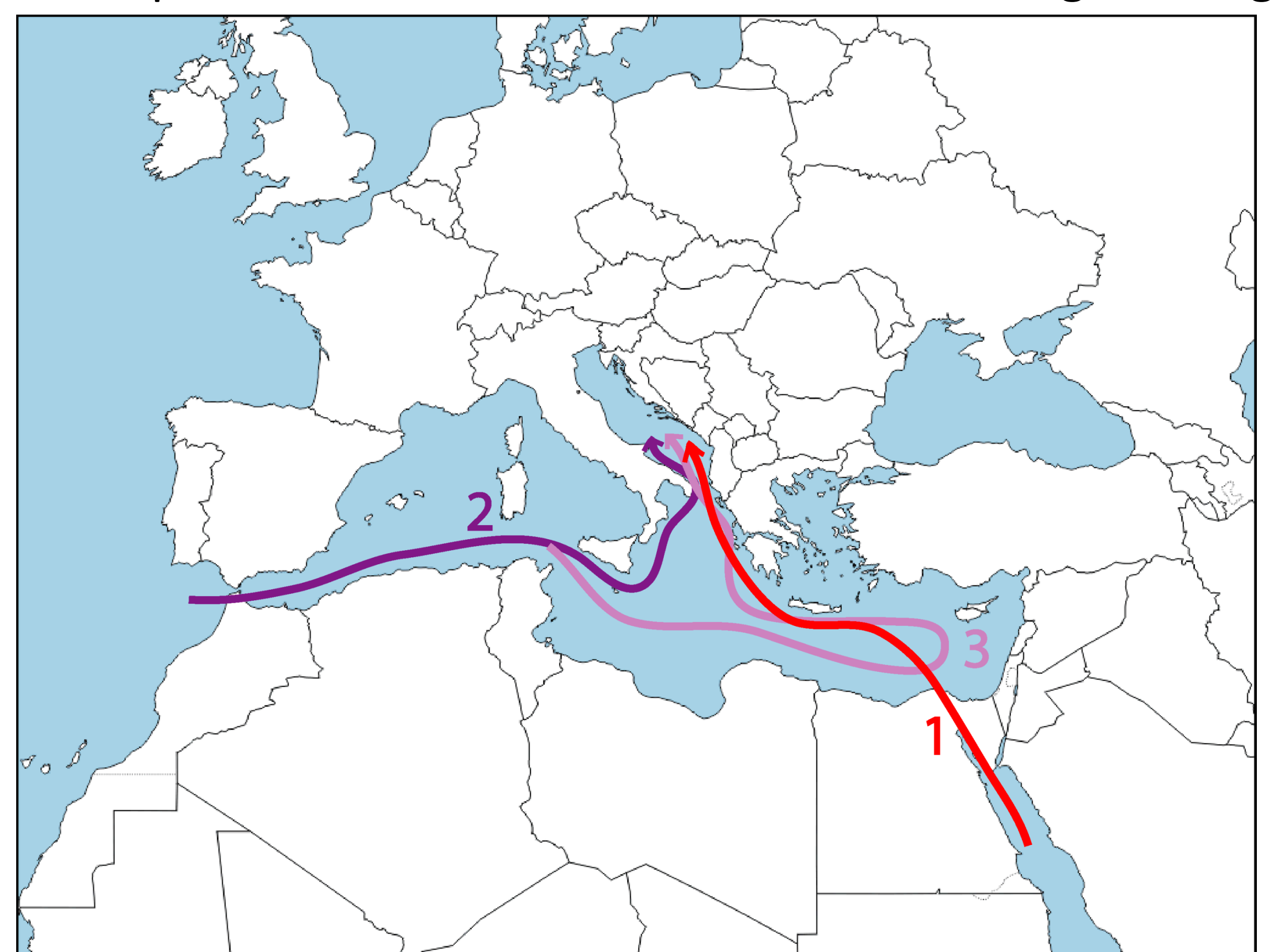
- *Thalia orientalis* Tokioka 1937

a) whole animals, b) medioventral projections, c) atrial palps

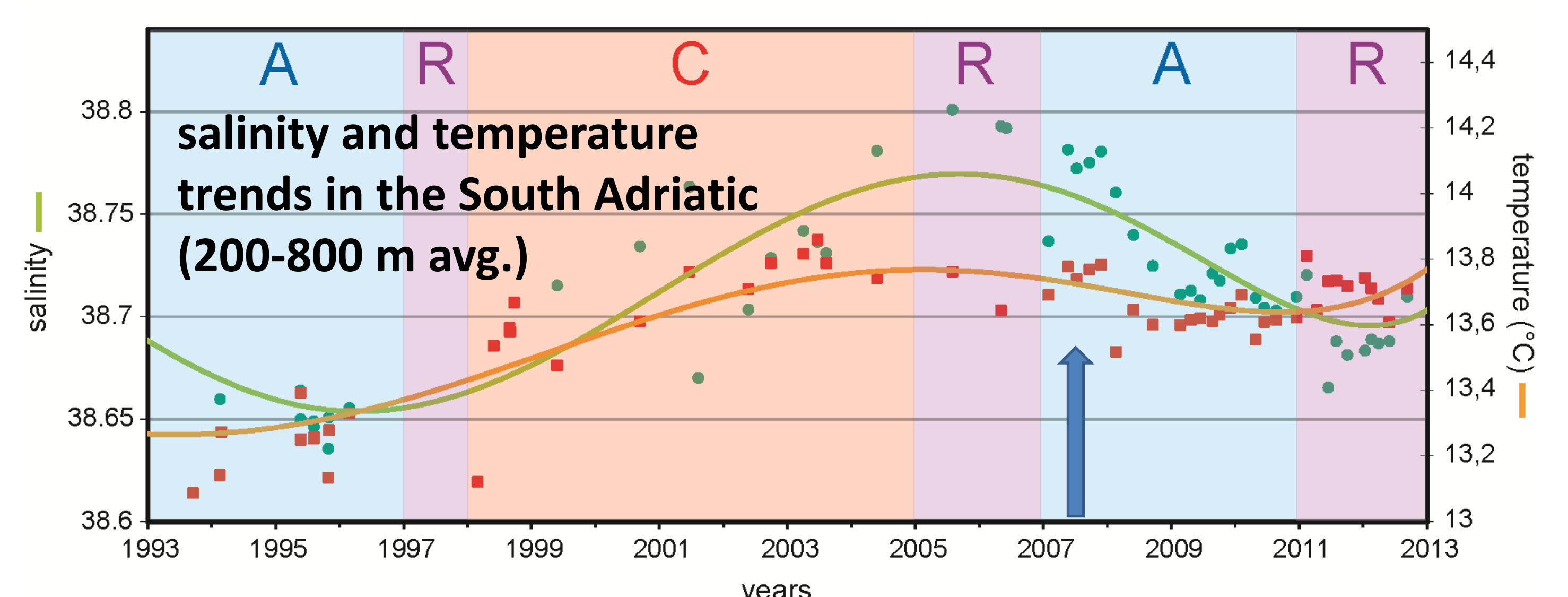
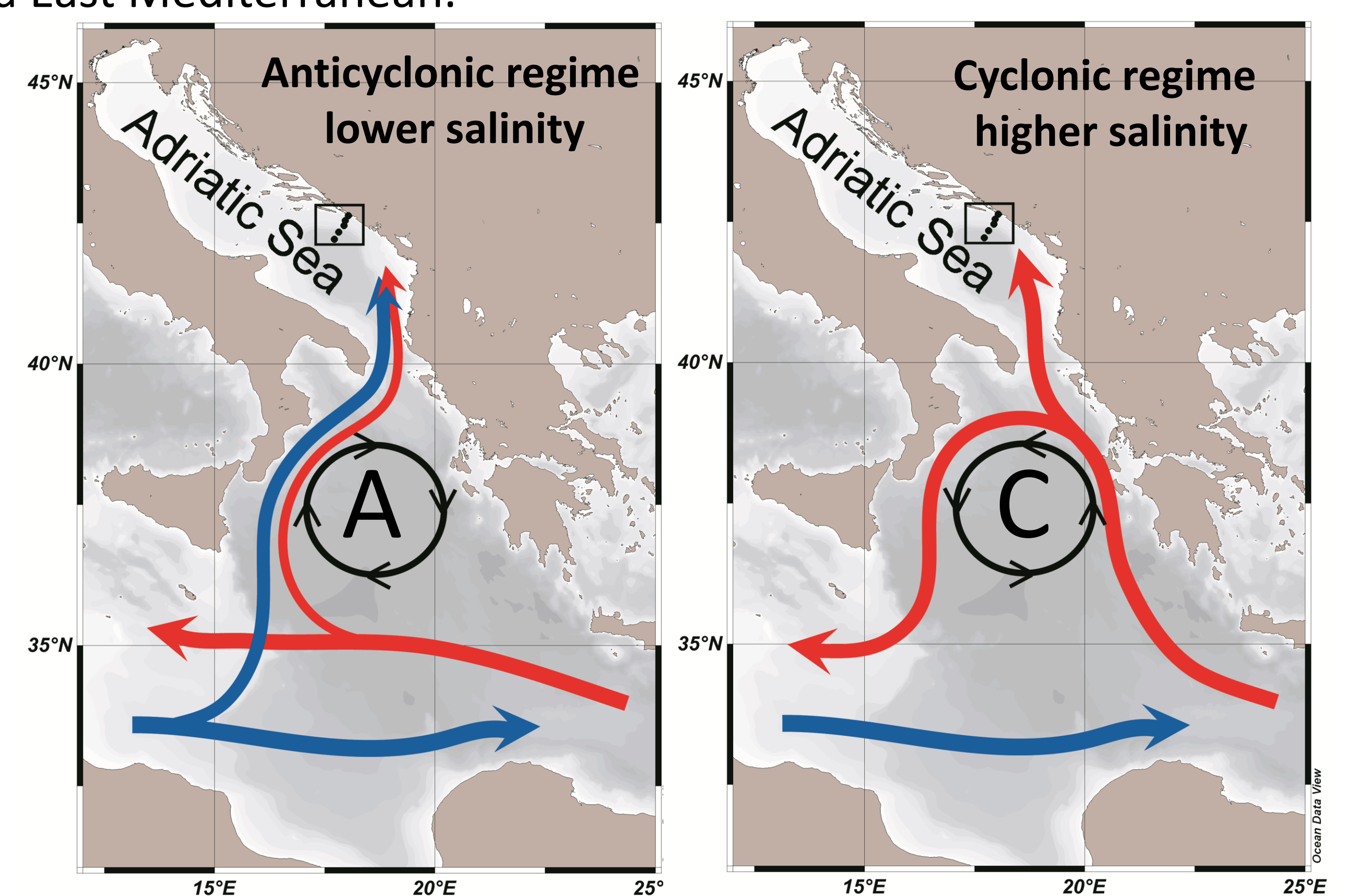
- *Thalia sp. nov.*

d) medioventral projections, e) atrial palps, f) whole animal

***Thalia orientalis* has more echinate test than *Thalia sp. nov.* They differ in the shape of mediolateral projections, the length of posterior projections and the shape of atrial palps.**



Possible routes of entrance of *Thalia orientalis* (now proved to be *Thalia sp. nov.*) into the Adriatic Sea. 1) entrance from the Red Sea through the Suez channel, 2) entrance from the Atlantic/West Mediterranean, 3) entrance from the Atlantic/West Mediterranean via East Mediterranean.



Salinity changes in the South Adriatic on pluriannual scale depending on the circulation regime of the North Ionian Gyre. *Thalia sp. nov.* arrived during early anticyclonic phase suggesting it arrived from the Western Mediterranean/Atlantic. A – anticyclonic, R – reversal, C - cyclonic