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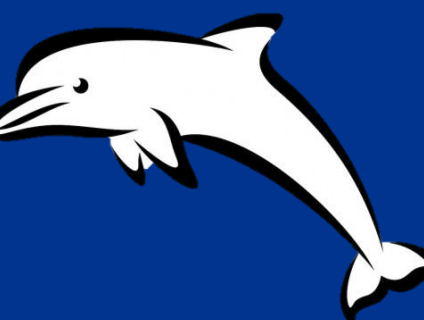
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Physiological and behavioural responses of Bottlenose Dolphin *Tursiops truncatus* to gustatory chemical stimuli

Pablo Pezzino¹ and Bertrand Bouchard¹, Julieta Arenarez³, Alba Rincon Monne³, Andreas Fahlman³, Sylvia Campagna¹, Angelo G. Torrente² and Aurélie Célérier¹

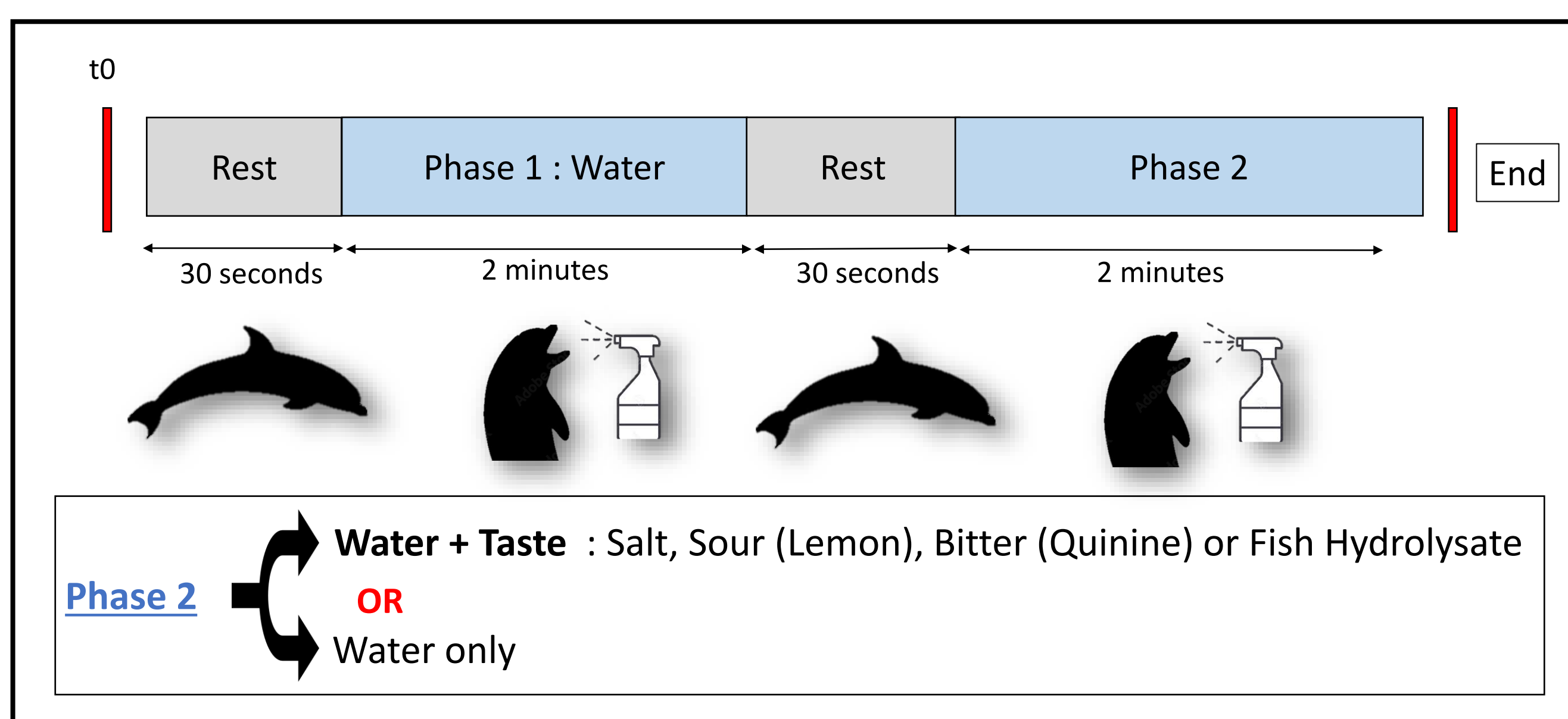
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Introduction

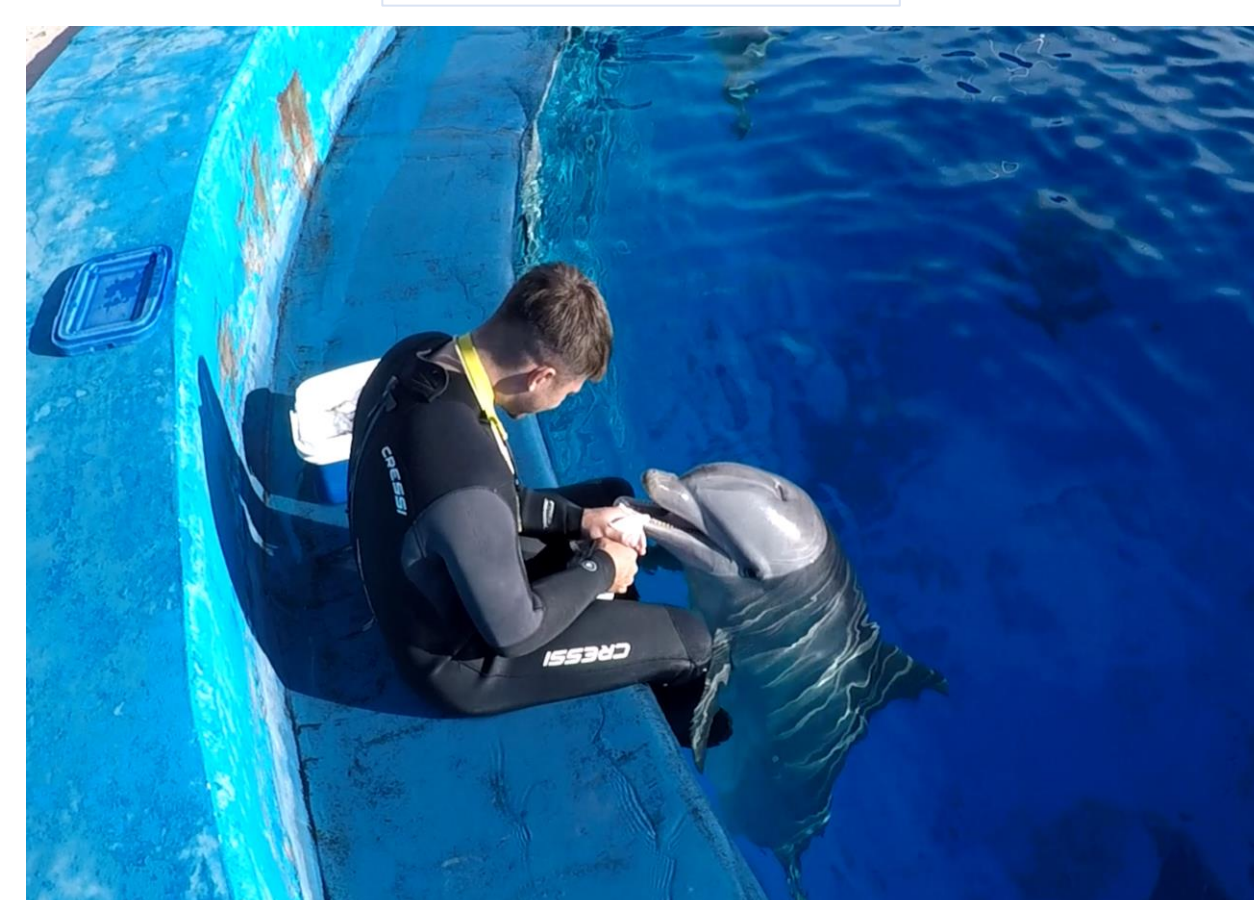
Chemical perception is the **first modality** that evolved in animals to sense the surrounding world. In terrestrials' mammals, chemical perception plays a crucial role in feeding, orientation, communication and much more. Conversely, information regarding this aspect is **notably scarce in marine mammals**, especially in cetaceans. The limited studies available so far indicate a **partial regression** of both anatomical structures and key genes families involved in olfaction and gustation. However, different behavioural observations suggest that chemical perception could be functional. In this study, we aimed to shed light on the chemical perception of Bottlenose Dolphins, focusing one of the chemical facet : **gustatory sense**. Gustation is characterized by the detection of molecules through taste receptors on the surface of papillae. We expected to unveil conserved processes and signalling pathways, through physiological and behavioural measurements. These findings would indicate that chemical senses could have kept a biological utility through odontocetes evolution.

Experimental design



Rest & Reward position

Testing position

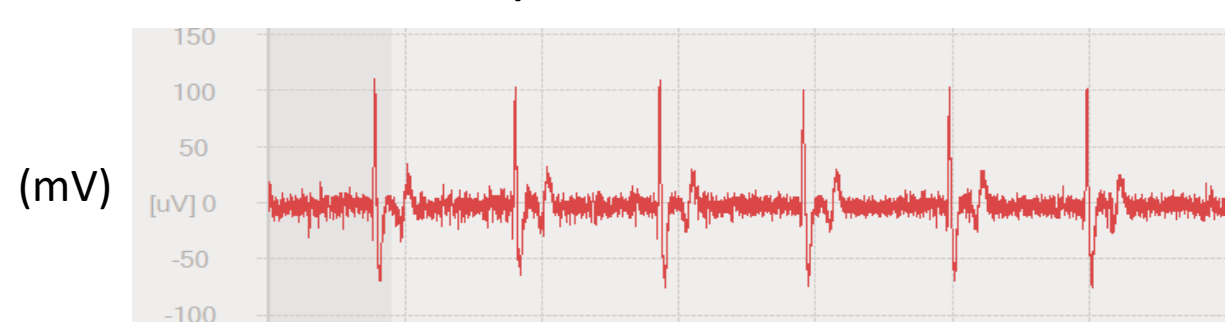


Physiological variables

Logger developed to record underwater electrocardiograms (ECG) in dolphins



Dolphins ECGs

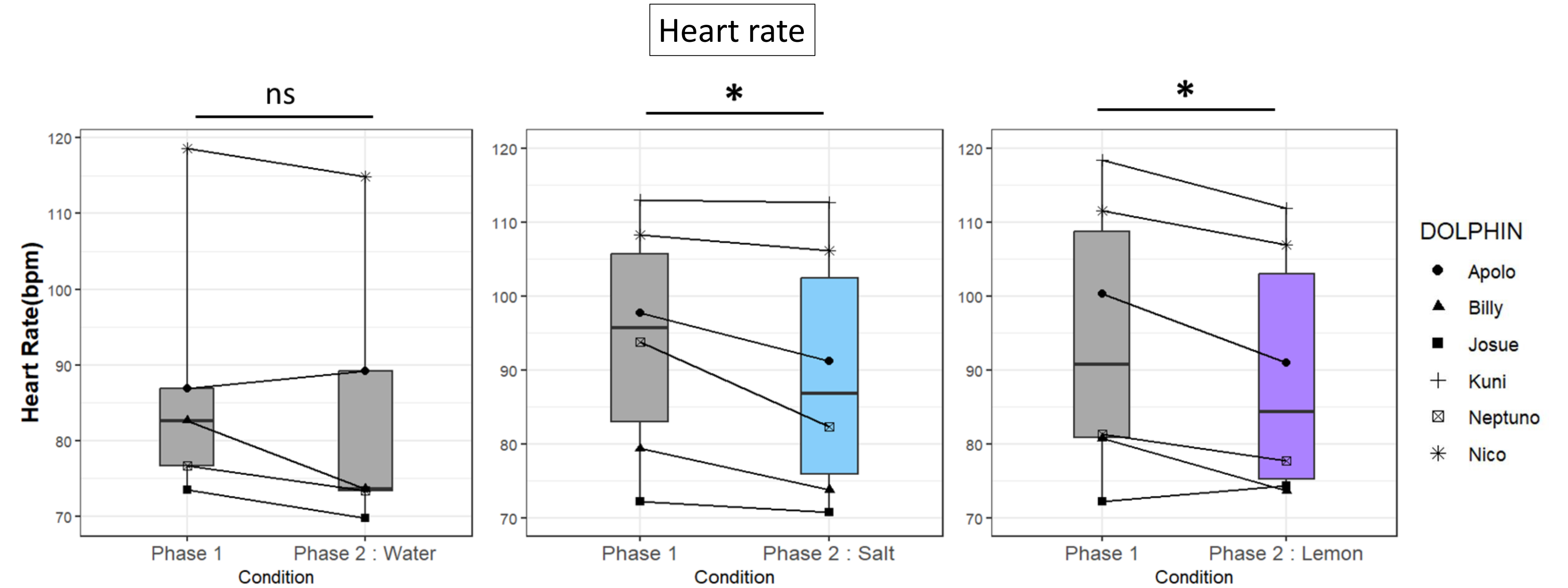


Behavioural variables

- Mouth openings and closing
- Vocalisations
- Breathing rate
- Avoiding behaviours (turning back, recoil)

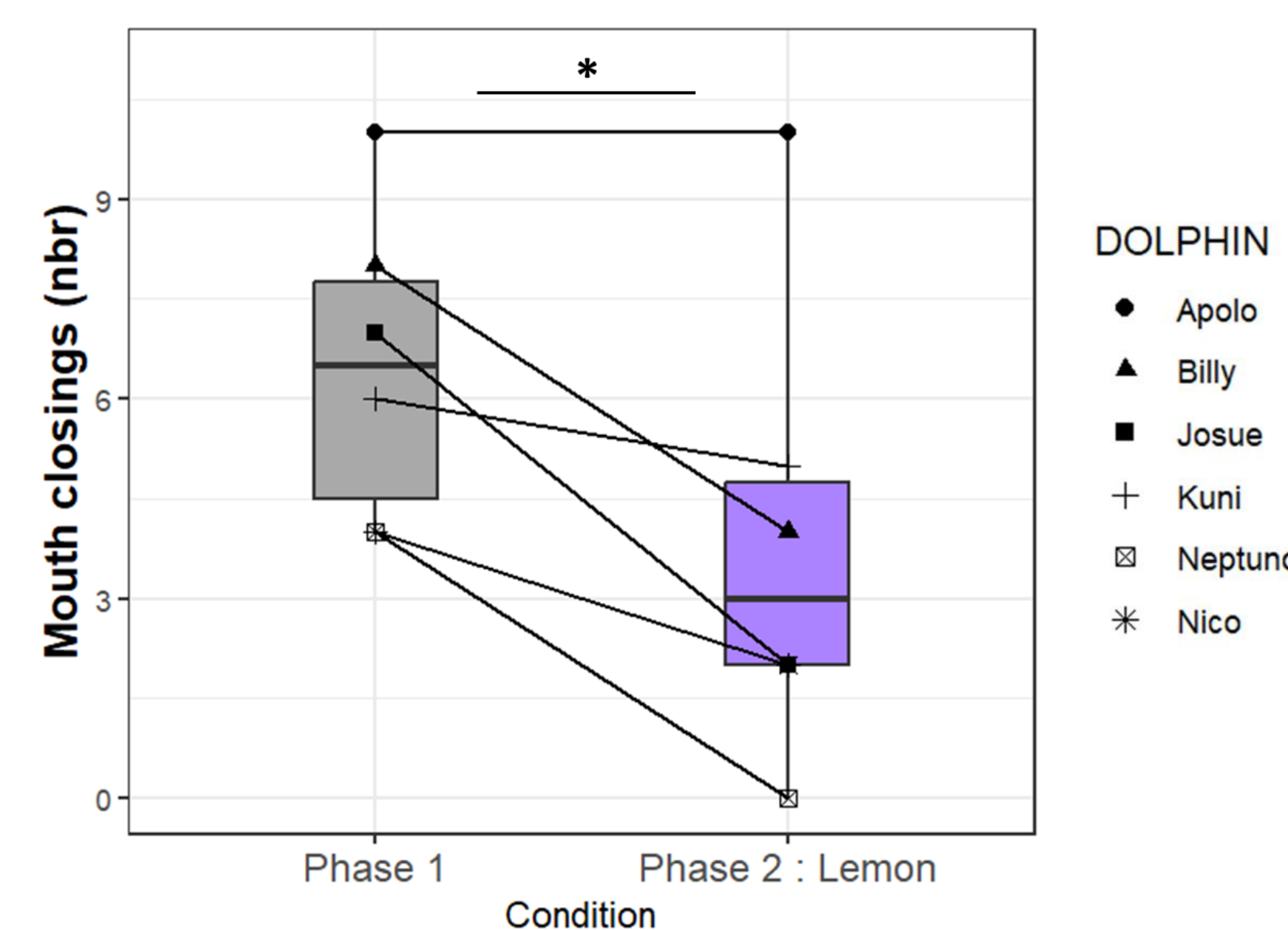


Main results



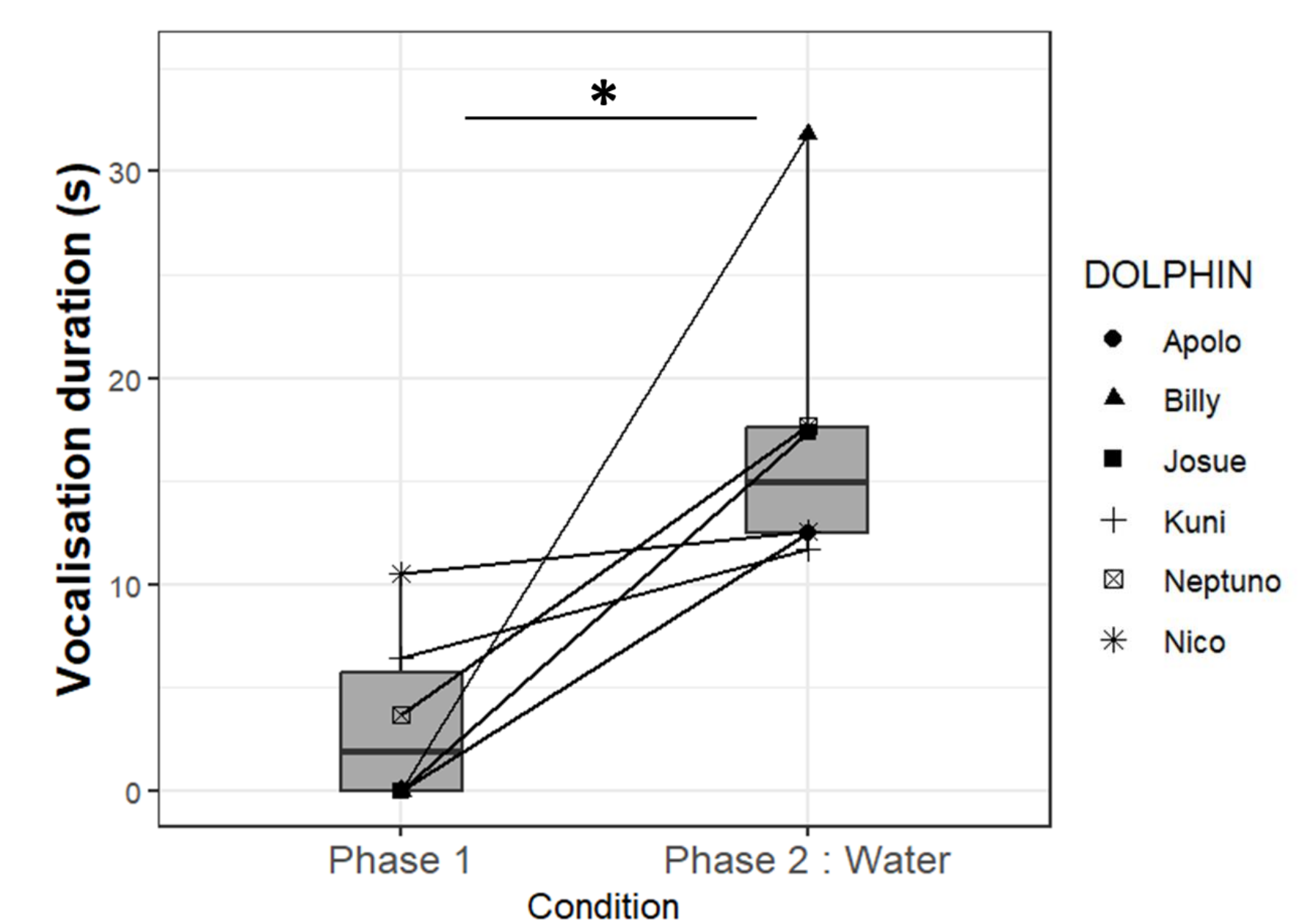
We observed a **significant decrease in heart rate** when the Phase 2 of the session was either **salt or lemon** compared to the Phase 1 (water). This effect was not observed when the Phase 2 was Water, Quinine or fish hydrolysate.

Mouth movements



The animals significantly **closed less their mouth** only when **lemon** was presented.

Vocalisations



The animals **vocalized more** during the Phase 2 when it was only Water. That did not happen with any actual taste.

Discussion & Conclusion

❖ Significant response for **Salt and Lemon** ➡ trigger behavioural and physiological response ➡ **functional gustatory perception** emotional response by autonomic nervous system ?

❖ Perception through **channels** (in opposition to GPCR for quinine/fish taste) ➡ some **molecular pathways** still operational in cetacean and may play a role in the sensory ecology : ➡ detection of **salinity gradient** near estuaries or in depths, perception of the **acid compounds** that may be clues of organic activity (through dissolved CO₂)

❖ **Vocal response** detected only when Water in Phase 2 ("no taste" session) ➡ **frustration** reaction from the animal due to the perceived absence of taste stimuli ?