COMMON DOLPHINS HAVE DISTINCT ACTIVITY BUDGETS IN THE NORTHERN AND SOUTHERN BAY OF BISCAY

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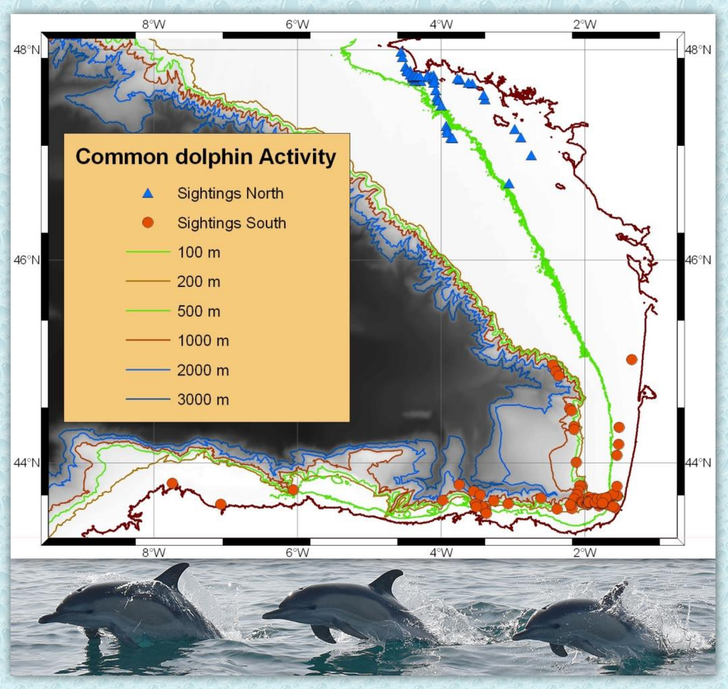
INTRODUCTION & MATERIALS

Activity budgets are essential elements of cetacean ecology, particularly in a conservation context.

From 2020 to 2025, we studied Common dolphins (*Delphinus delphis*) in the Bay of Biscay (BoB), using a dedicated sailboat with a crew of 3 to 5 persons, and *PADOC* mobile application to document behaviours. Visual and passive acoustic techniques were employed to determine the activity of dolphins schools during summer, both in the southern (2020-2024) and northern BoB (2025). Sampled habitats were different in the northern region, N.BoB (neritic habitat with water depth < 120 m) and in the southern region, S.BoB (slope habitat, with a predominance of water deeper than 200 m).

Only Common dolphin sightings collected with suitable conditions were selected to provide activity data:

Wind ≤ Beaufort 3, daylight hours (9h-21h), sighting duration ≥ 2 minutes and a maximal observation distance of 800 meters. Similar conditions were selected for both S.BoB and N.BoB.



METHODS: DATA COLLECTION

Data were collected during motorized sailboat surveys from 2020 to 2025, which were constrained by wind (equal or less than Beaufort 4) and swell conditions (less than 1.5 meter). Boat speed was five knots (2.6 m/s) on average, the diesel engine being used to maintain a predetermined course according to wind conditions. Survey protocol combined one-minute acoustic monitoring every 10 minutes and continuous visual searching with naked eye, three observers sharing the 180° frontal sector.

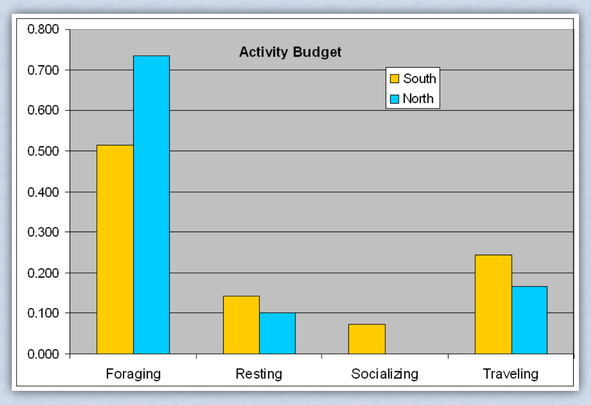
The hydrophone array was a (2+2) *Ecologic* system which was towed 120 meters behind the boat and used in high-frequency mode (two spherical 2-150 kHz elements with preamplifiers, global sensitivity -160 dB re1V/µPa), feeding an analog amplifying and filtering device (*MAGREC* HP27st). Output was connected to a *Fireface* 400 analog-digital converter (24 bit resolution, 110 dB signal to noise ratio, frequency response < 1 dB from 5 Hz to 90 kHz), feeding a lunch box PC. A sampling rate of 96 kHz was used.

Upon cetacean detection, the crew switched to an observation mode, one observer confirming the species with binoculars and visual observers collecting behavioural data *ad libitum* while the acoustic system recorded underwater sounds. The dolphin school was progressively approached to a distance of about 300 m following a minimal disturbance protocol, to collect data on school structure and behaviour. A second phase eventually involved a closer approach, staying farther than 100 m, to check for calf presence and improve school size estimation.

RESULTS I

153 sightings were available for analyses, **109** in the S.BoB and **44** in the N.BoB, out of which **100** had their activity determined from visual and acoustic observation data (resp. 70 and 30 in S.BoB and N.BoB).

Activity budgets were significantly different in the southern and northern BoB, with **51.4%** of dolphins groups of the first region observed foraging, against **73.3%** in the north (*Chi-2* test, p< 0.04). Both frequencies included mixed activity cases, *i.e.* when dolphin groups were simultaneously foraging and either traveling, socializing, or resting. A higher proportion of groups were observed resting or traveling in the S.BoB, and none of the schools observed in the N.BoB were recorded only as 'socializing'.

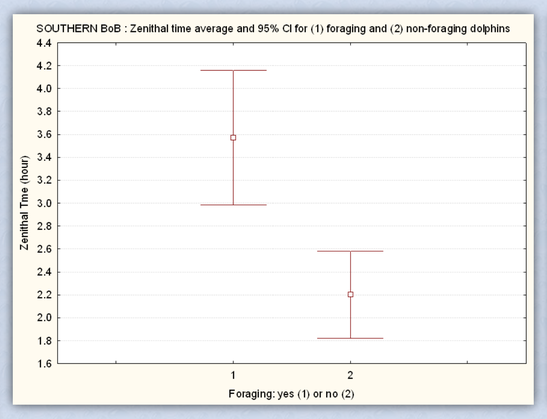


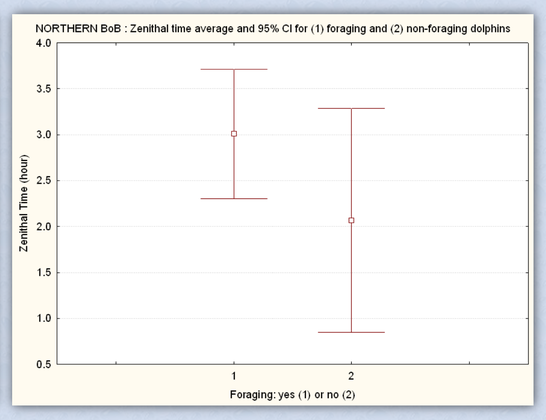
RESULTS II

To provide additional informations on foraging habits in both regions, normalized 'zenithal' times (ZT) were calculated as the absolute difference between the local sighting time and 14h00 (which is approximately the zenithal time on 30 July in the Bay of Biscay, UTC+2). Higher ZTs correspond to earlier in the morning or later in the afternoon.

In the southern region, the **mean foraging ZT** (**3.57 hour**, SD= 1.71) was significantly higher (*T-test* p < 10^{-4}) than the **mean non-foraging ZT** (**2.20 hour**, SD= 1.24), while the difference was not significant in the northern region (foraging ZT= 3.00, SD= 1.61, non-foraging ZT= 2.07, SD= 1.94).

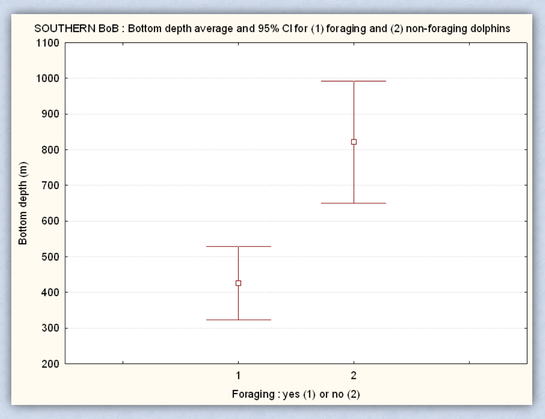
Common dolphins tend to forage earlier in the morning or later in the afternoon in the S.BoB, when they did not favour a particular day period in the N.BoB.



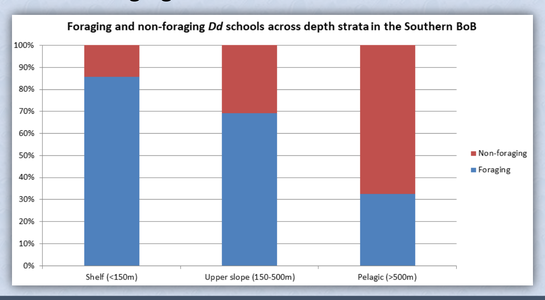


RESULTS III

To further document dolphin feeding habits, we calculated the average bottom depth for locations of foraging and non-foraging groups in the southern region. **Foraging dolphins** were observed in **shallower waters** (mean depth of **425 m**, SD= 299 m) than **non-foraging dolphins** (mean depth of **821 m**, SD= 555 m) and this was statistically significant (*T-test* p< 10^{-4}). A similar calculation was not meaningful in the extended neritic habitat of the northern region.



Reciprocally, sorting of sightings by increasing depth strata showed a decreasing trend in terms of foraging versus other activities.



DISCUSSION I

Our results show that N.BoB Common dolphins spend most of their day-time foraging, and that their environment apparently provide them round-the-clock access to suitable prey items. Three different day-time foraging modes were observed: two epipelagic modes (either chasing seemingly scattered fishes, or statically feeding on shoaling fishes with a slow pace) and one mesopelagic. Although the hydrophone could not always be deployed due to shallow water, echolocation click trains were frequently absent during the two epipelagic foraging modes.

All our N.BoB sightings were done on the continental shelf, where common dolphin summer densities are known to be relatively low except in the northwestern part of the area (*e.g. SCANS-IV* data). Given the large width of the northern Biscayan shelf, dolphins found over it probably spend several consecutive weeks on this habitat, and therefore select areas where they can find a sufficient amount of good quality preys to sustain them during prolonged periods (sardine for instance is an important fishery resource in the Bay of Biscay in spring (Doray *et al.*, 2018) and summer). This condition may for example not be met on the central Biscayan shelf, where common dolphin summer densities are the lowest.

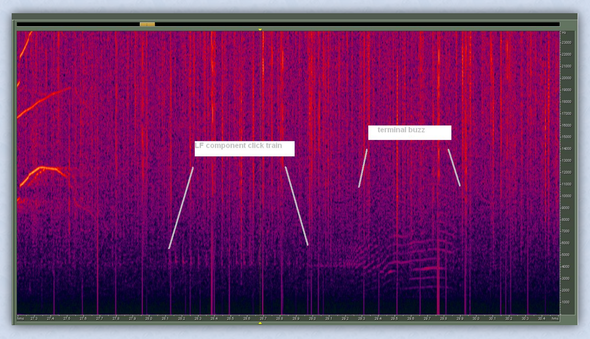
In the S.BoB, the continental shelf is narrow and intersected by deep canyons such as *Gouf de Capbreton*, with steep slopes separating the two habitats in our area of study. Given this topography, one may suppose that dolphins can easily go back and forth between the different habitats, particularly when they are seen less than 20 km from the slope.

In this area, our results indicate that Common dolphin's day-time foraging takes place predominantly early in the morning and late in the afternoon. Percents of foraging schools for each depth stratum also show that S.BoB Common dolphins mainly use shallower waters to feed, and use deep waters to perform other vital activities.

Taking this into account, a pendular diel movement, similar to what is observed for other dolphin species elsewhere (Gannier, 1999), would be, for at least some of the dolphins, a plausible theory. Under this hypothesis, it is unclear what would be the primary trigger of the movement, in an area where direct anthropic (*e.g.* recreational boating) isn't extremely developed and where the pressure from fishing activity (leisure or professional) is not dramatically lower in the *Gouf* compared to the nearby shelf, except regarding trawling. Biotic aspects could be important factors, either related to movements (horizontal and/or vertical) and availability of favourite preys, or simply to dolphins vital activities (gathering in larger schools in deeper waters (GREC *unpub. data*) to socialize or rest).

DISCUSSION II

Although foraging mostly takes place in shallower waters, it was also observed with a lower frequency in deep waters, perhaps with different target preys: small epipelagic fishes such as sardines are probably the main prey above the shelf, but mesopelagic species are known to be eaten by offshore Common dolphins in the BoB, and could be important preys of dolphins foraging above the slope or deeper waters. This would be consistent with aerial and acoustic observed behaviours, particularly echolocation activity (click train and buzzes) that is recorded during these sightings (as well as during night-time sampling). The fact that these events take place in the early morning or late afternoon indicates a probable nycthemeral vertical migration of their preys.



Spectrogram of an echolocation click train with a terminal buzz (Cool Edit, FFT Han 1024, 50%). Recorded on 04 August 2025 in the northern BoB.

Common dolphins of the southern region are often observed in mixed schools with Striped dolphins (*Stenella coeruleoalba*), this species being known worldwide as a primarily oceanic species. While the ecologic purpose of such an association remains to be uncovered, it may be related to their respective feeding habits, mesopelagic fishes being abundant prey items of both common and striped dolphins in oceanic waters of NE Atlantic (Spitz *et al.*, 2010).

Relation with bycatches?

In the northern region, Common dolphins are intensively feeding in an area where coastal fisheries are extremely active, which may contribute to explain why bycatches locally peak during summer. Our further research effort should include night-time acoustic sampling in the northern Bay of Biscay.

CONCLUSION & ACKNOWLEDGEMENTS

Non-invasive small boat survey techniques have proven useful to shed light on Common dolphin ecology in summer. With the completion of visual and acoustic behavioural data, including in winter, it might be possible to contribute to current efforts to decrease bycatches in the Bay of Biscay.

Acknowledgements: Part of the data was collected as part of the ***Moana Gascogne*** project under the *Super-Pouvoirs de l'Océan* framework that receives funding from *France Télévisions* and is carried out in partnership with *France Nature Environnement*.

REFERENCES

Doray *et al.*, 2018. **Monitoring small pelagic fish in the Bay of Biscay ecosystem using indicators from an integrated survey**. *Progress in Oceanography* 166: 168-188.

Gannier, 1999. **Diel variations of the striped dolphin distribution off the French Riviera (Northwestern Mediterranean Sea)**. *Aquatic Mammals* 25 (3): 123-134.

Spitz *et al.*, 2010. **Prey selection by the common dolphin: fulfilling high energy requirements with high quality food**. *Journal of Experimental Marine Biology and Ecology* 390: 73-77.