

# Supplementary material: Behavioural responses of common dolphins *Delphinus delphis* to a bio-inspired acoustic device for limiting fishery by-catch

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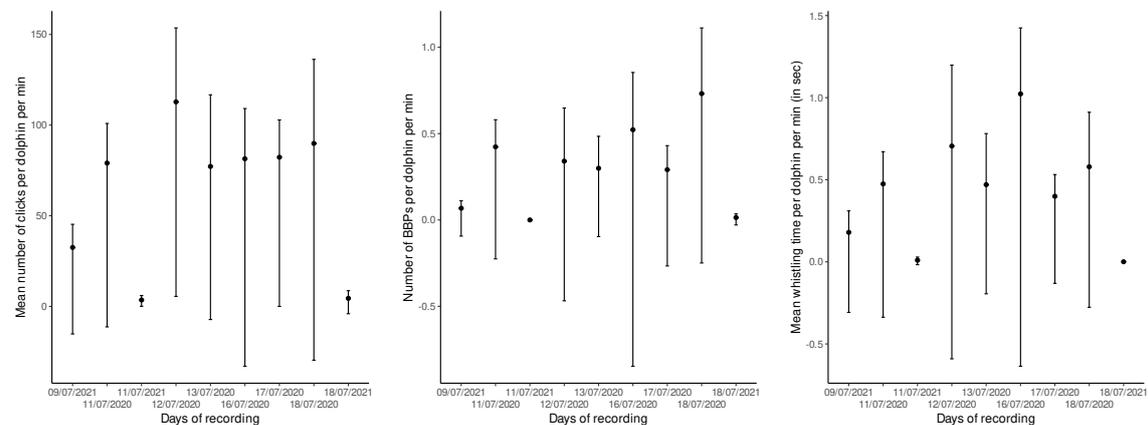
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## 1 Supplementary figures

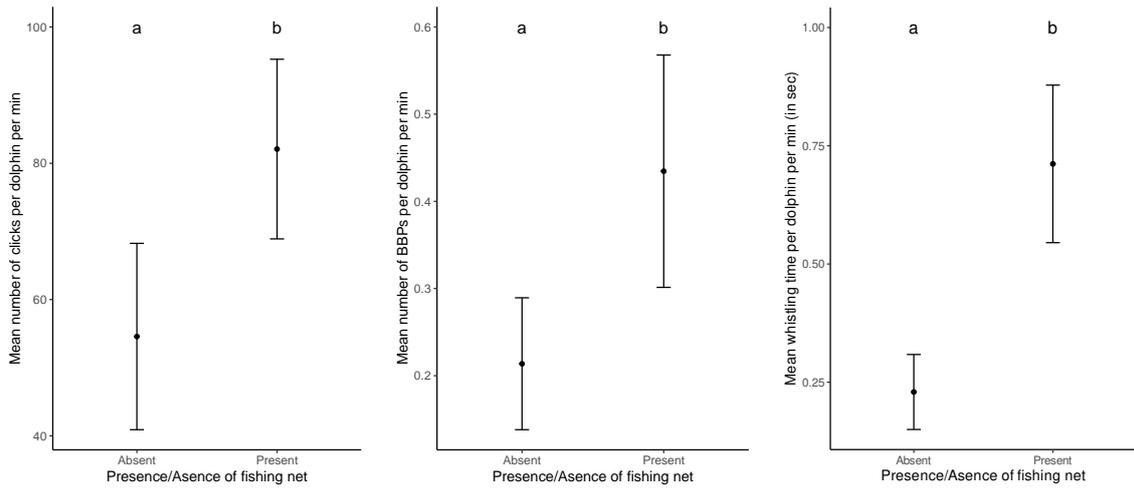


(a) Number of detected echolocation clicks per audio per dolphin during each day of the experiment.

(b) Number of detected BBPs per audio per dolphin during each day of the experiment.

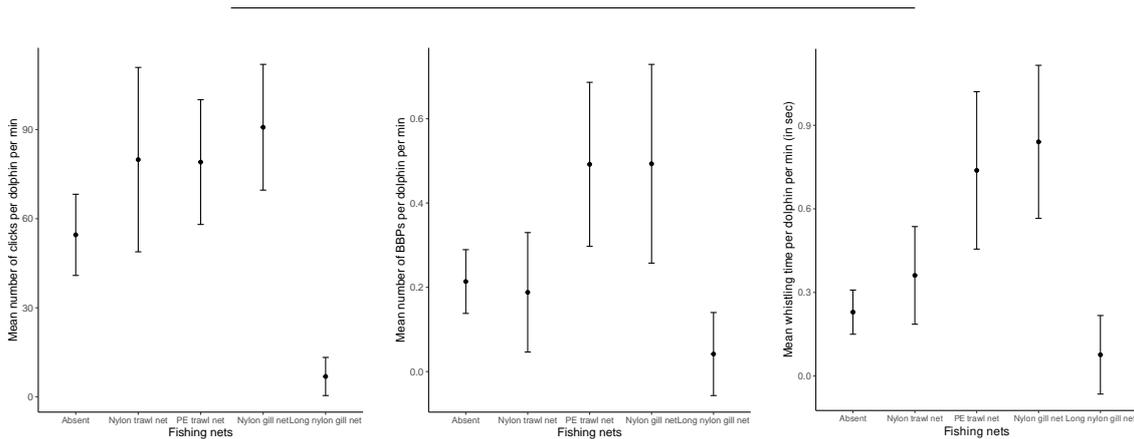
(c) Identified whistling time per audio per dolphin during each day of the experiment.

**Figure S1:** Detected acoustic responses of dolphins during each day of the sampling campaign, for each type of signal emitted by dolphins. Points are mean values and ranges show 95% confidence intervals. On 9 July 2021, the boat echosounder was left on by mistake. No differences were noted between the sampling days (Kruskal-Wallis post-Hoc test,  $p > 0.05$ ).



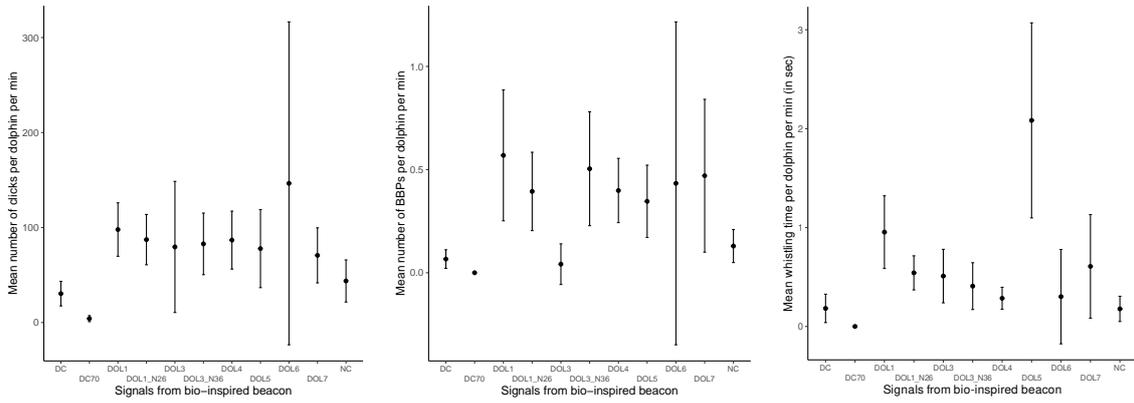
(a) Detected echolocation clicks per audio per dolphin according to absence/presence of a fishing net. (b) Detected BBPs per audio per dolphin according to absence/presence of a fishing net. (c) Identified whistling time per audio per dolphin according to absence/presence of a fishing net.

**Figure S2:** Detected acoustic responses of dolphins in relation with the presence of a fishing net underwater for each type of signal emitted by dolphins (columns). Points are mean values and ranges show 95% confidence intervals. Group with different letters have different mean values (Tukey post-hoc test). *BBP: Buzz or Burst-Pulse*.



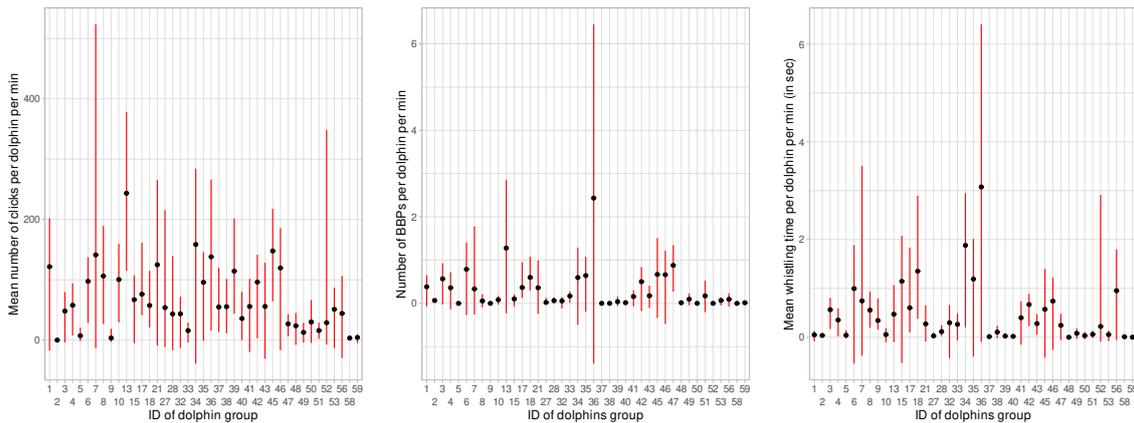
(a) Number of detected echolocation clicks per audio per dolphin for each fishing net type. (b) Number of detected BBPs per audio per dolphin for each fishing net type. (c) Identified whistling time per audio per dolphin for each fishing net type.

**Figure S3:** Detected acoustic responses of dolphins in relation with the type of fishing net that was underwater for each type of signal emitted by dolphins (columns). Points are mean values and ranges show 95% confidence intervals. Kruskal-wallis tests showed significant differences in means for clicks, BBPs and whistles (Chi2 were respectively 47.8, 15.2 and 30.2; with  $df=4$  and  $p<0.01$  each). Pairwise post-hoc tests are not shown for readability.



(a) Number of detected echolocation clicks per audio per dolphin for each signal from the beacon. (b) Number of detected BBPs per audio per dolphin for each signal from the beacon. (c) Identified whistling time per audio per dolphin for each signal from the beacon.

**Figure S4:** Detected acoustic responses of dolphins in relation with the signal emitted by the bio-inspired beacon for each type of signal emitted by dolphins (columns). Points are mean values and ranges show 95% confidence intervals. Kruskal-wallis tests showed significant differences in means for clicks, BBPs and whistles (Chi2 were respectively 69.5, 48.8 and 101.1; with  $df=10$  and  $p<0.01$  each). Pairwise post-hoc tests are not shown for readability. *The code associated with each signal is described in Table S1.*



(a) Number of detected echolocation clicks per audio per dolphin for each group of dolphin. (b) Number of detected BBPs per audio per dolphin for each group of dolphin. (c) Identified whistling time per audio per dolphin for each group of dolphin.

**Figure S5:** Detected acoustic responses of dolphins according to the ID group, for each type of signal emitted by dolphins. Points are mean values and ranges show 95% confidence intervals. *Groups 15, 32, 33, 35, 42, 45, 46, 47 & 59 were sampled several times during separated treatment sequences. Pairwise post-hoc tests not showed for readability. The groups mentioned above could be clustered with other groups of the dataset, no differences were underlined (Kruskal-Wallis post-Hoc test,  $p>0.05$ ) among groups inside each cluster.*

## 2 Supplementary table

**Table S1:** Signification of codes associated with signals emitted by the acoustic beacon. Signals were recorded in a previous experiment, they are returning echoes of echolocation clicks from common dolphins on different types of fishing nets (sometimes with a carcass of a common dolphin manually added in the net, see Section 2.b. for more details). Most signals were emitted with a correction table to adjust features of the material (ceramic) that constitutes the acoustic beacon. **Notes:** DOL7 signal is a returning echo from a click of a *Tursiops truncatus* that was used to test for response of common dolphins to signals generated from clicks of other species. DC (20-200 kHz) and DC70 (20-70 kHz) signals were tested in 2021, they are improved versions of DOL1 signal tested in 2020 (i.e. new prototype emitted more faithfully the signal). PE = polyethylene.

Code	Type of net	Presence of a dolphin carcass	Correction of emitted frequencies	n Samples
DC	Nylon gill net	Yes	Yes	51
DC70	Nylon gill net	Yes	Yes	22
DOL1	Nylon gill net	Yes	Yes	75
DOL1.N26	Nylon gill net	Yes	No	45
DOL3	PE trawl net	No	Yes	8
DOL3.N36	Nylon trawl net	No	No	41
DOL4	PE trawl net	Yes	Yes	41
DOL5	Nylon trawl net	No	Yes	11
DOL6	Nylon trawl net	Yes	Yes	5
DOL7	Nylon trawl net	Yes ( <i>T. truncatus</i> click)	Yes	24

**Table S2:** Intensity of response of observed dolphin behaviour according to the signals emitted by the bio-inspired beacon (see Table 1 for signal codes). For a total of 83 observations ('n obs'), including 6 for which intensity of response was not mentioned in the observation grid during the field survey, and 6 observations linked to sequences cancelled (activation of the beacon being too late). This led to 71 observations with a reported intensity of response. See Section 2.2. for a definition of the intensity of response.

Signal emitted	n groups	n obs	Distance (m)	n Intensity 0	n Intensity 1	n Intensity 2
DC	7	9	20-100	0	0	5
DC70	11	12	10-50	1	2	7
DOL1	8	22	5-300	1	0	20
DOL1.N26	4	8	10-100	0	1	6
DOL3	1	2	30	0	2	0
DOL3.N26	5	11	5-50	0	7	2
DOL4	5	9	10-100	2	4	3
DOL5	2	4	5-15	0	1	3
DOL6	2	2	8	0	0	0
DOL7	2	4	15-50	3	0	1
Total	47	83	-	7	17	47