Deploying Porpoise Alerting Device (PALfi) in Baltic and North Sea Gillnet Fisheries

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Annually, large numbers of harbour porpoises (*Phocoena phocoena*) perish in gillnets as unintended bycatch (Fig. 1).

Fig. 1: Porpoise caught in gillnet

Conventional deterrents such as pingers may lead to habituation, habitat exclusion and noise pollution.

Our novel, patented Porpoise Alarm for fisheries (PALfi; *Culik et al. 2013*) uses synthesized porpoise communication signals to alert the animals. The aim is to increase their acoustic awareness without deterring them (*Culik et al., Bioacoustics, in press*).

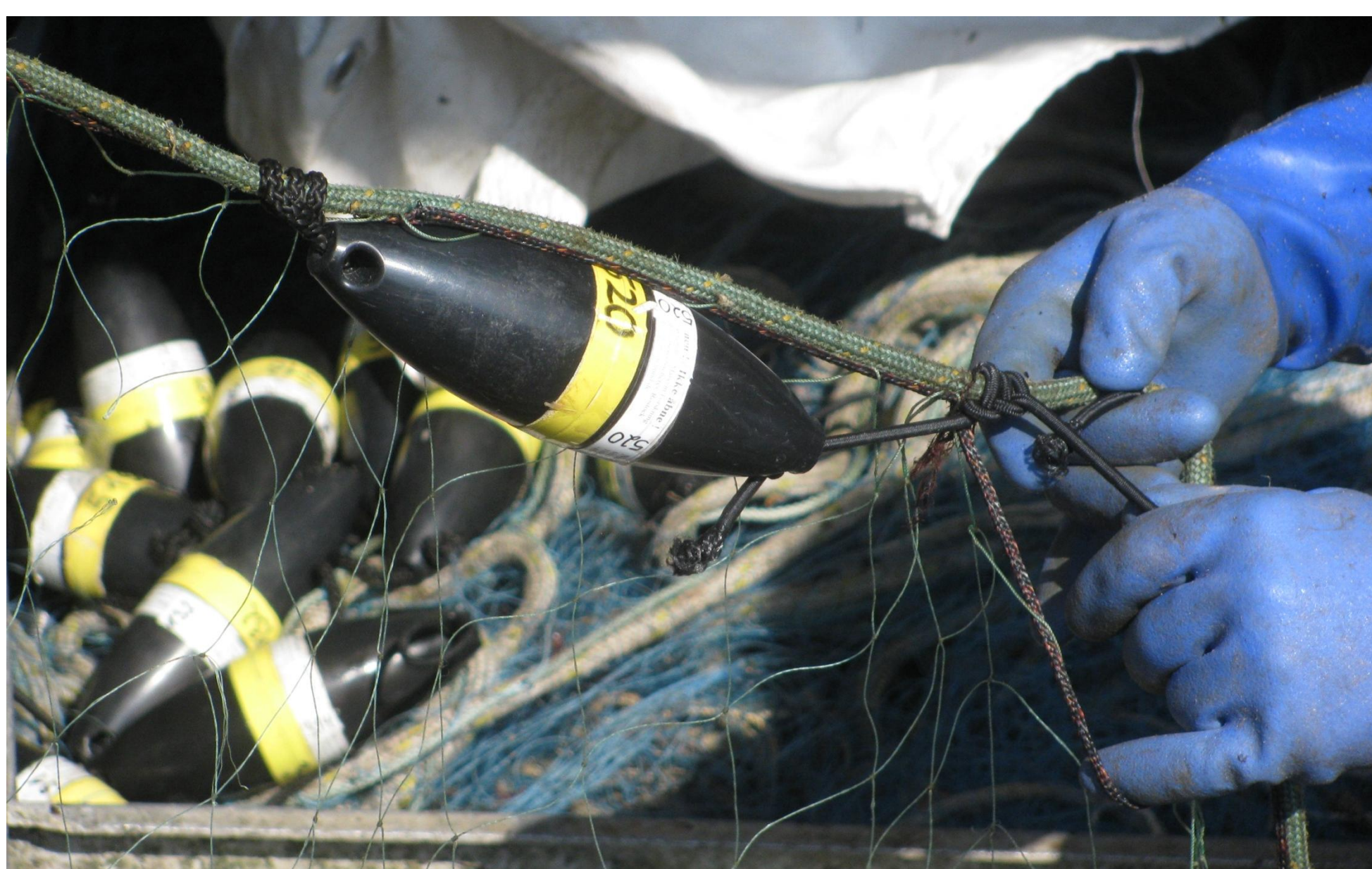**We report here on first results of PALfi trials in gillnet fisheries.**

Fig. 2: PALfi attached to gillnet floatline

PALfi are attached via elastic lines to the headrope of gillnets and spaced 200 m apart (Fig. 2).
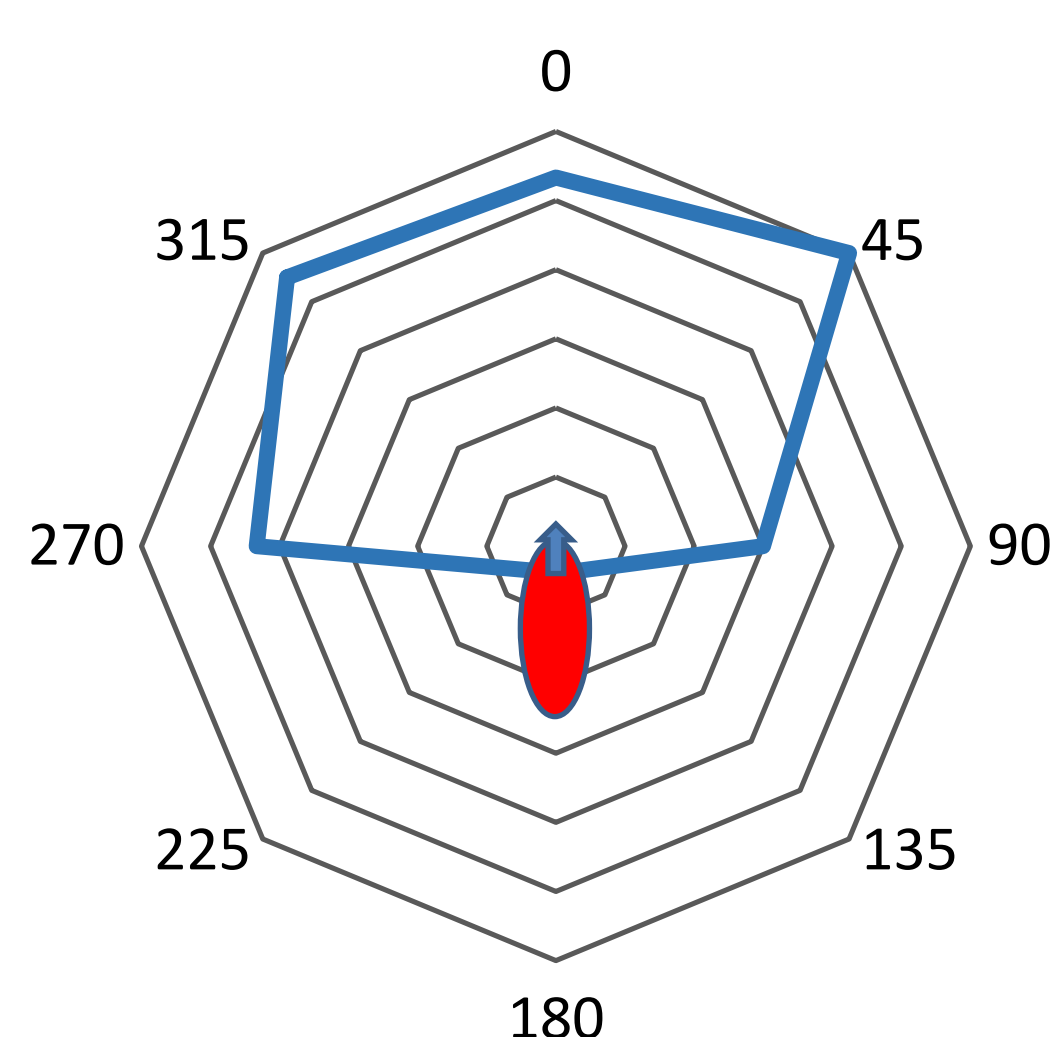

Fig. 3: PALfi is a directional sound transducer, emitting in the long axis between 270° and 90°

Like most pinger types, PALfi are directional (Fig. 3) along the long axis (but omnidirectional around). They all have to be attached facing the same direction to avoid acoustic "holes" .
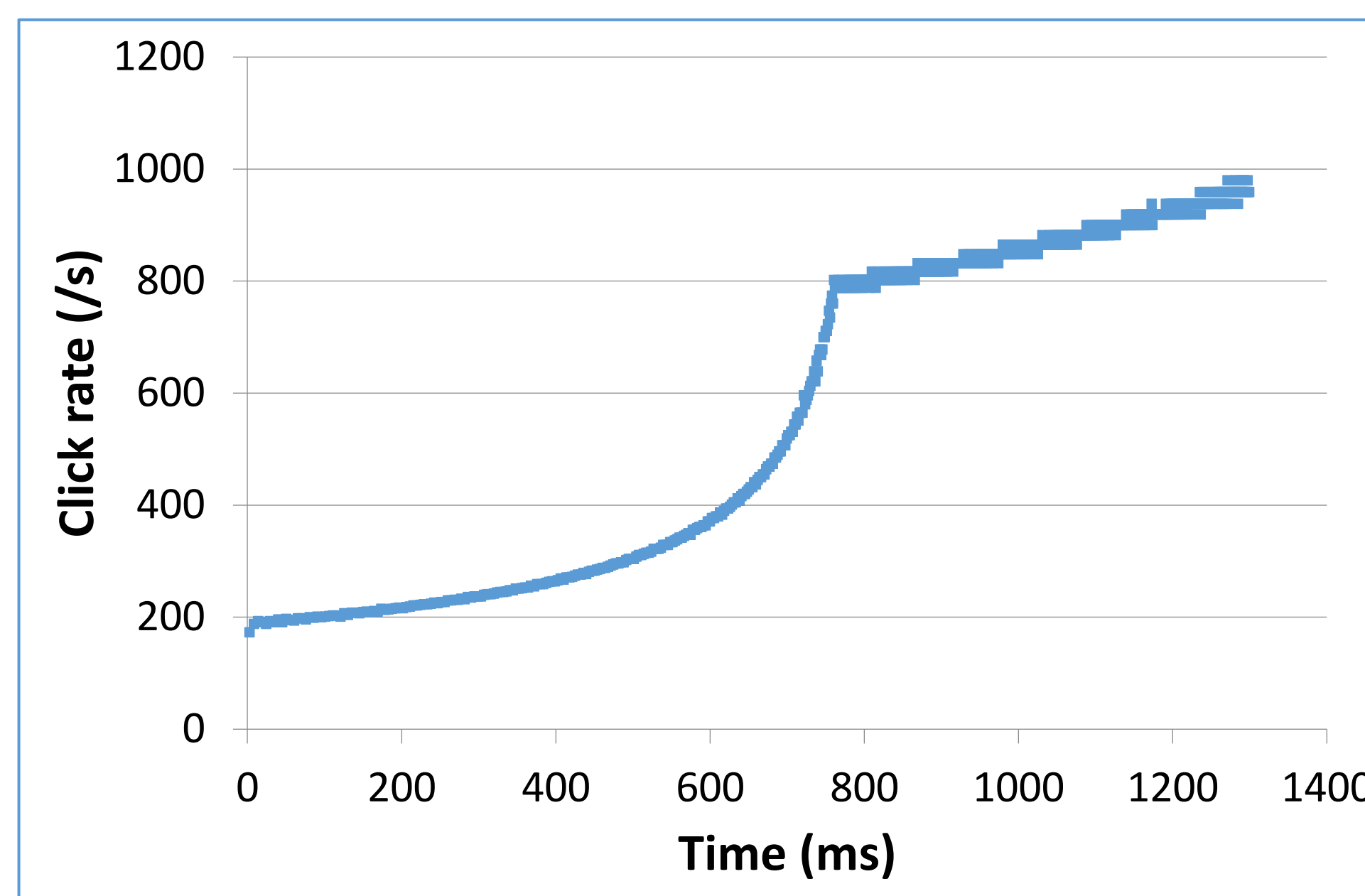

Fig. 4: Synthetic porpoise signal generated by PALfi

PALfi produces 3 synthetic porpoise-like alerting signals per Minute. Each upsweep chirp has a duration of 1.3 s and consist of 700 clicks (Fig. 4).
Acoustics: SL 151dB ± 2dB p-p re 1µPa at 1 m; transmission frequency 128 kHz ± 13 kHz.
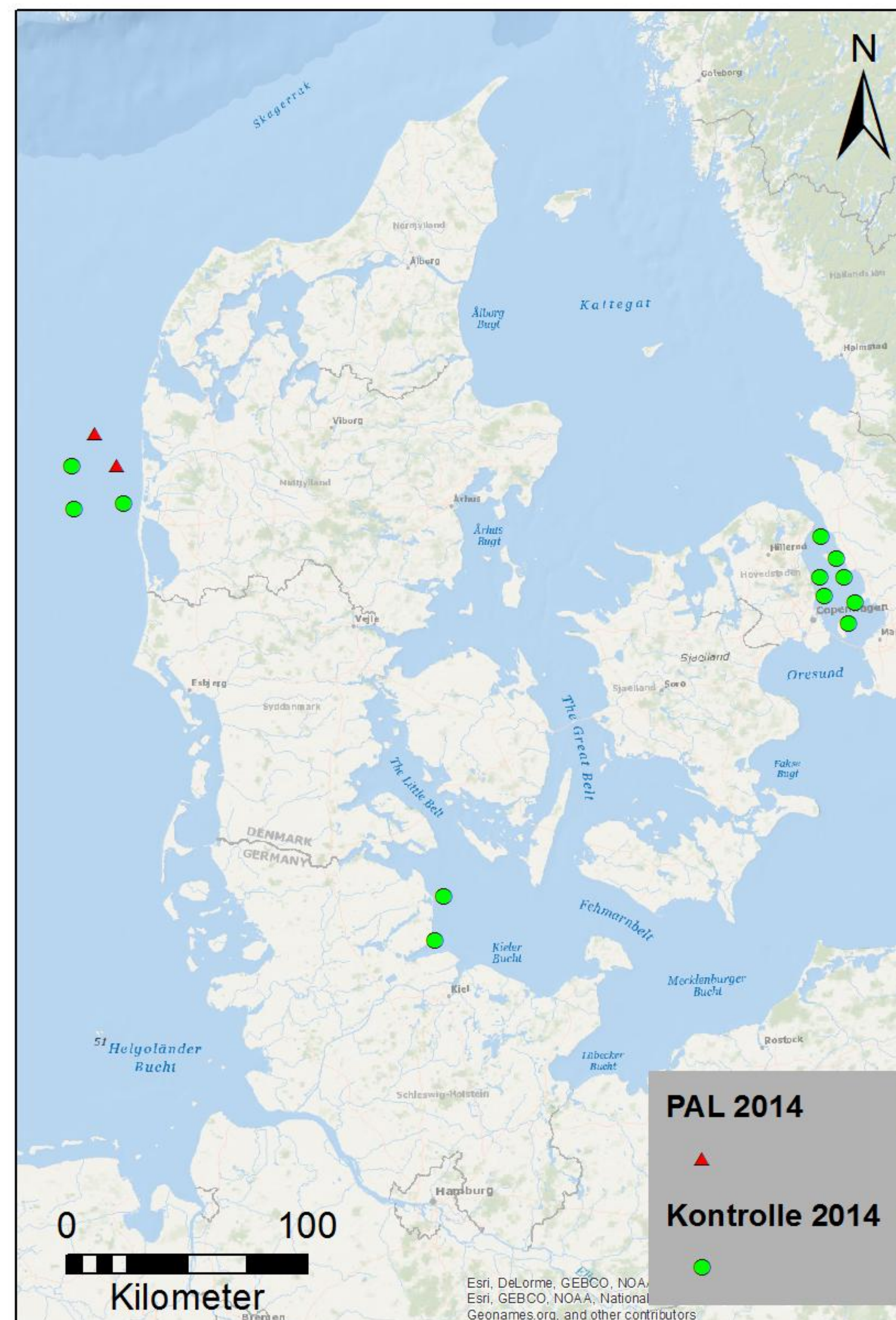

Fig. 5: Porpoise by-catch in 2014 gillnet fisheries. Green: control. Red: PALfi-equipped nets

Between September 10, 2013 and November 6, 2014 we tested and re-tested a total of 524 PALfi in German and Danish gillnet fisheries in the Baltic and North Sea.

Deployment duration for each batch of 30-50 PALfi was approximately 45 days (corresponding to the safe battery autonomy of the experimental prototype).

Fishery data are still being analyzed, but in total, during the 2014 experiments, fishermen had PALfi attached to gillnets and soaked for approximately 900 Net Kilometer Days.

Simultaneously to nets equipped with PALfi, approx. the same number of standard nets were set and served as controls.

Details of fishing operations were reported by the fishermen via protocols and for approx. 30% of all trips additionally monitored by on-board video-equipment or scientific observers .

A total of 14 porpoise by-catch events were reported (Fig. 5) during the 14 month field test: 12 in control and 2 in PALfi nets (p= 0.006, binominal test).

In the Baltic, 9 porpoises were reported from control and 0 from PALfi-equipped nets (p=0.002).

In the North Sea, 3 porpoises were reported from control and 2 from PALfi-equipped nets (p=0.5).

CONCLUSIONS

Our data indicate that PALfi is an efficient by-catch mitigation device in Baltic Sea gillnet fisheries. Whether the lack of effect in the North Sea is genuine or an artifact requires further investigation: PAL research is ongoing.

Fig. 6: Alerted Porpoises near PALfi test-site

REFERENCES
Culik B, Conrad M, L3-Communications ELAC Nautik (2013) Patent "Vorrichtung zum Schutz von Zahnwalen vor lebensbedrohlichen, gesundheitsschädlichen und/oder beeinträchtigenden Gegenständen". DPM Nr.: 102011109955
Culik B, Dorrien C, Müller V, Conrad M (in press) Synthetic communication signals influence wild harbour porpoise (Phocoena phocoena) behaviour. Bioacoustics

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