Supporting Information: Whyte *et al.* 2020 (JASA)

Estimating the impacts of pile driving sounds on seals: pitfalls and possibilities

TABLE S1: Details of the 24 tagged harbour seals and tag deployment durations.

Seal Reference	Sex	Age Class	Mass (kg)	Length (cm)	Girth (cm)	Tag duration (days)
pv40-268-12	F	Adult	75.4	130	106	135
pv40-270-12	M	Adult	94.8	150	120	91
pv42-162-12	F	Adult	112.6	146	126	160
pv42-165-12	F	Juvenile	49.2	130	92	64
pv42-194-12	M	Adult	82	141	112	115
pv42-198-12	M	Adult	88.8	152	116	131
pv42-220-12	M	Adult	81.8	149	109	144
pv42-221-12	M	Adult	111.4	150	123	50
pv42-266-12	F	Adult	100	149	118	84
pv42-277-12	F	Adult	107.8	142	126	158
pv42-287-12	M	Adult	112.4	144	126	18
pv42-288-12	F	Adult	89.8	148	115	170
pv42-289-12	M	Adult	94	146	115	79
pv42-290-12	F	Adult	85	140	113	58
pv42-291-12	F	Adult	91.6	141	113	109
pv42-292-12	M	Adult	92.2	145	113	105
pv42-293-12	F	Adult	85	141	112	69
pv42-294-12	M	Adult	98	145	119	103
pv42-295-12	F	Adult	77	145	109	69
pv42-316-12	M	Juvenile	33.2	101	82	106
pv42-317-12	F	Adult	102	143	122	111
pv42-318-12	F	Adult	91.6	137	120	139
pv42-319-12	M	Juvenile	31.6	101	77	114
pv42-320-12	F	Adult	89.6	143	117	106

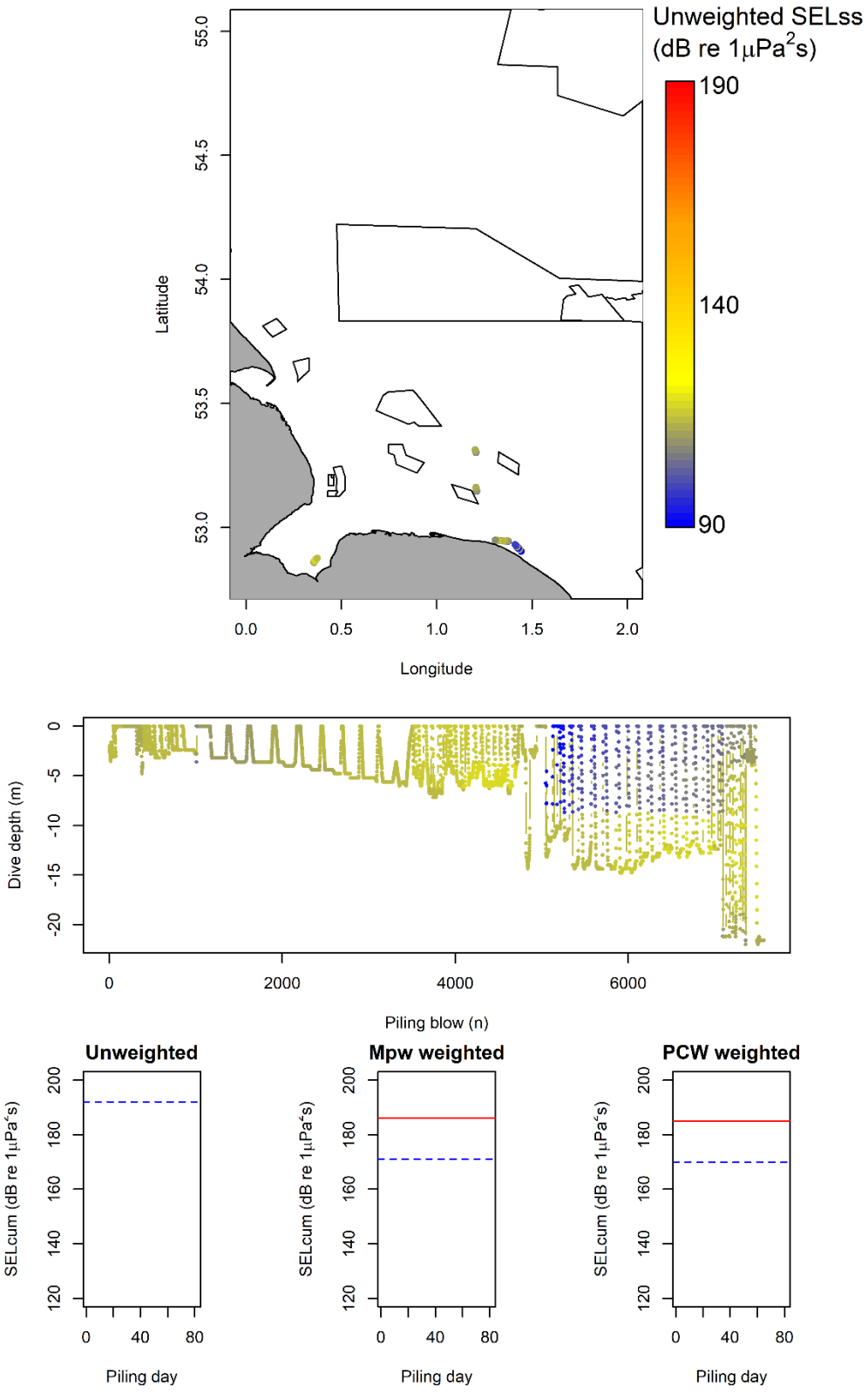

FIG. S1(a). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv40.270.12).

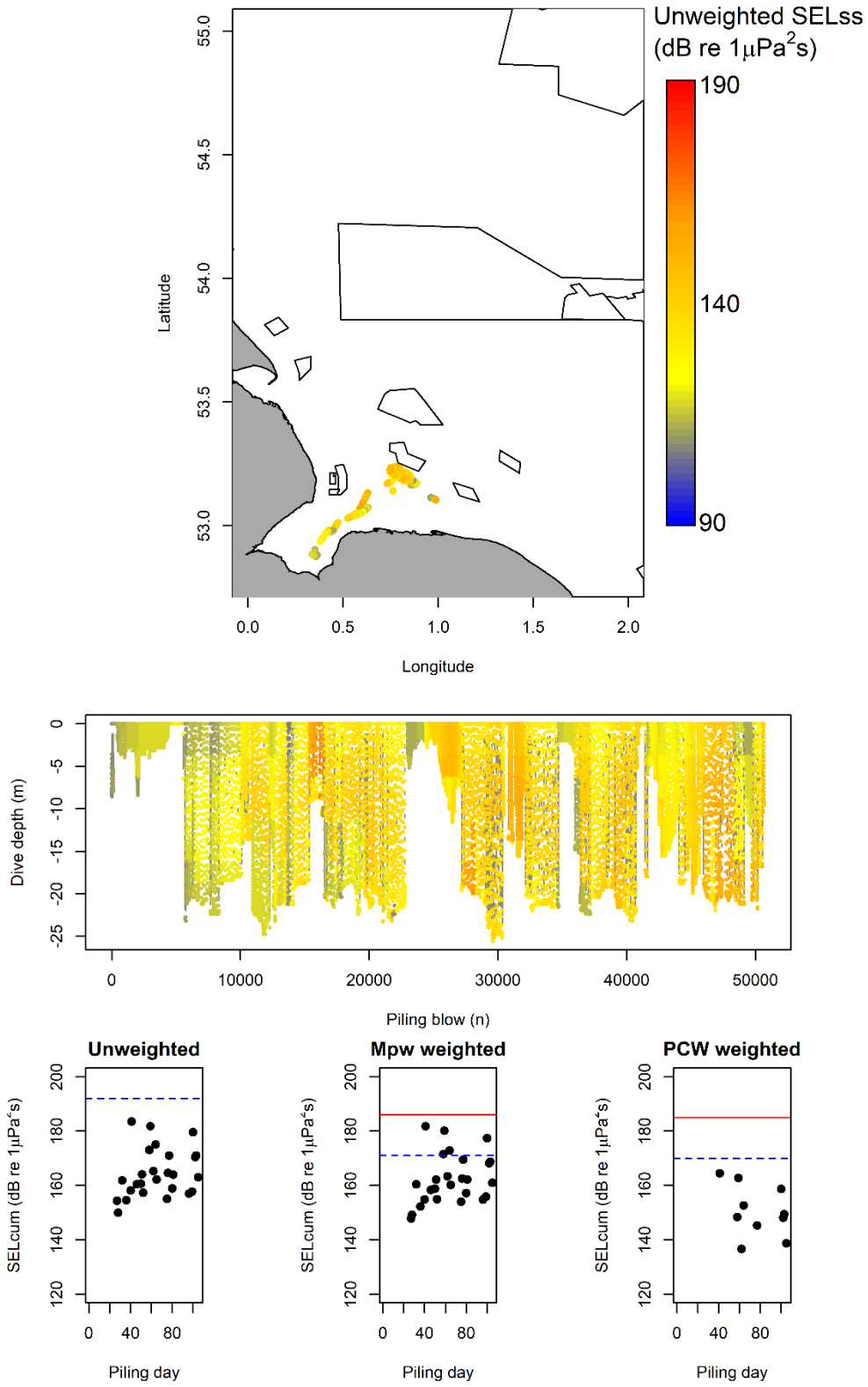

FIG. S1(b). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.162.12).

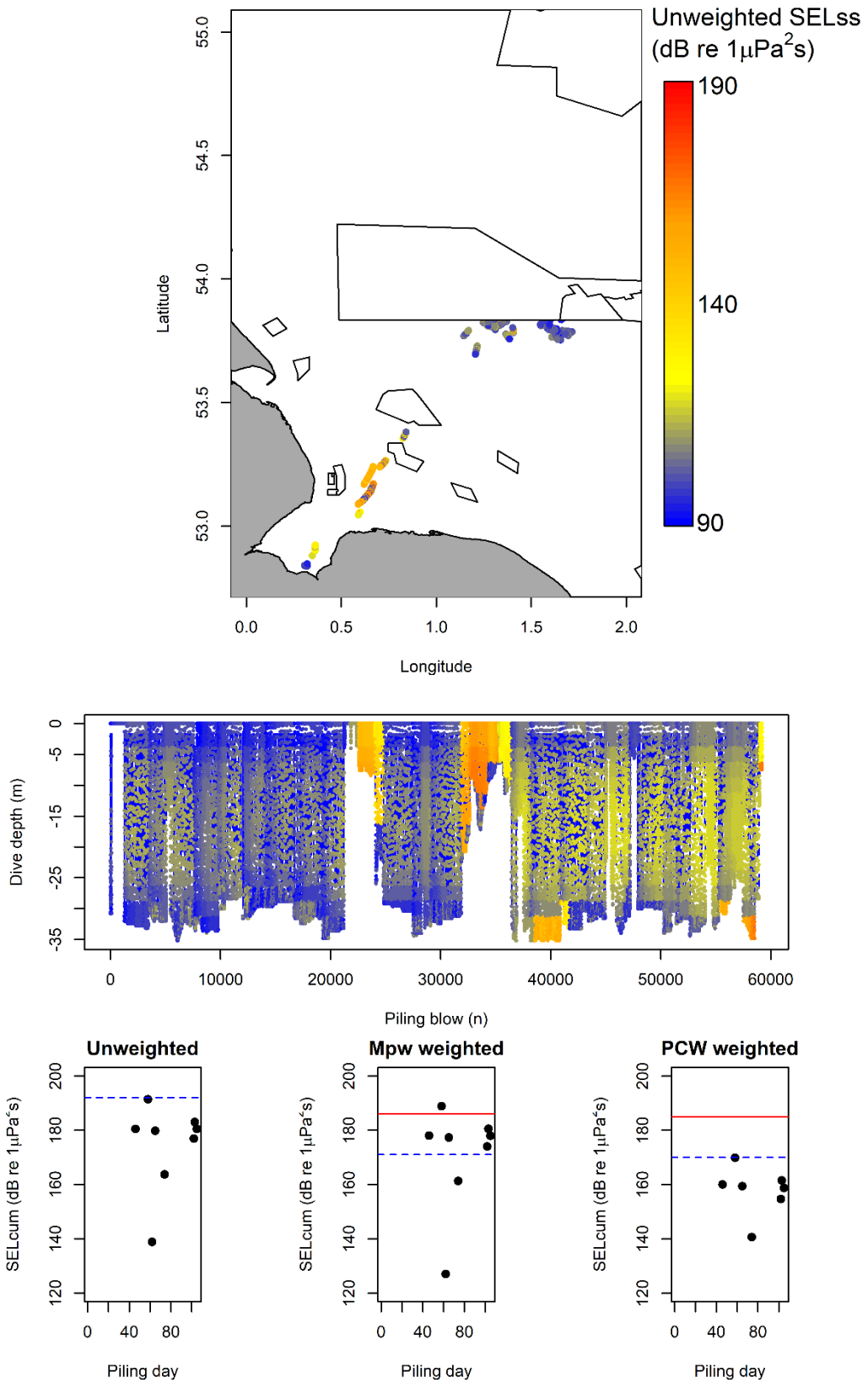

FIG. S1(c). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.165.12).

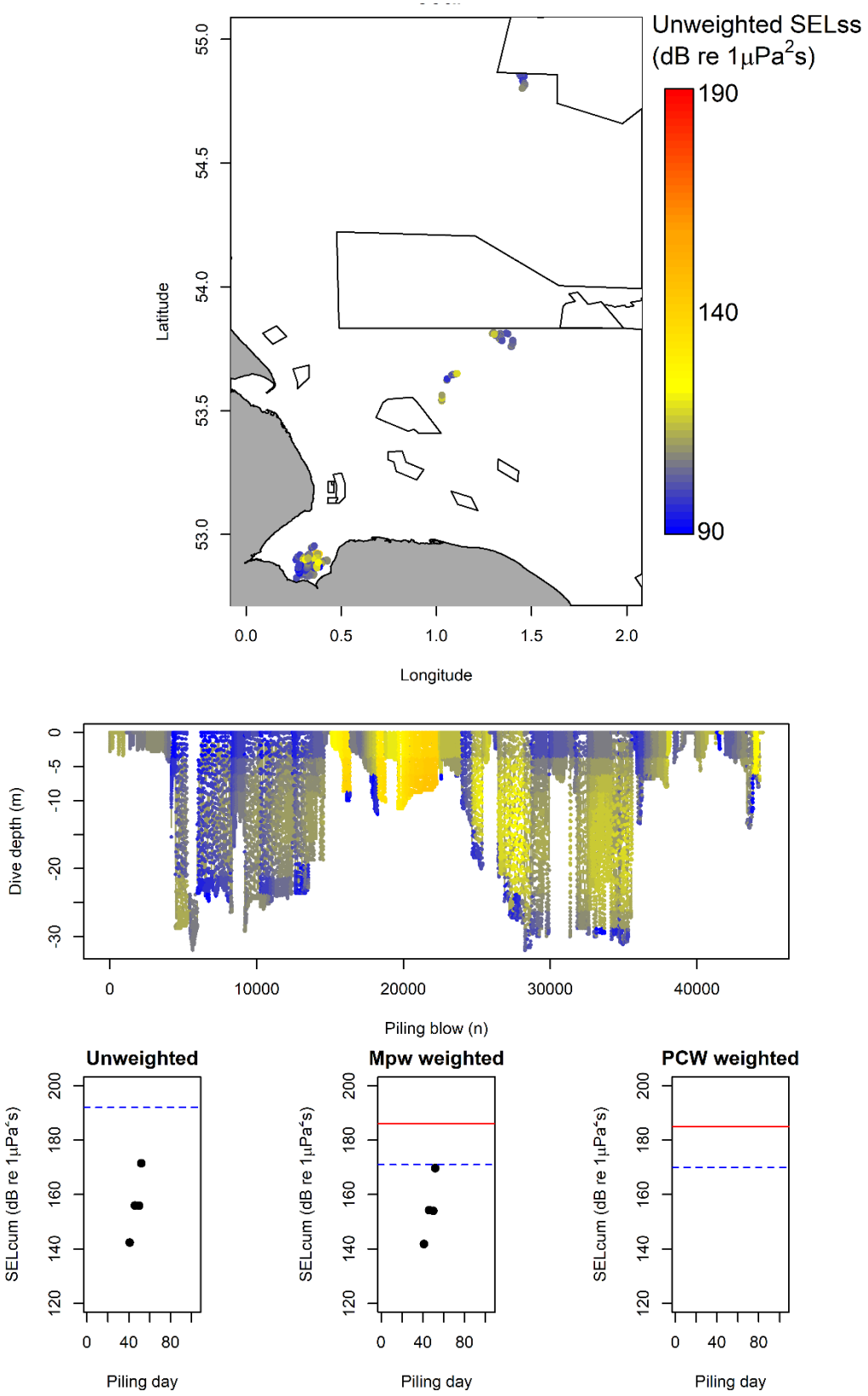

FIG. S1(d). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.194.12).

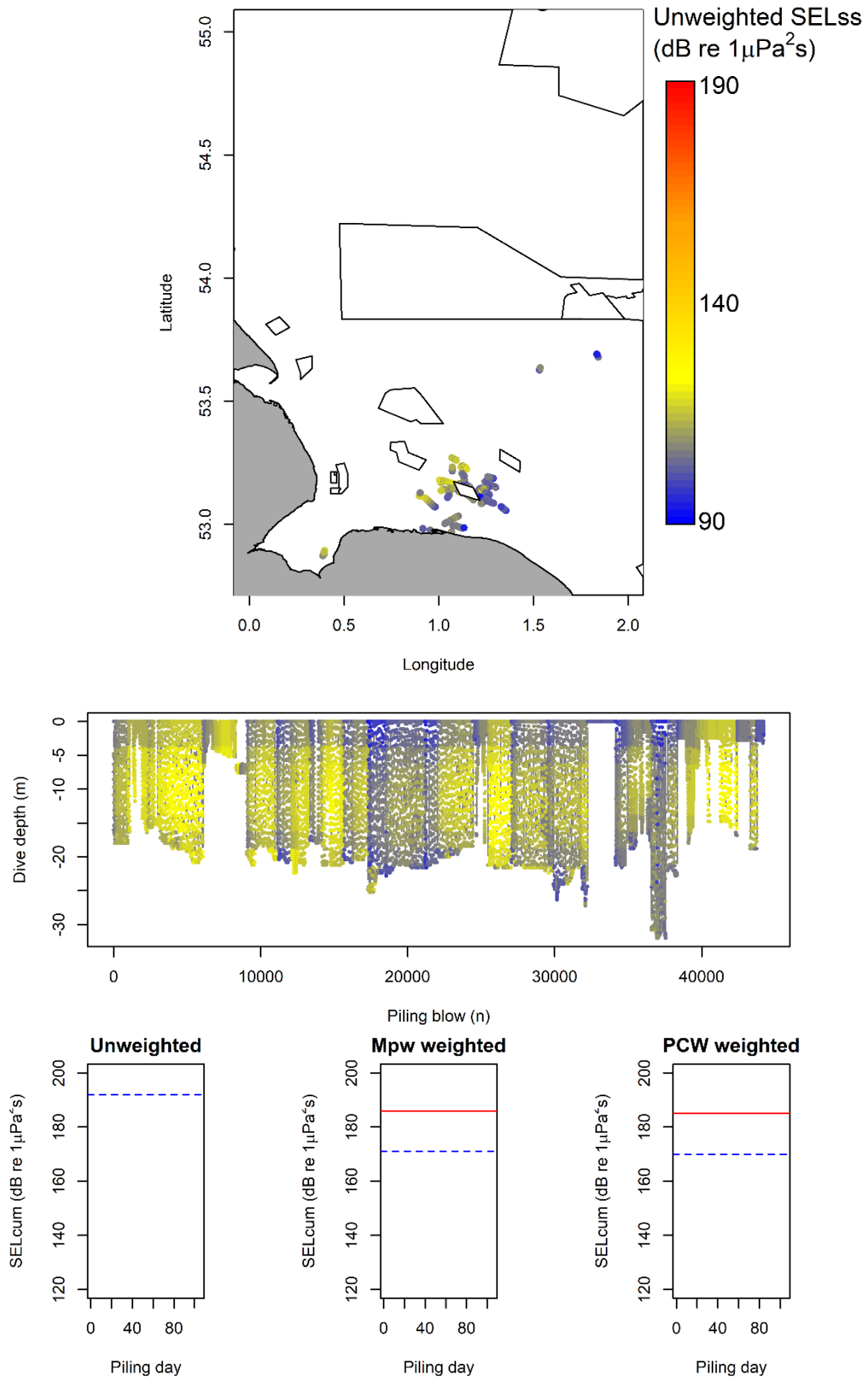

FIG. S1(e). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.198.12).

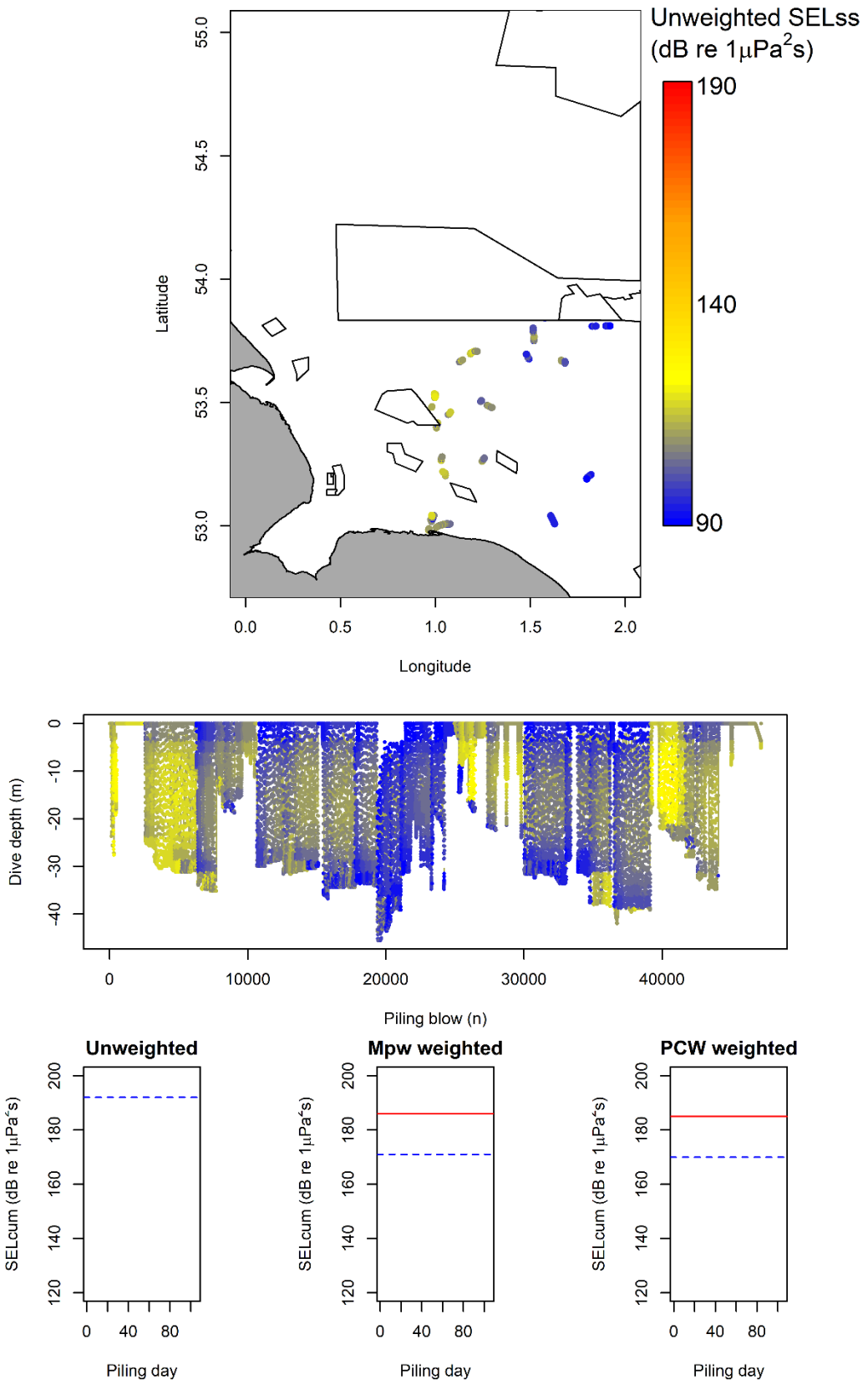

FIG. S1(f). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.220.12).

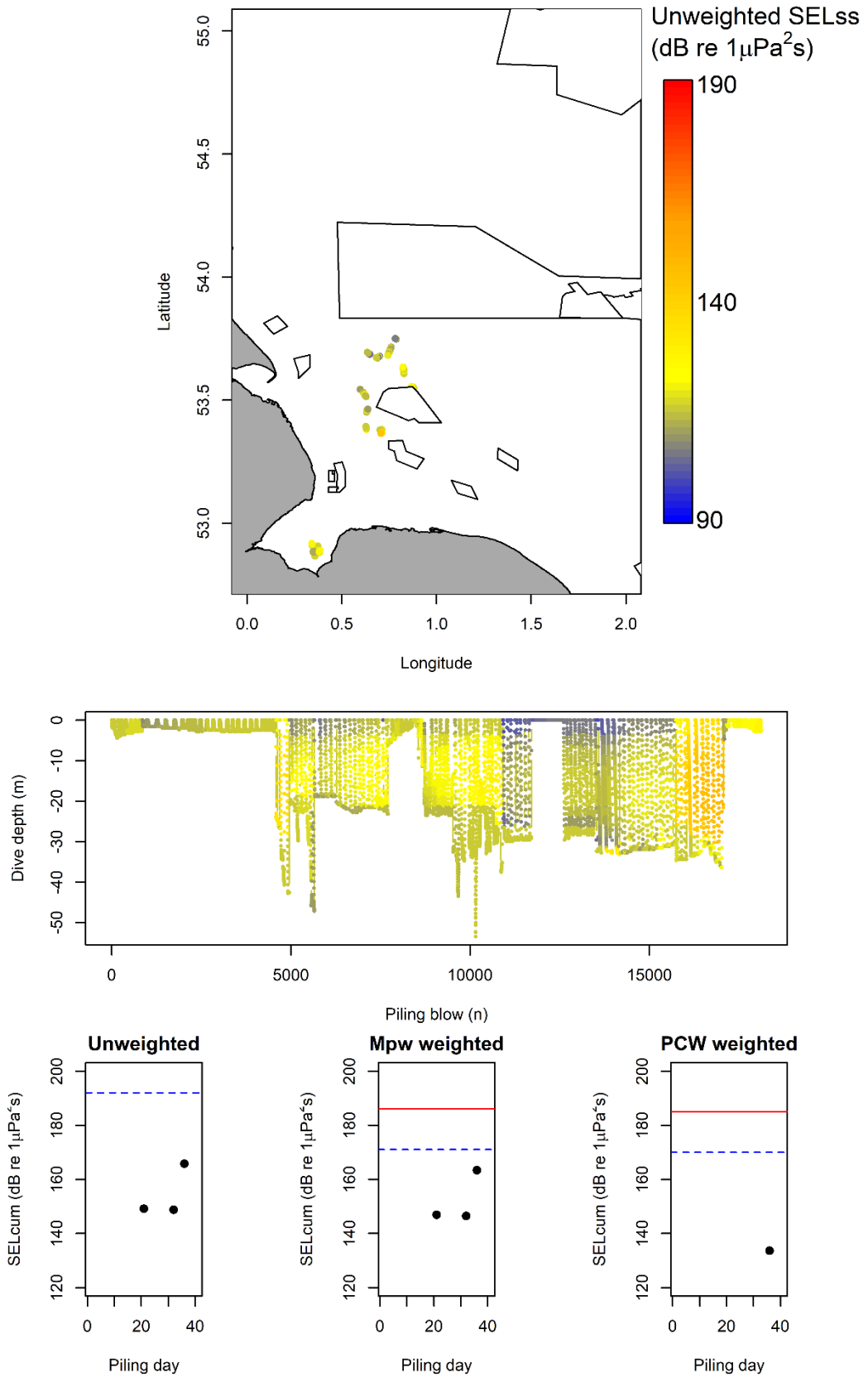

FIG. S1(g). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.221.12).

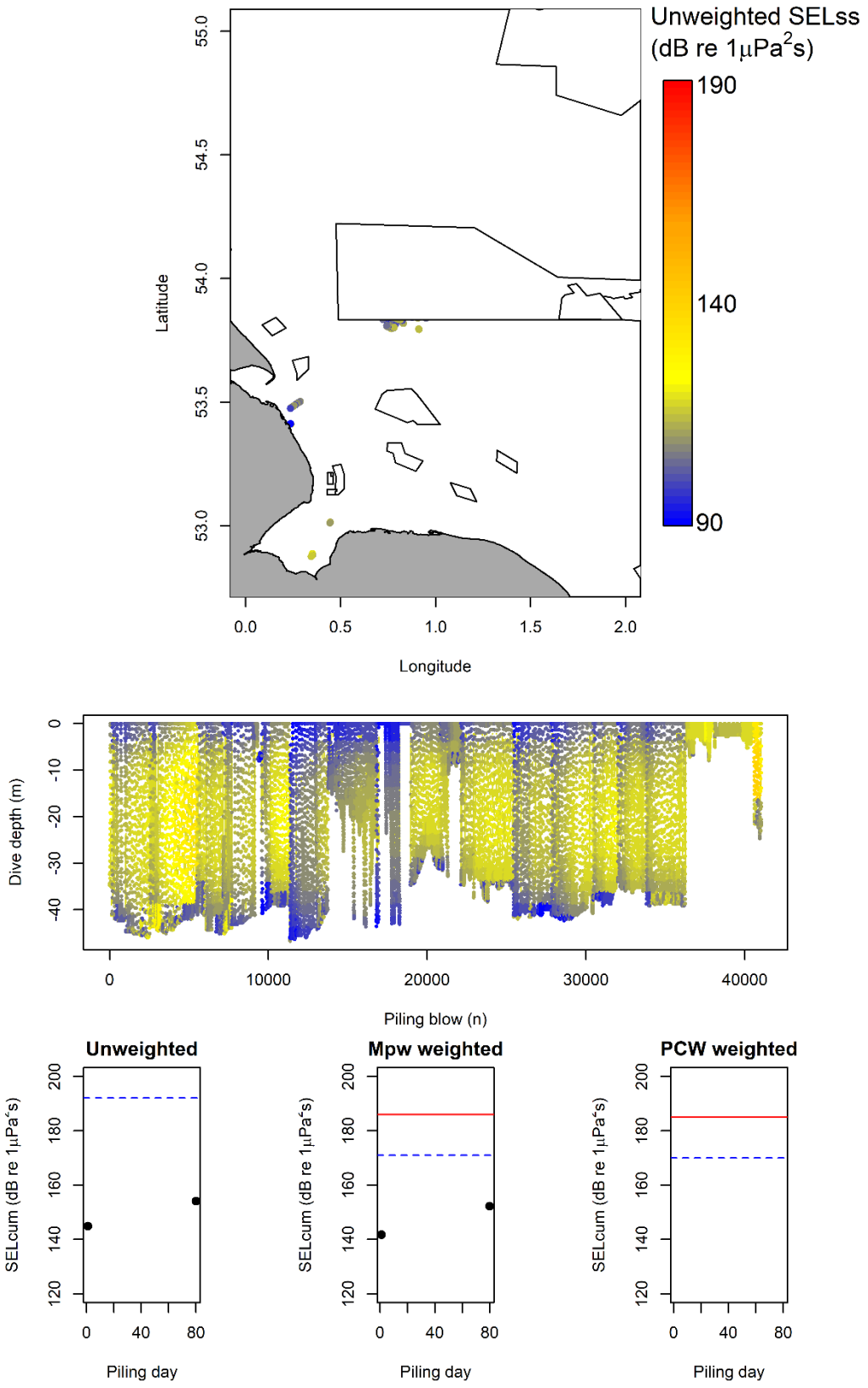

FIG. S1(h). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.266.12).

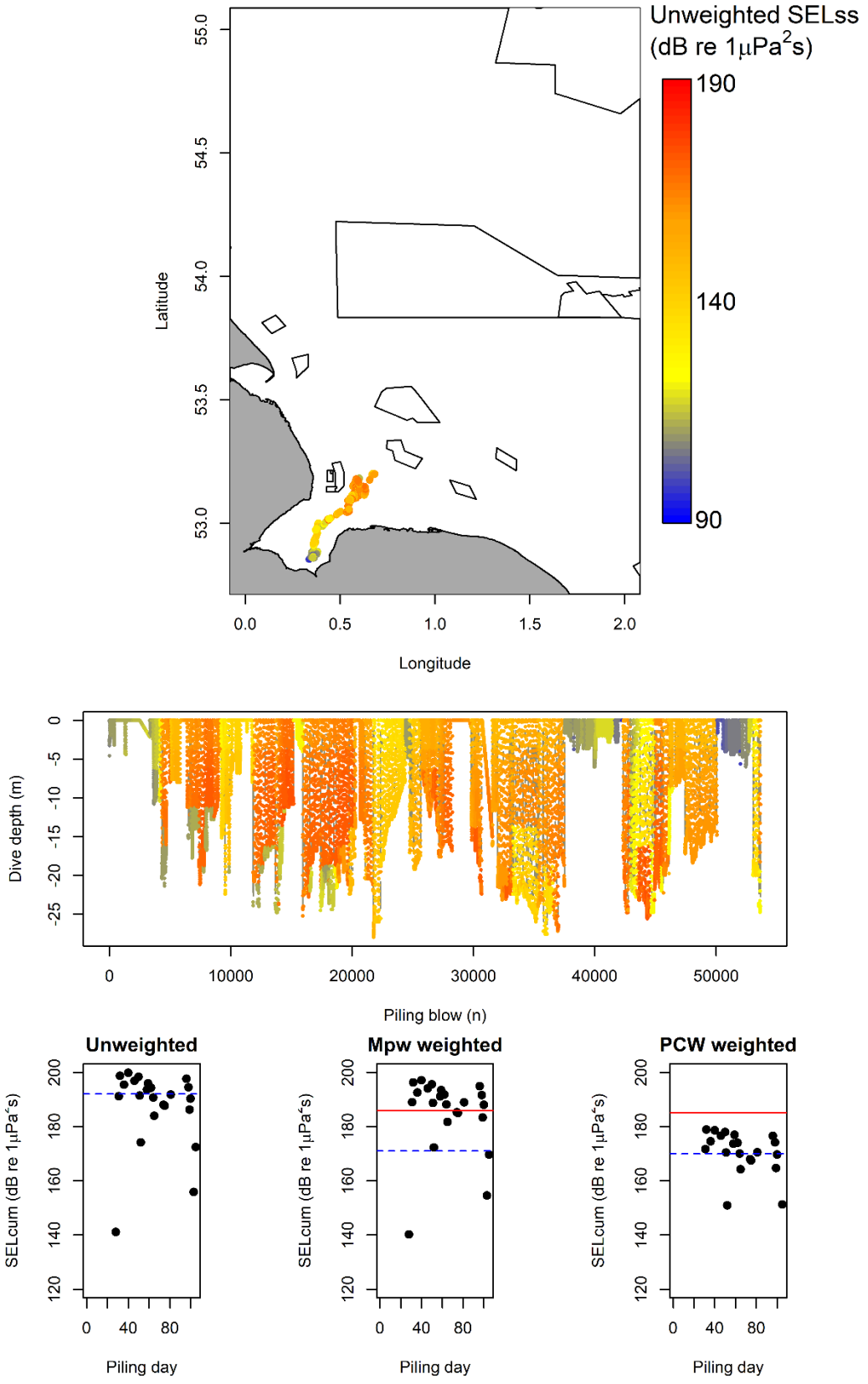

FIG. S1(i). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.277.12).

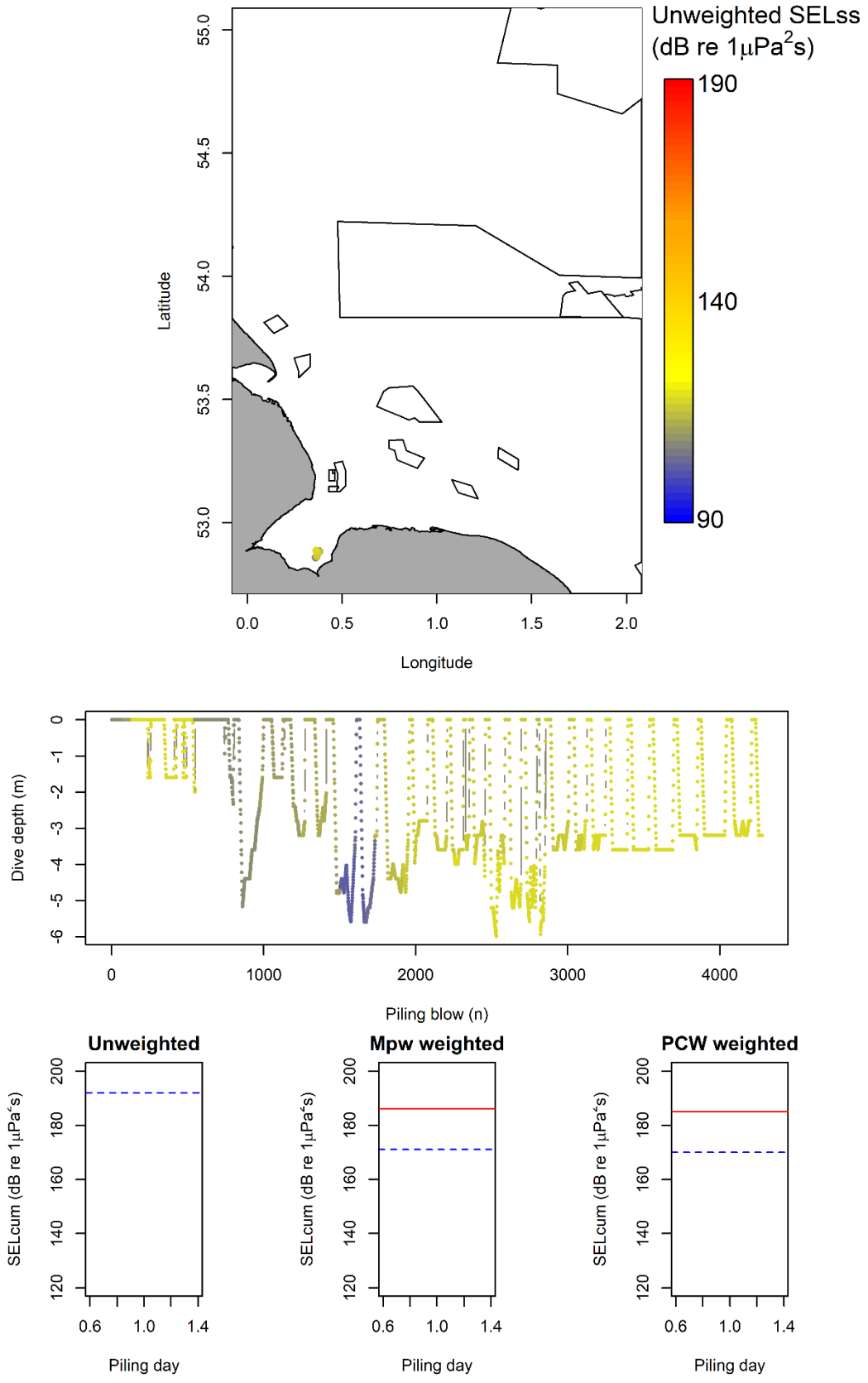

FIG. S1(j). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.287.12).

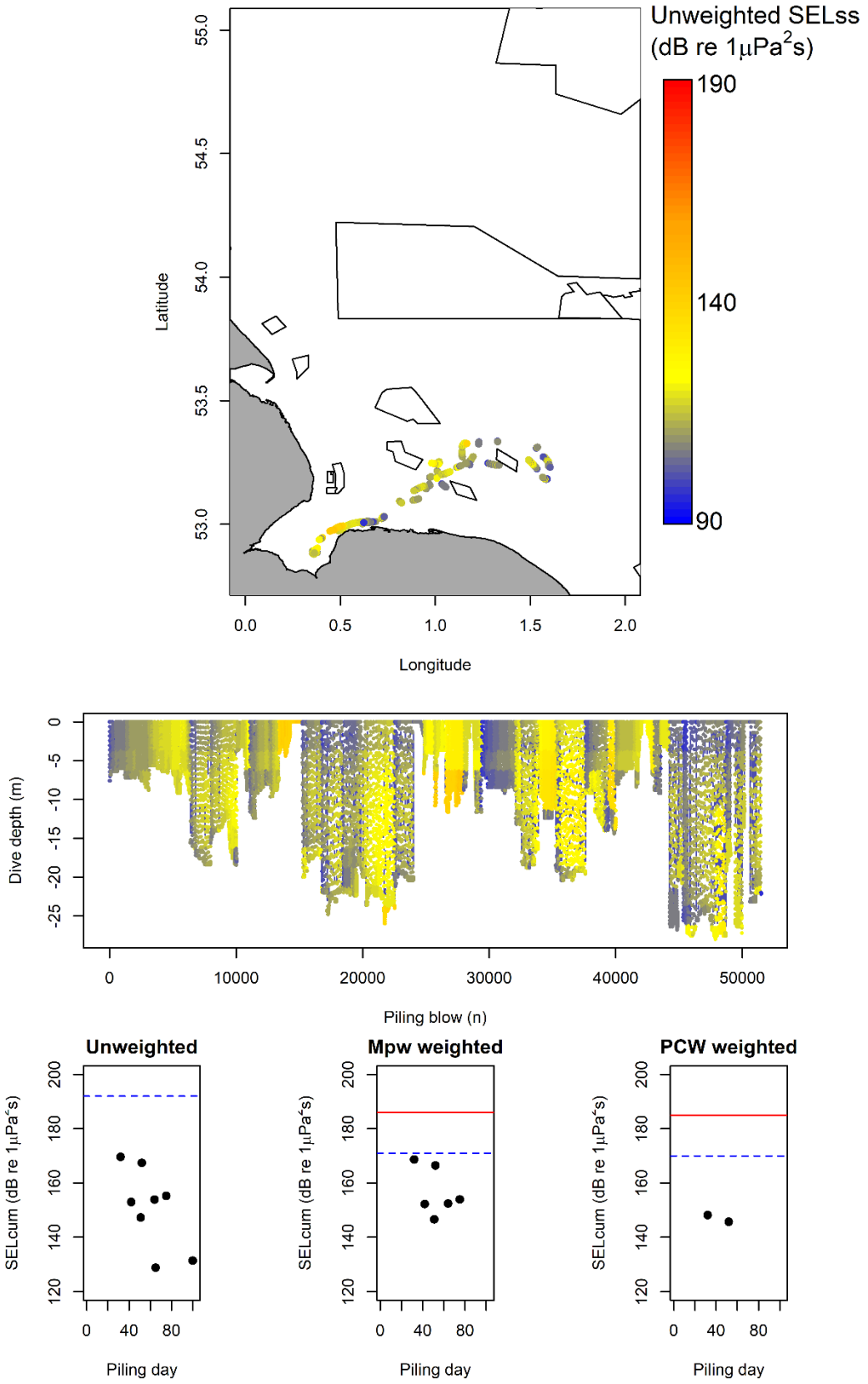

FIG. S1(k). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.288.12).

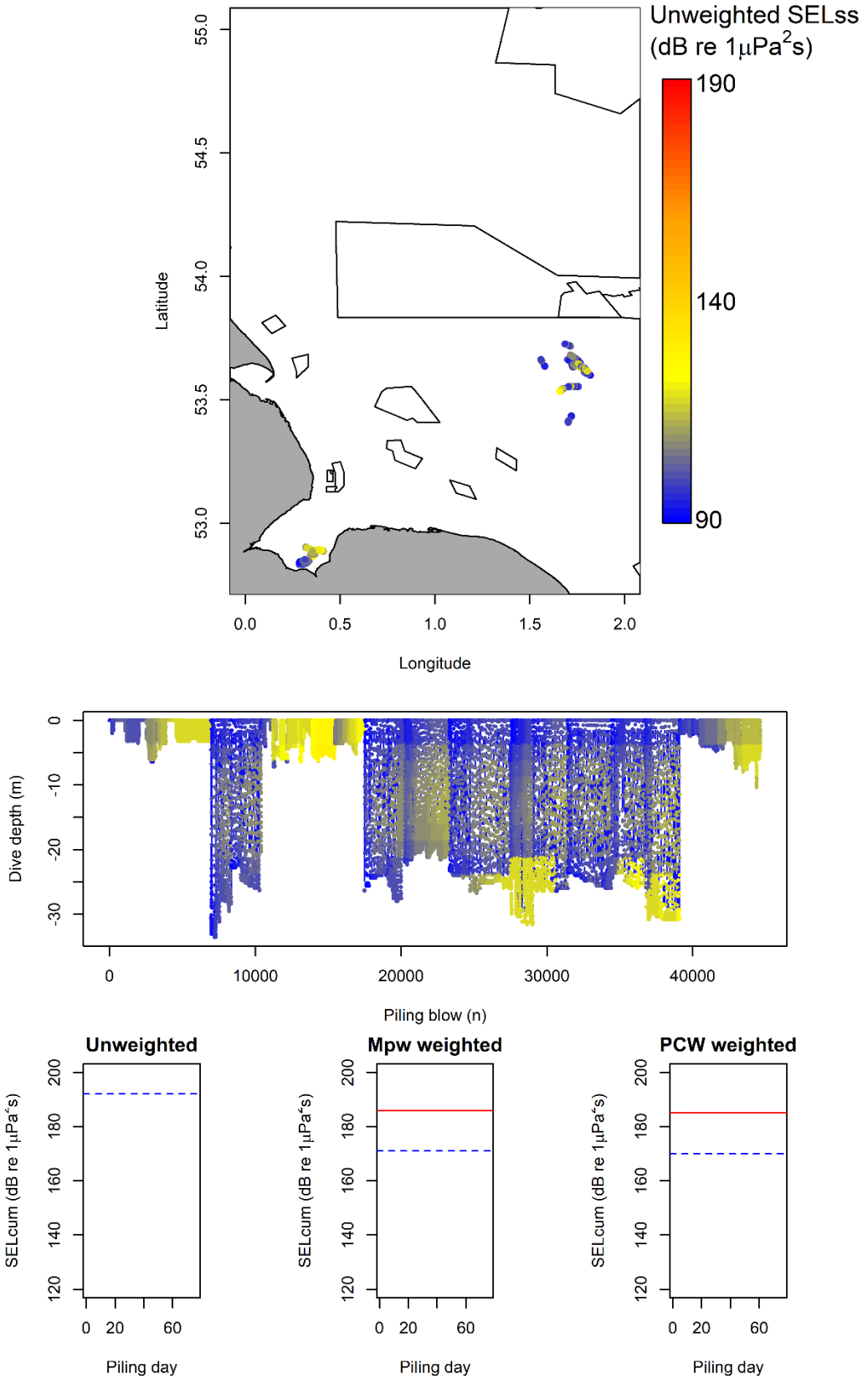

FIG. S1(l). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.289.12).

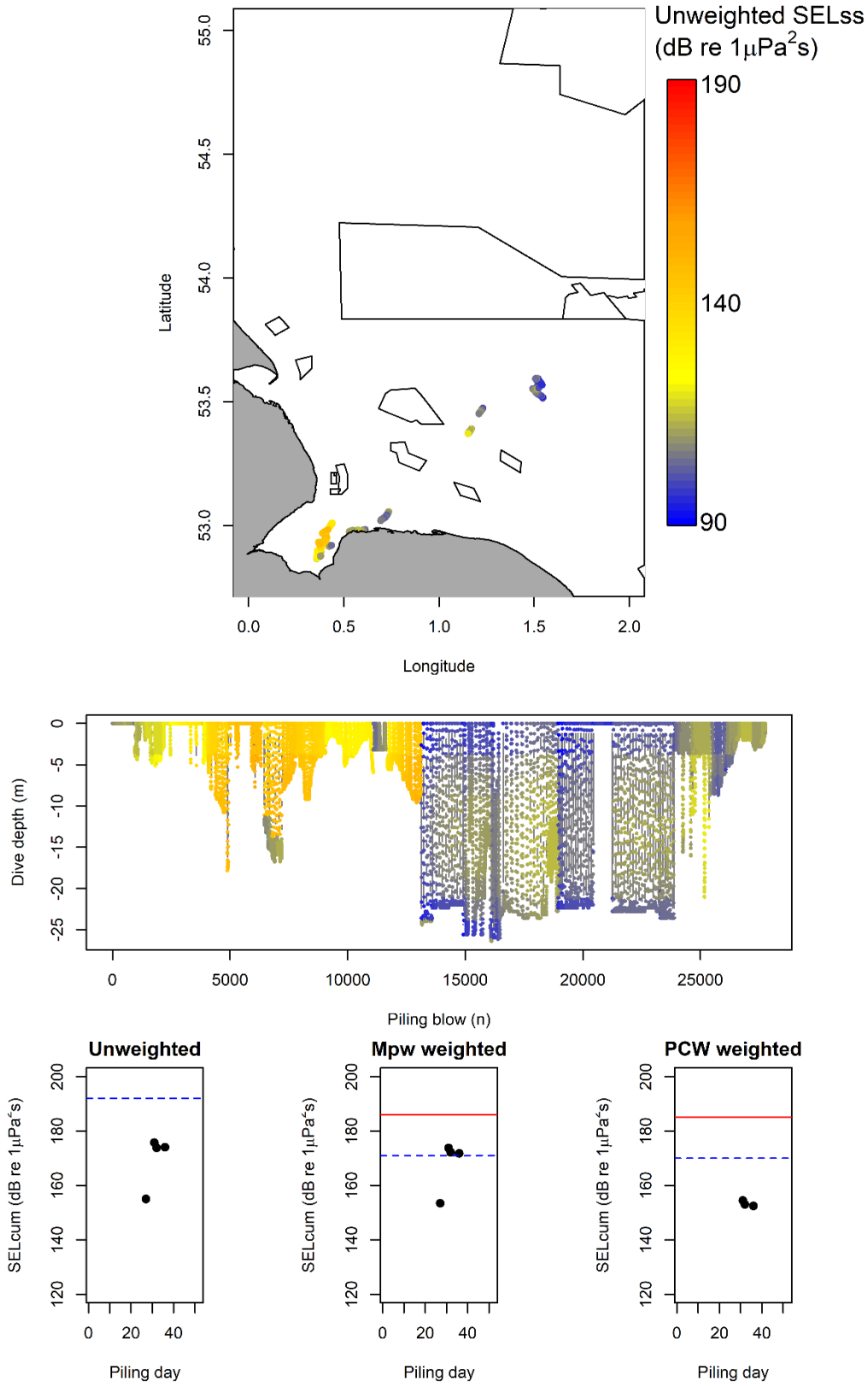

FIG. S1(m). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.290.12).

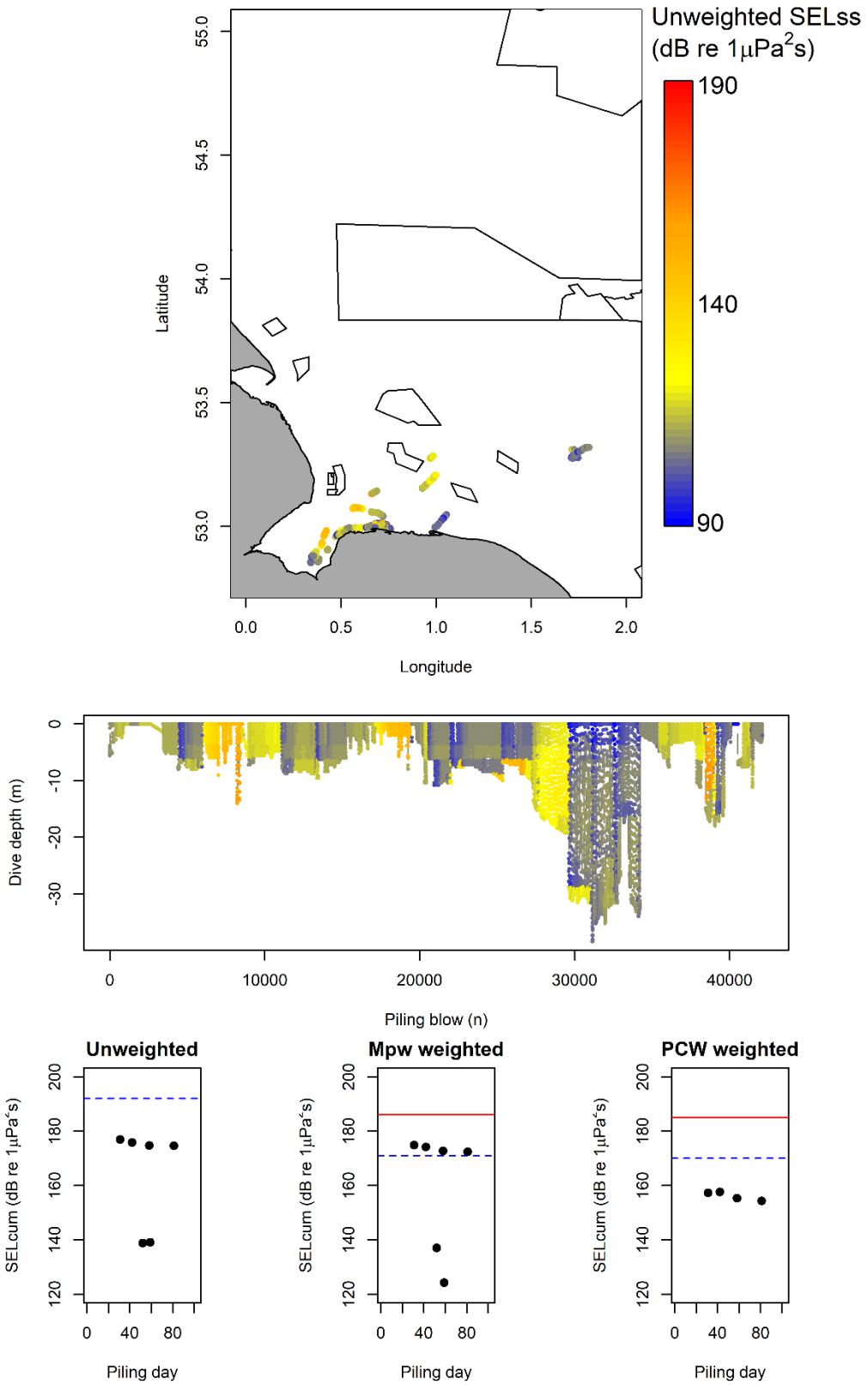

FIG. S1(n). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.291.12).

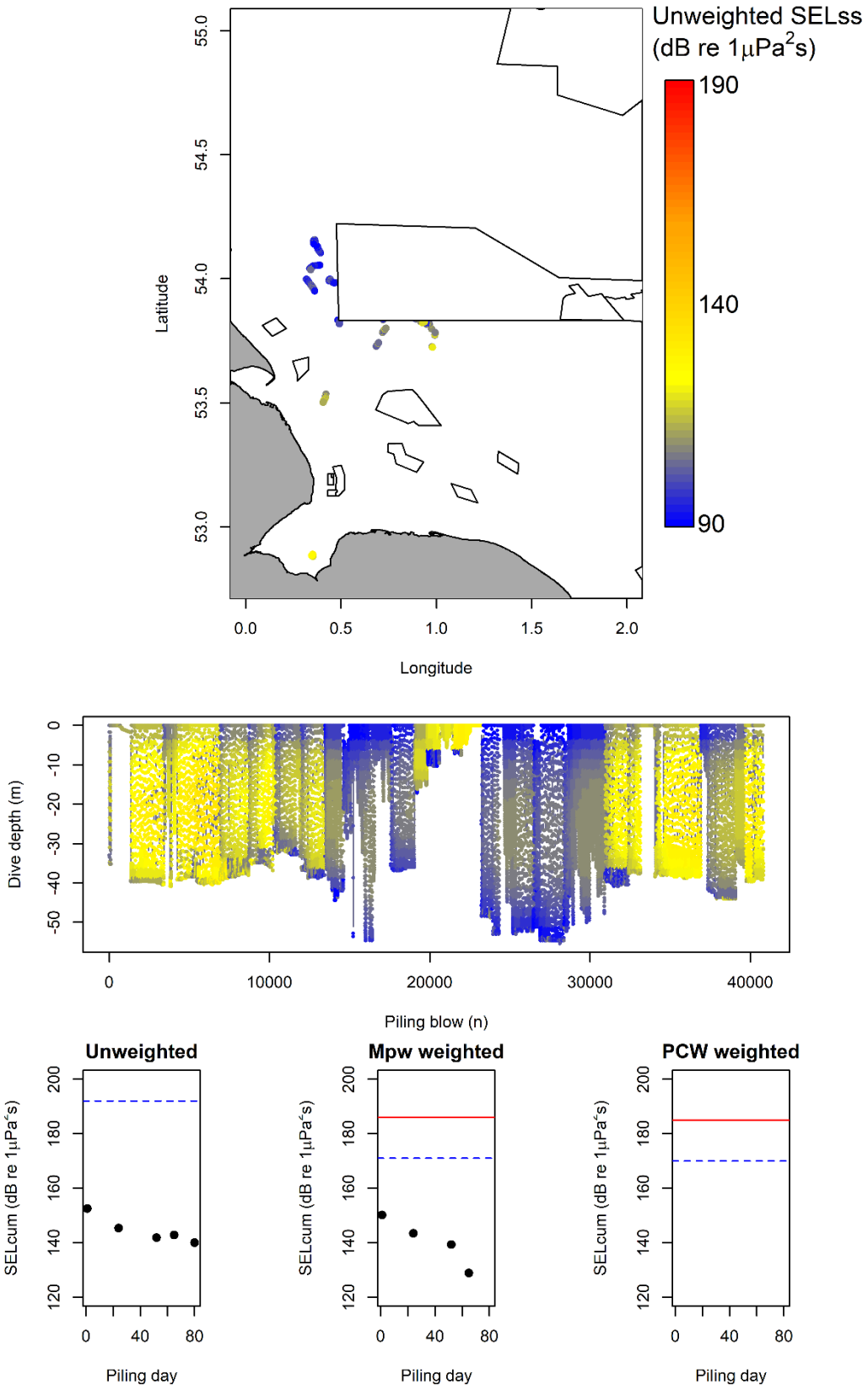

FIG. S1(o). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.292.12).

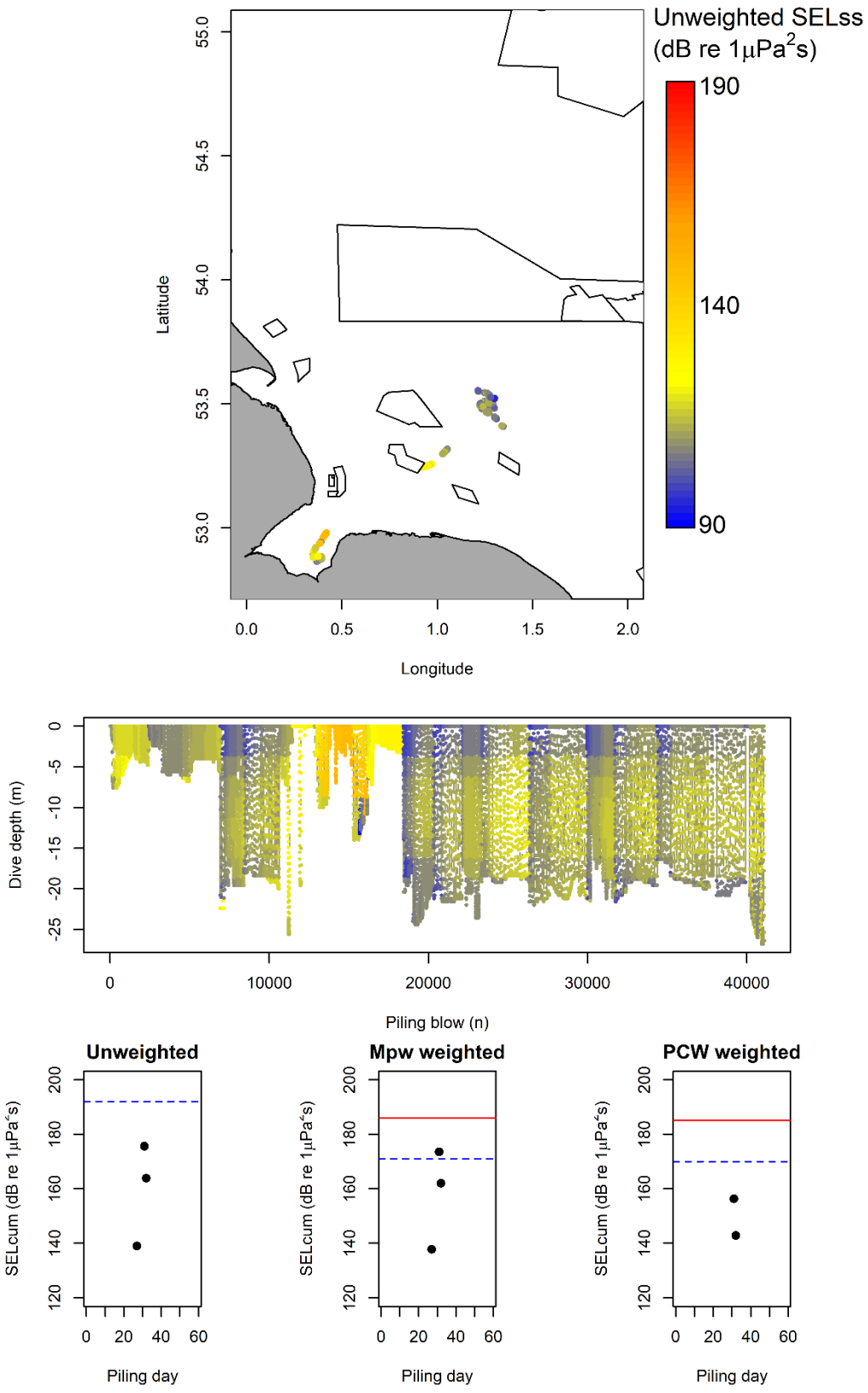

FIG. S1(p). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.293.12).

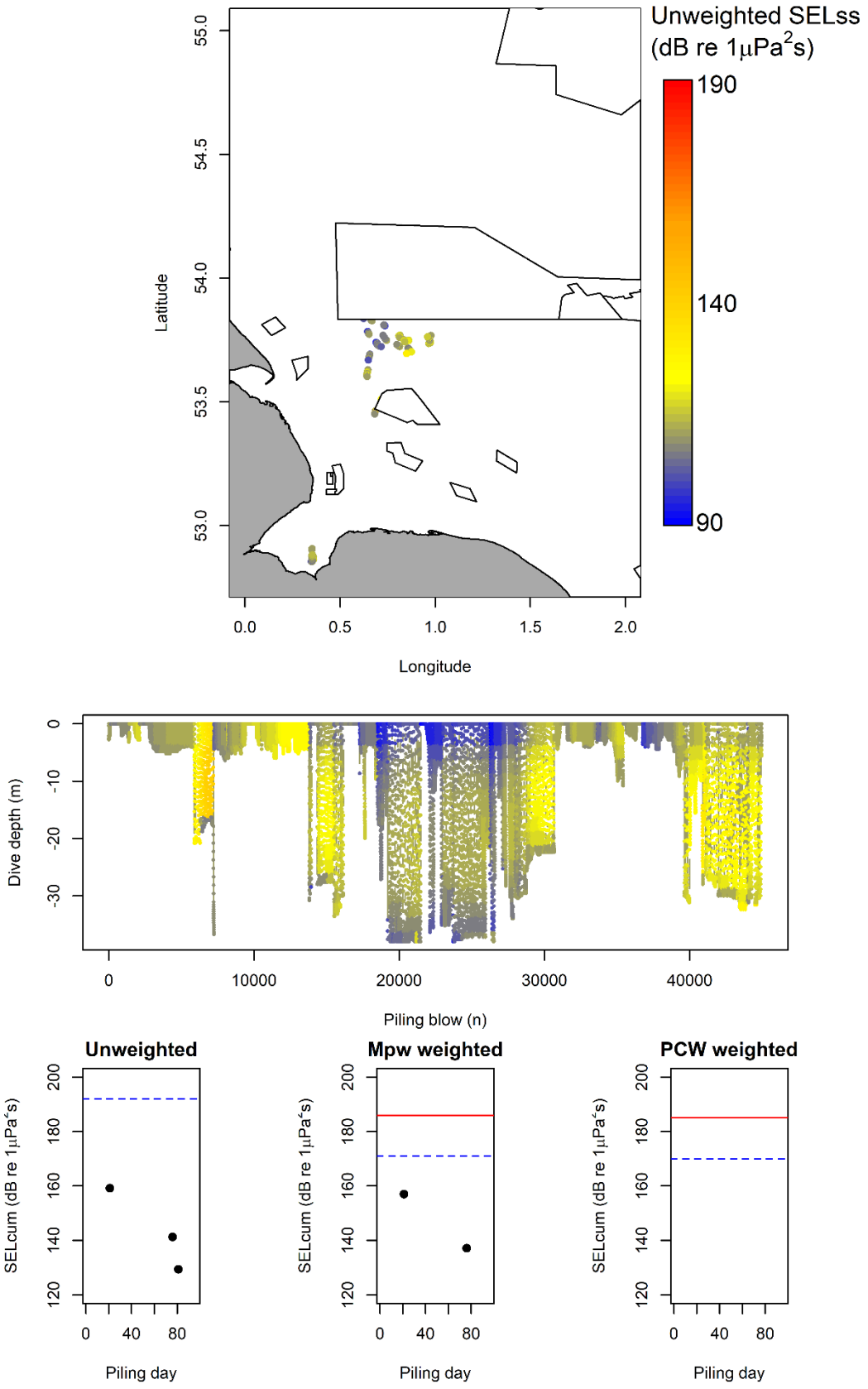

FIG. S1(q). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.294.12).

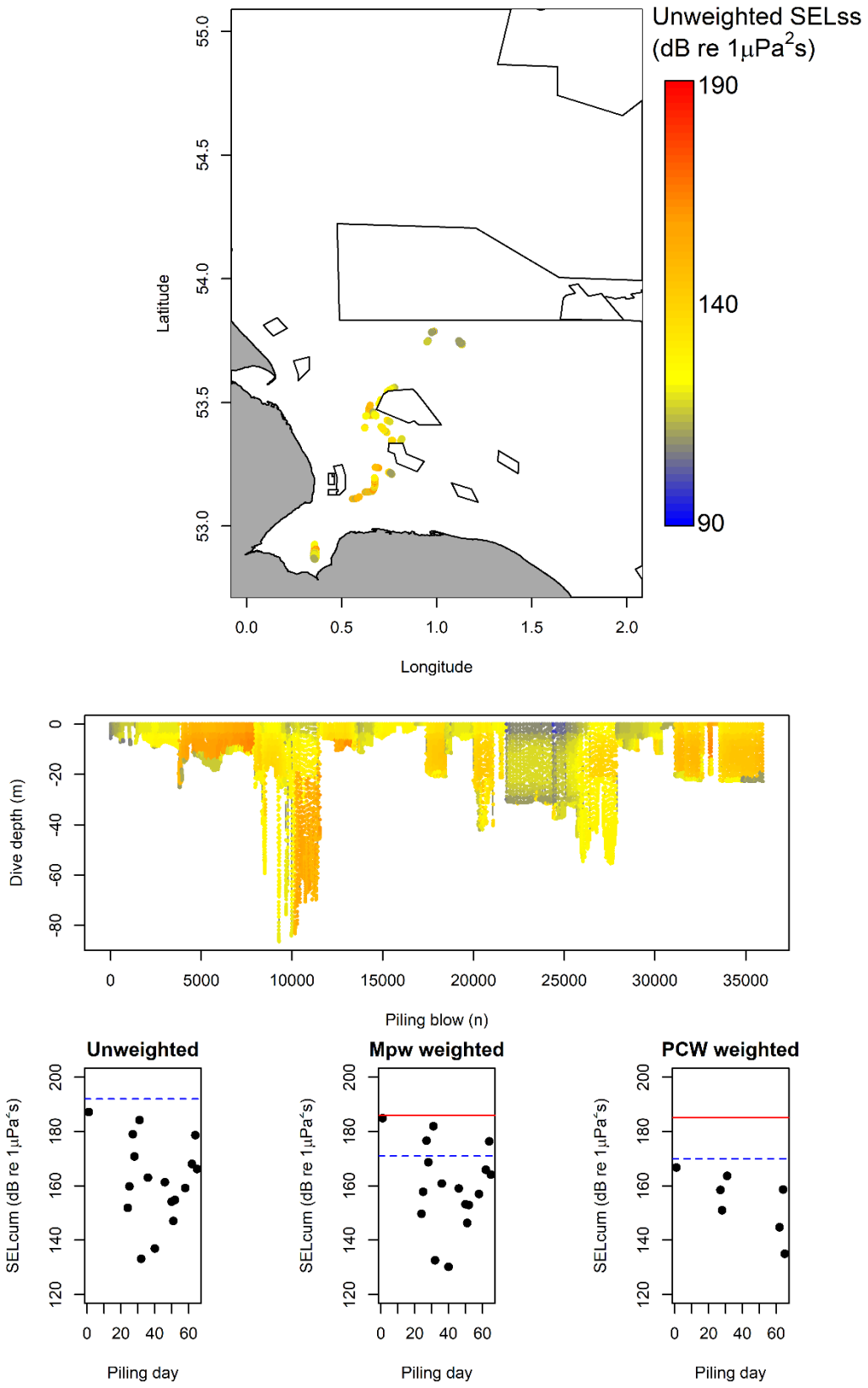

FIG. S1(r). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.295.12).

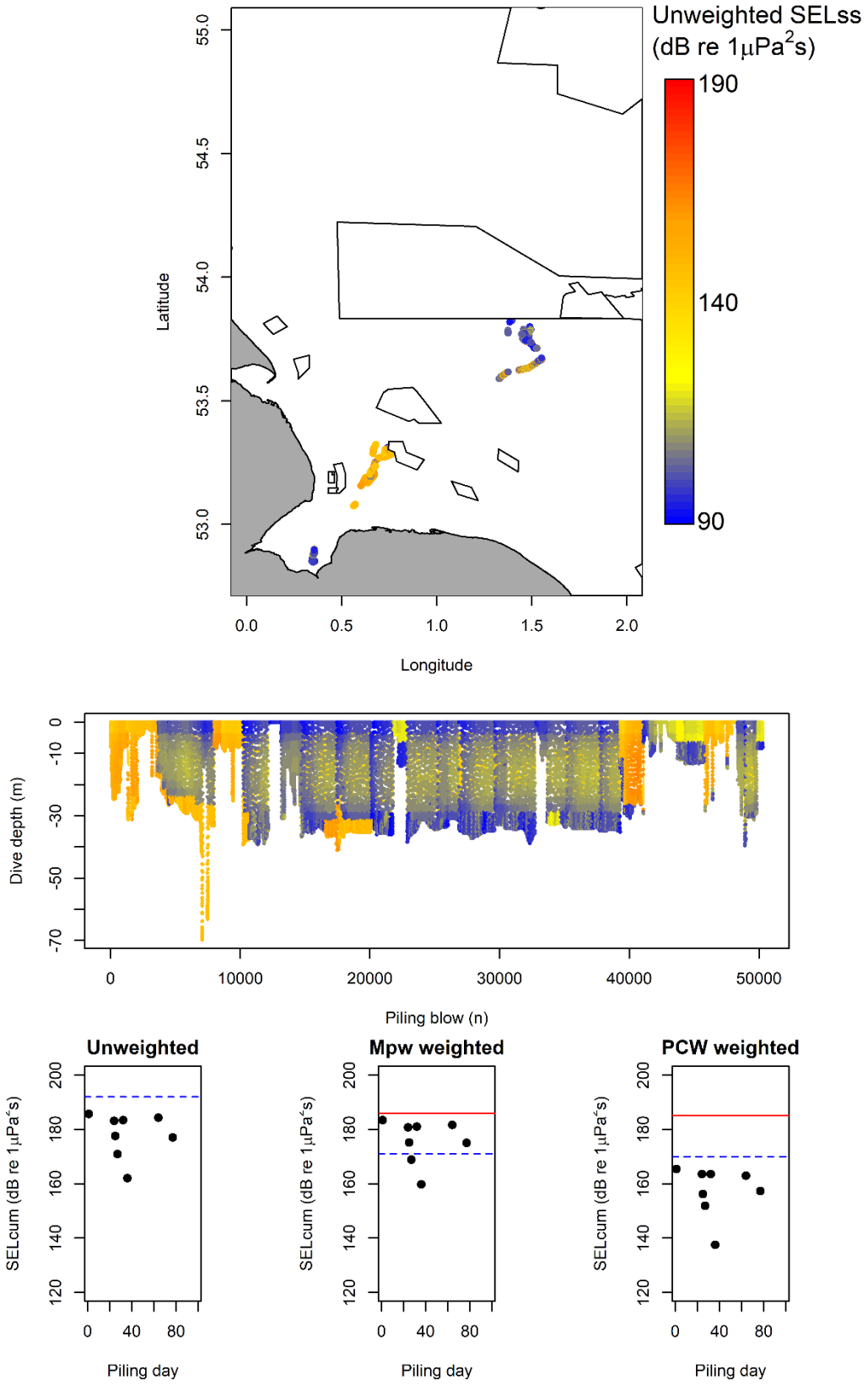

FIG. S1(s). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.316.12).

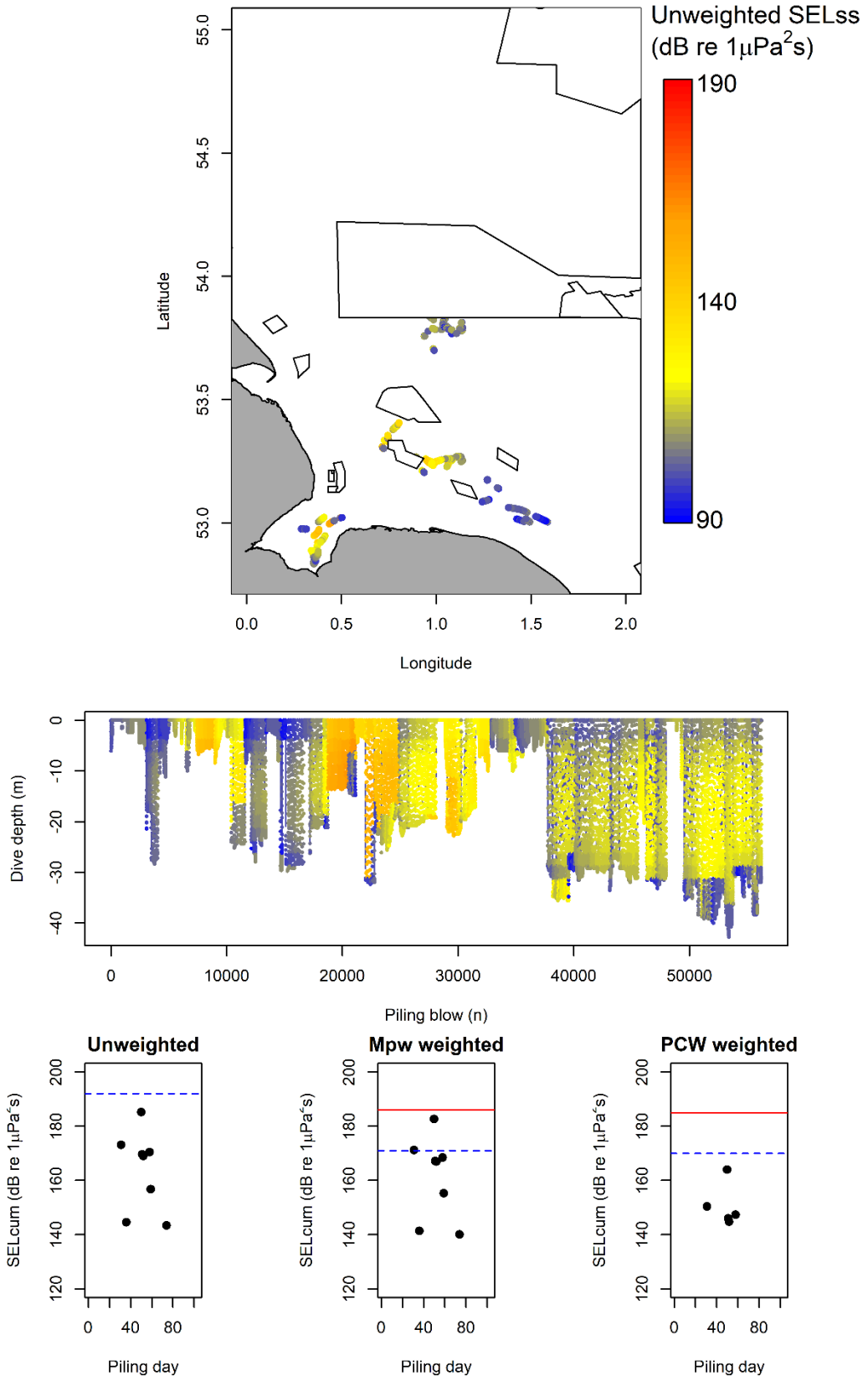

FIG. S1(t). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.317.12).

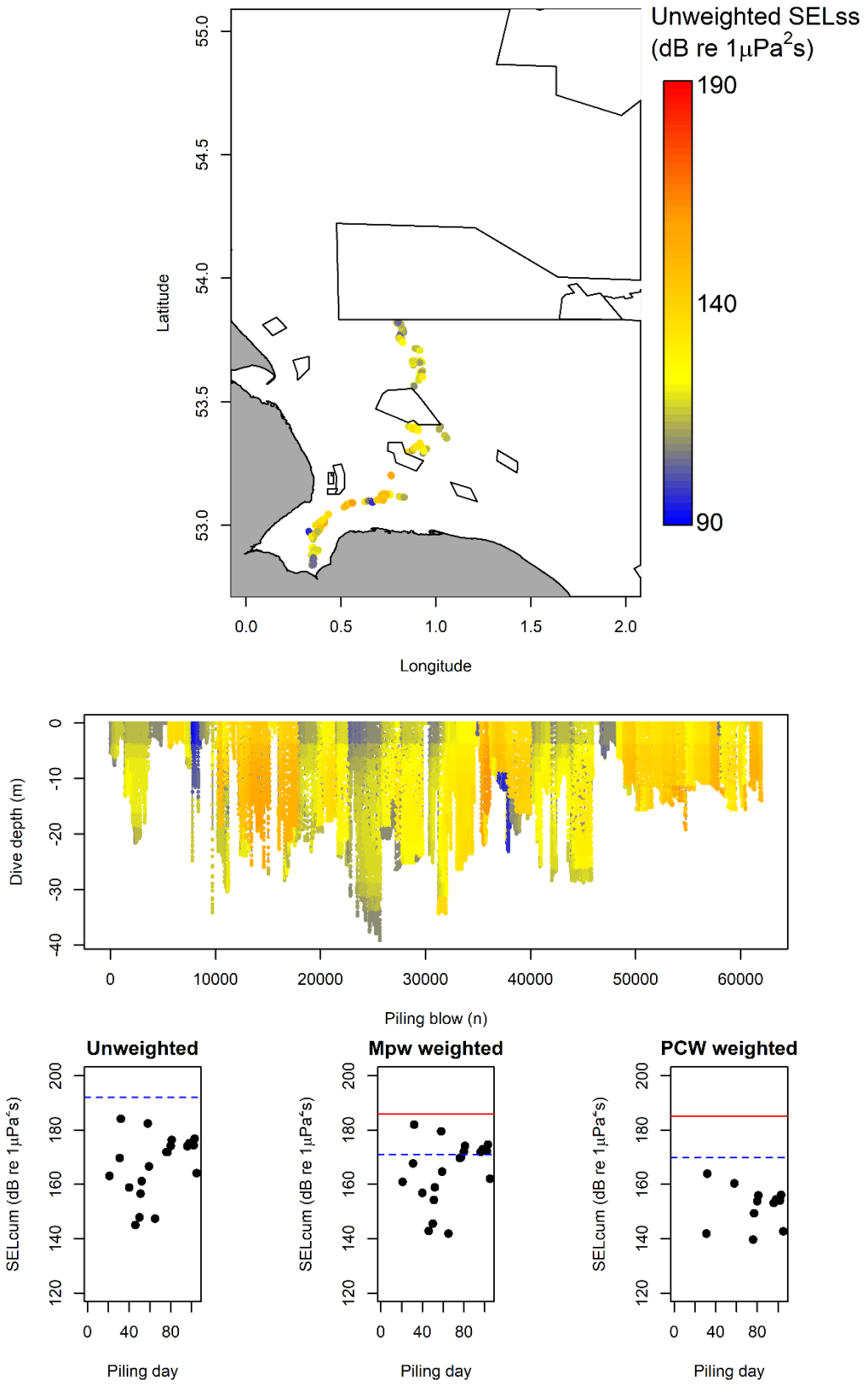

FIG. S1(u). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.318.12).

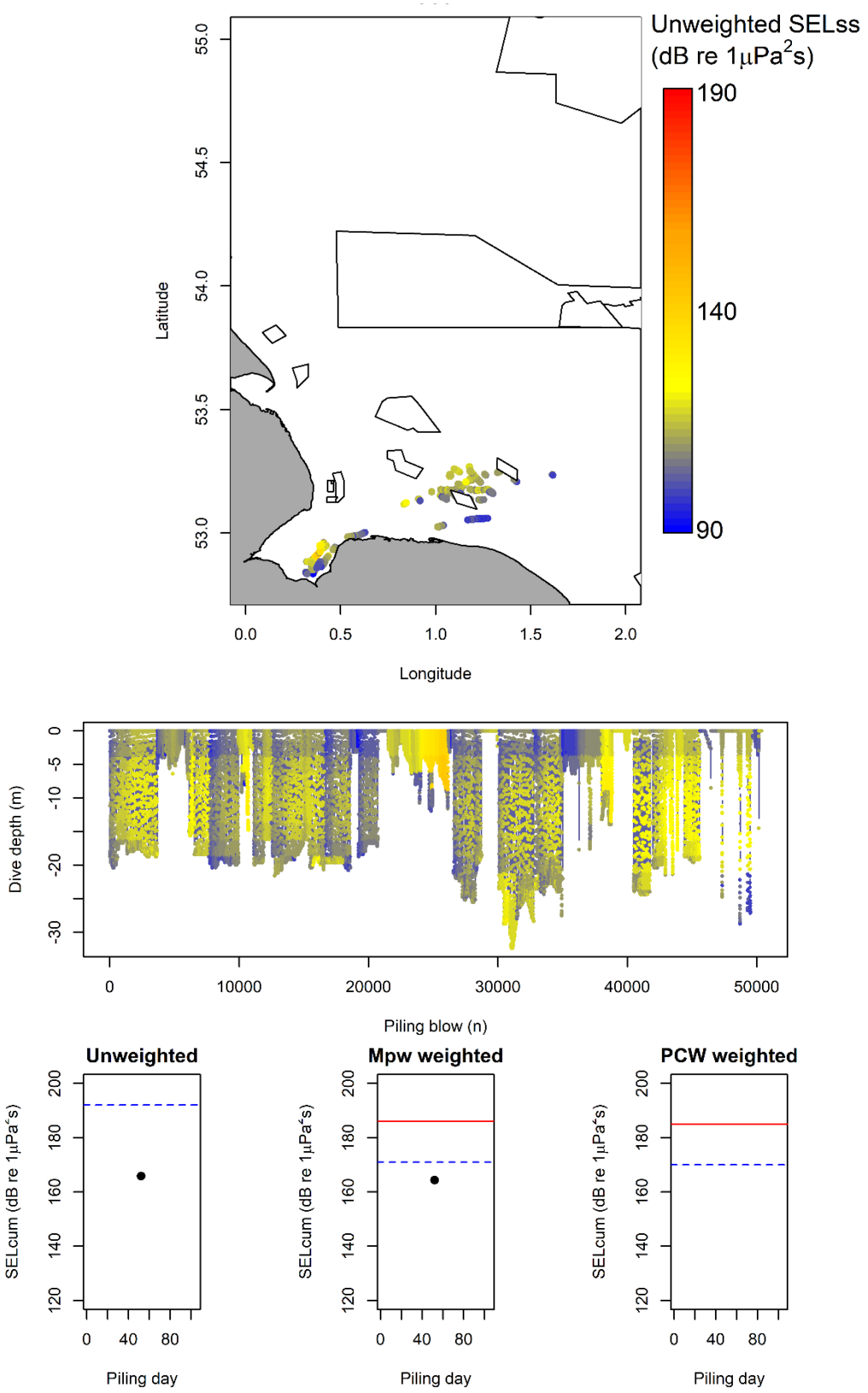

FIG. S1(v). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.319.12).

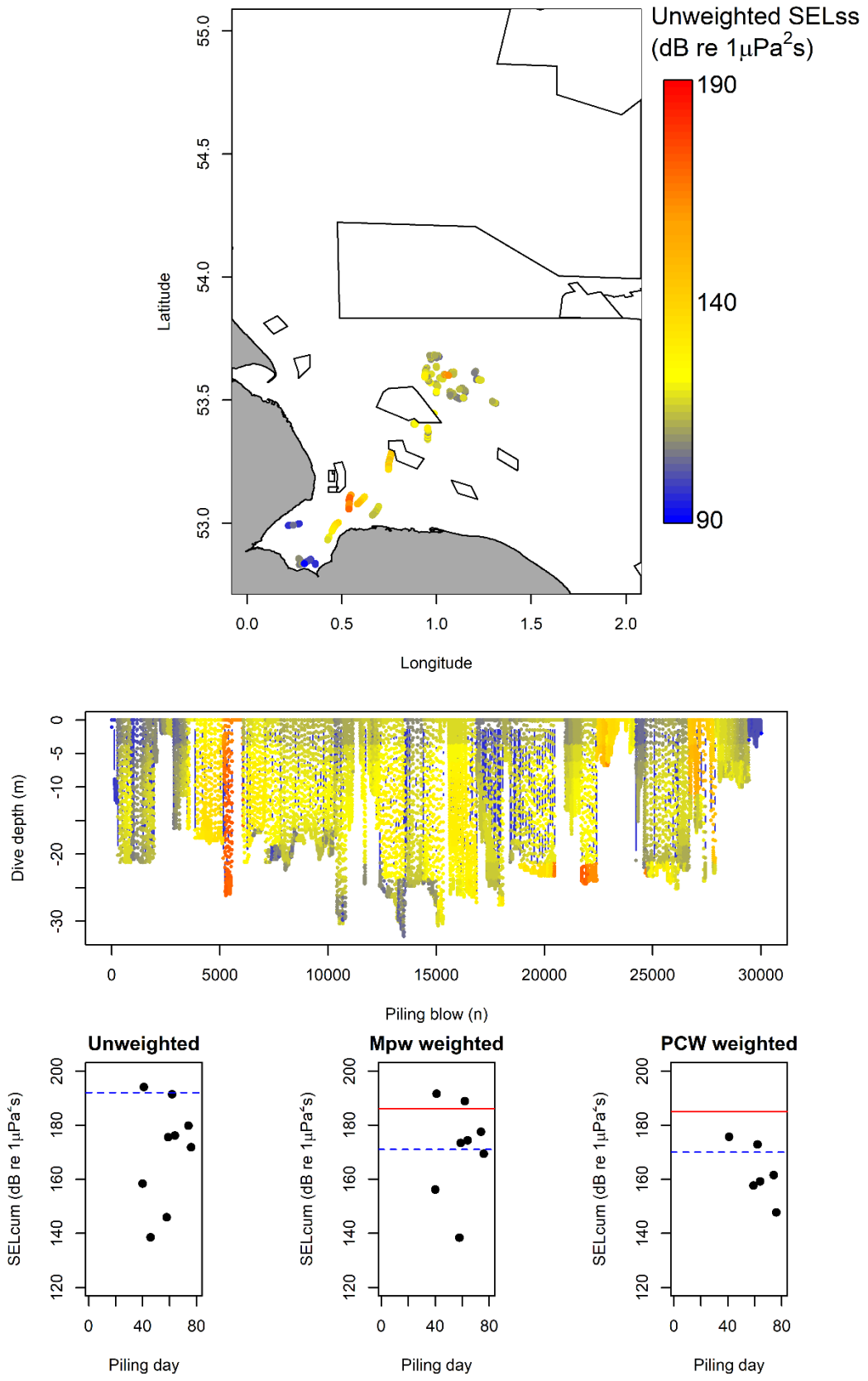

FIG. S1(w). Example of the estimated acoustic exposure from pile driving at one of the tagged harbour seals (ID#: pv42.320.12).

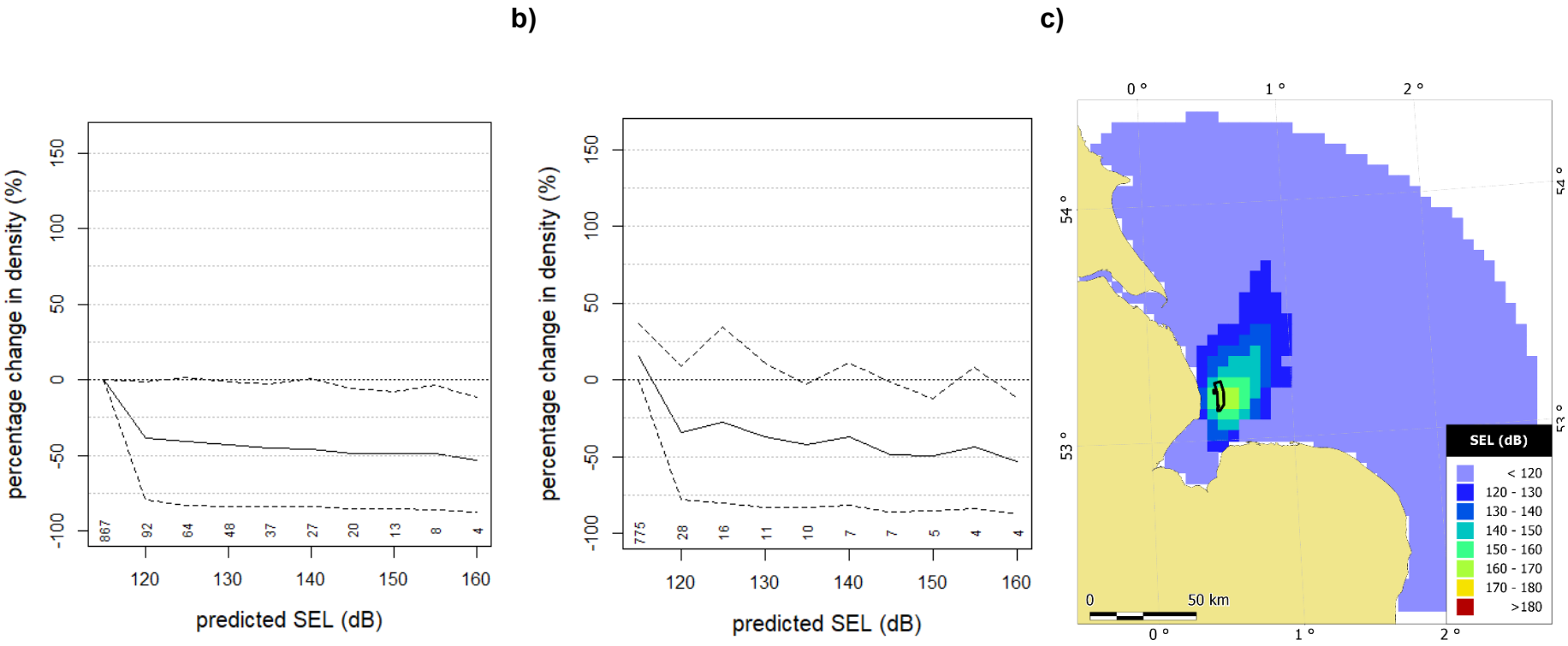

FIG. S2: The predicted lower 95% CI sound exposure level (SEL, dB re 1 μPa^2.s) across piles, meaned across all depths, and the associated cumulative (a) and annulus (b) changes in density of seals. Number of cells (a, b) predictions relate to are shown along the bottom. The dashed lines represent 95% confidence intervals. The corresponding predicted SELs across the study area are shown in (c).

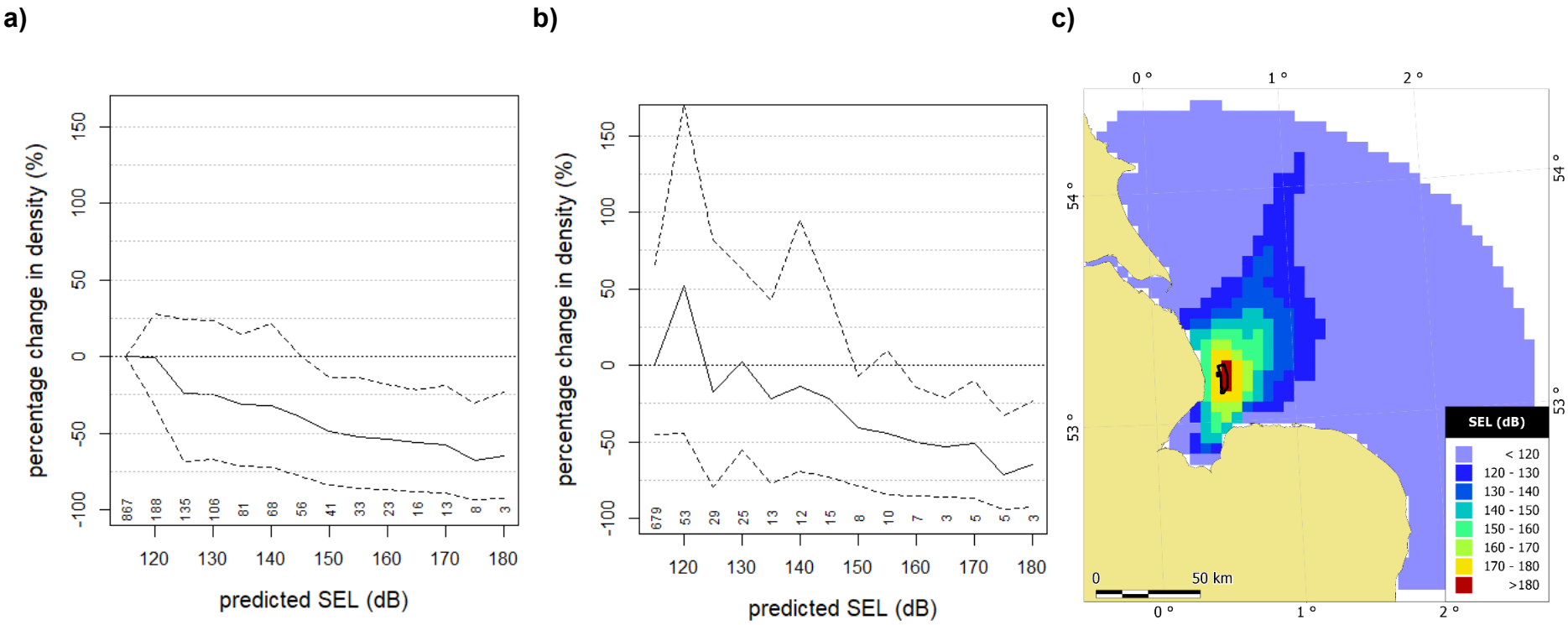

FIG. S3: The predicted upper 95% CI sound exposure level (SEL, dB re 1 μPa^2.s) across piles, meaned across all depths, and the associated cumulative (a) and annulus (b) changes in density of seals. Number of cells (a, b) predictions relate to are shown along the bottom. The dashed lines represent 95% confidence intervals. The corresponding predicted SELs across the study area are shown in (c).

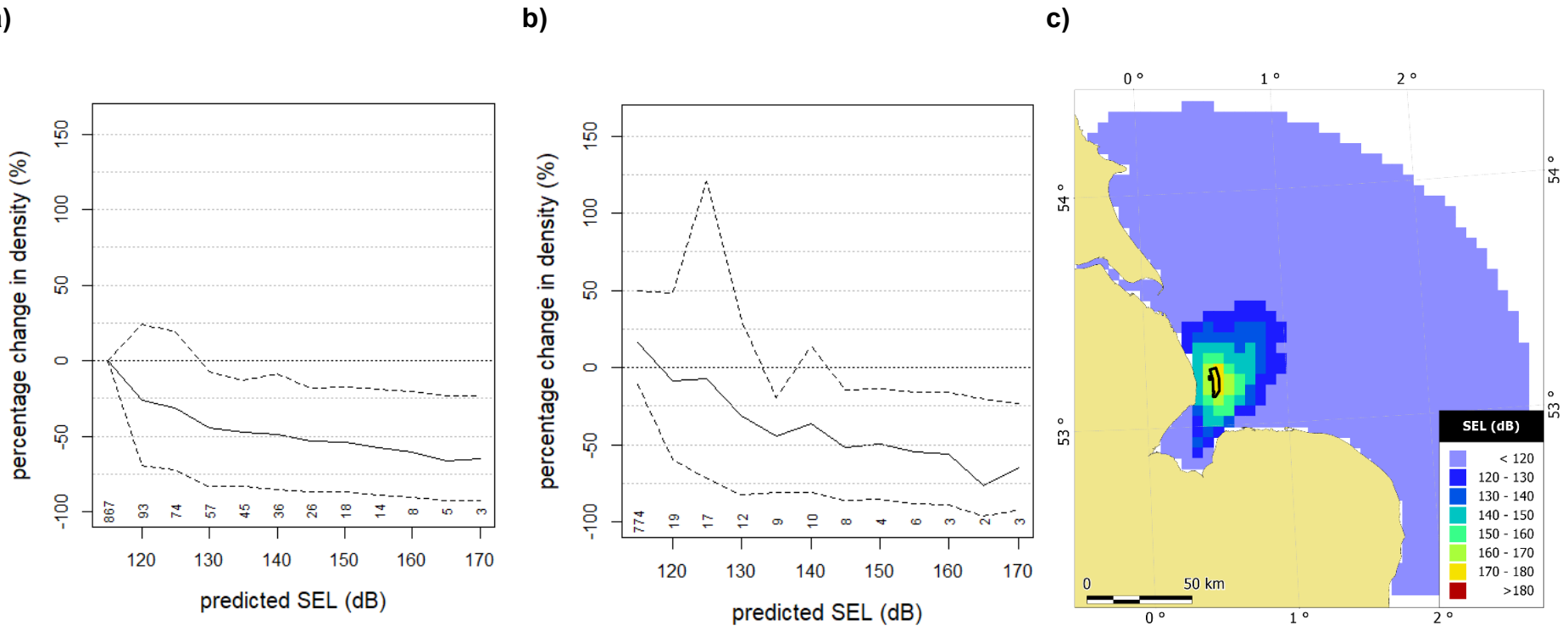

FIG. S4: The predicted sound exposure level (SEL, dB re 1 μPa^2.s) at the quietest depths, meaned across all piles, and the associated cumulative (a) and annulus (b) changes in density of seals. Number of cells (a, b) predictions relate to are shown along the bottom. The dashed lines represent 95% confidence intervals. The corresponding predicted SELs across the study area are shown in (c). (a) and (c) are presented in Russell *et al*. 2016, using a different sound propagation model.

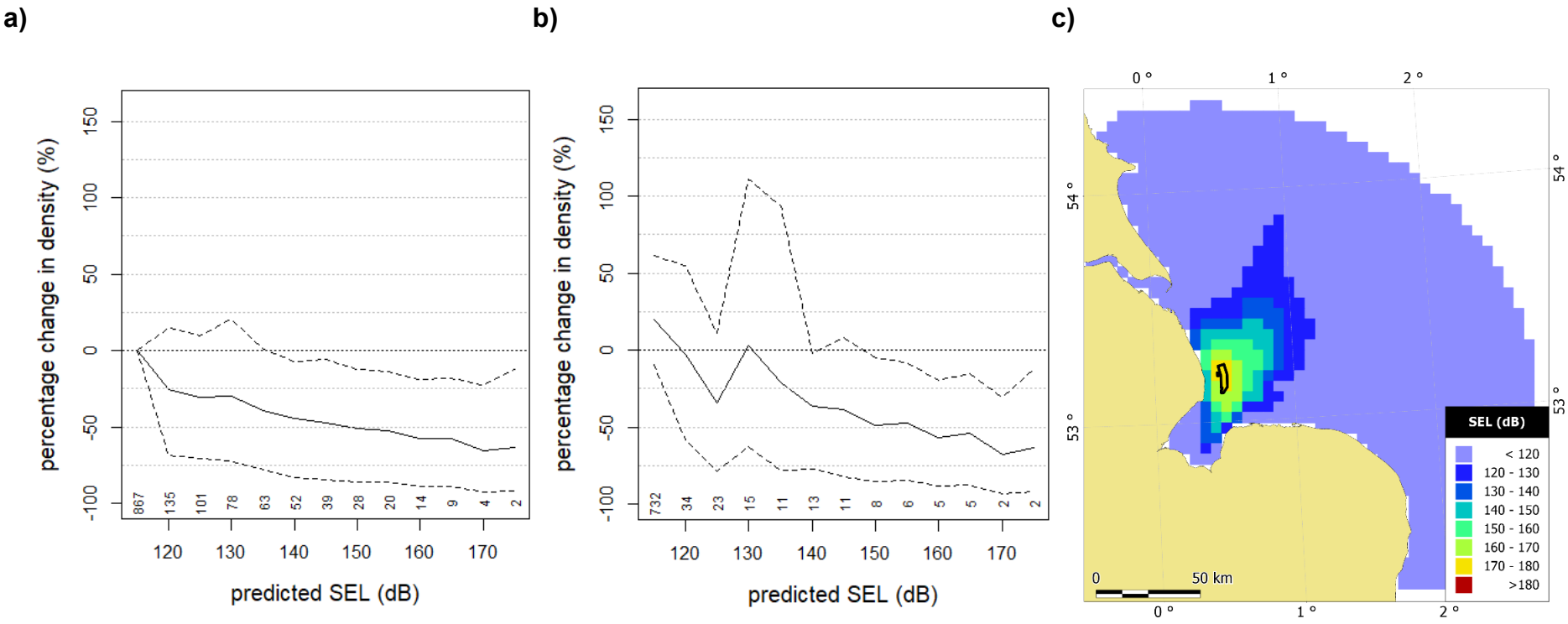

FIG. S5: The predicted sound exposure level (SEL, dB re 1 μPa^2.s) at the loudest depths, meaned across all piles, and the associated cumulative (a) and annulus (b) changes in density of seals. Number of cells (a, b) predictions relate to are shown along the bottom. The dashed lines represent 95% confidence intervals. The corresponding predicted SELs across the study area are shown in (c). (a) and (c) are presented in Russell *et al*. 2016, using a different sound propagation model.

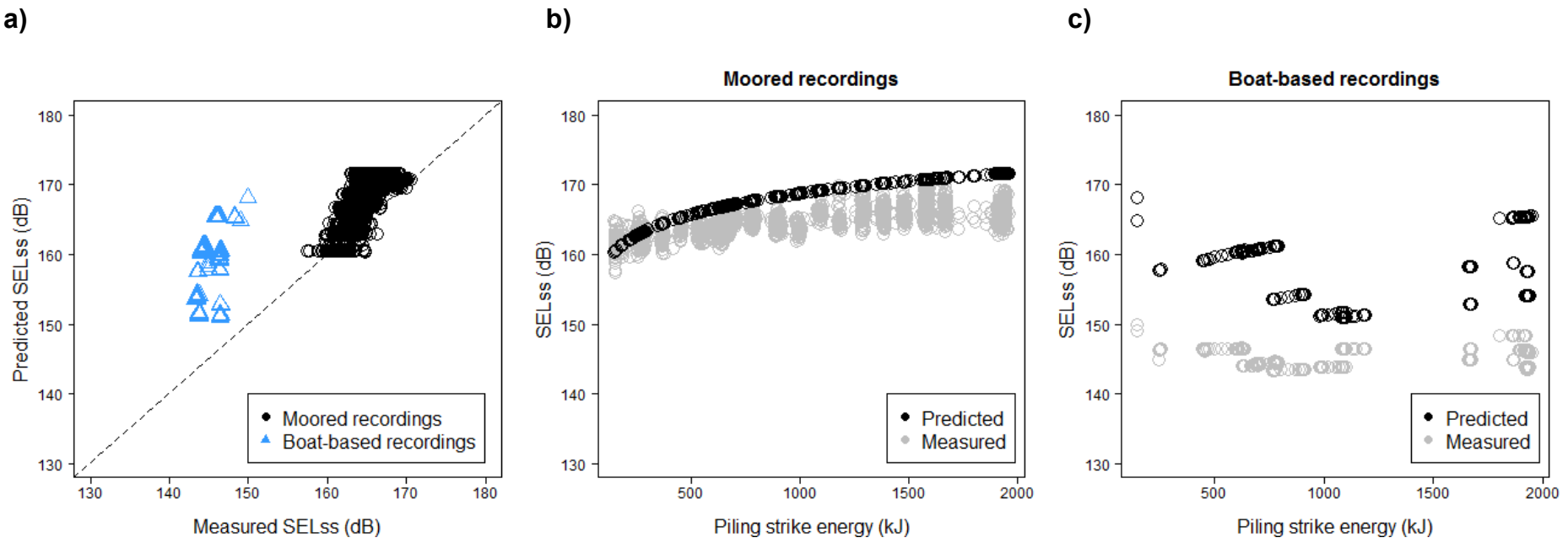

FIG. S6: The modelled single-strike sound exposure levels (SELss, dB re 1 $\mu Pa^2.s$) were compared to measurements from recordings made in the study area of 2,902 piling strikes. (a) Predicted SELss are shown against measured SELss for both the moored sound recorder (black circles) and boat-based recordings (blue triangles). (b) Predicted (black) and measured (grey) SELss for the range of pile strike energies recorded by the moored sound recorder 9 m below the water surface and a distance of 4,900 m from piling. (c) Predicted (black) and measured (grey) SELss for the range of pile strike energies recorded by the boat-based recordings at 1 m below the water surface and distances of 1,000 to 9,500 m from piling.