Fig. S1. Accuracy of the measured mean coherence function for an integration time of 0.14 s (top), 1.14 s (middle), and 9.1 s (bottom) for random Gaussian noise. The accuracy of the measured mean coherence function <C>, averaged over all frequencies, as a function of SNRL = SPL$_{ncorr}$ – SPL$_{corr}$, with the correct coherence coefficient superimposed in red. Artificial time series were generated by mixing a coherent and incoherent time series. Error-bars indicate the 3-sigma uncertainties on the measured mean coherence function. The black dashed line shows the empirically determined limit $C_{lim} = \frac{3}{\sqrt{N_{samp}/2}}$ for measuring the coherence function when the flow noise dominates, with $N_{samp} = \frac{w}{df} = w \cdot T_{int}$ and *df* the frequency resolution. The shortest integration time (0.14 s, top panel) indicated that in order

to ensure that the measurement was dominated by the correlated noise (SNRL ≤ -3 dB), the measured level of the correlation coefficient $10 \log_{10} <C>$ needed to be at least -6 dB or higher. This criterion was adopted to obtain reliable measurements of the ambient noise. For the longest integration time (9.1 s, bottom panel), the correlation coefficient could be measured reliably even when the uncorrelated noise exceeded the correlated noise by 10 dB.

Fig. S2. Tag placement location on two killer whales. The top picture shows the tag placement of oo09_144a, and the bottom picture that of oo09_144b. Tag oo09_144b was situated on the left flank of the killer whale, whereas tag oo09_144a was placed just posterior

of the dorsal fin of the animal. Tag oo09_144a was positioned on the right side of the body near the dorsal fin and slid backwards slightly during the deployment. The tag on the other animal slid much further down, to the lower left side of the body, soon after it was deployed. Before the start of the first sonar exposure, the tagged animals were making deep dives, with underwater tail slap sounds indicative of feeding recorded on the tags.

Table S1. Stereo acoustic version-2 DTAG deployments on two whale species. The table lists the tags used in the flow and ambient noise analysis, with Tag ID, species, estimated age/sex of the animals, dates, duration and general area of the tag deployments.

Tag ID	Species	Age/Sex	Date	Deployment duration	Location
mn12_180a	Humpback whale (*Megaptera novaeangliae*)	adult female	June 2012, at 18:03 UTC	15 hours	Near Bear Island
oo09_144a	Killer whale (*Orcinus orca*)	adult male	May 2009 at 09:58 UTC	12 hours	Norwegian continental shelf (Vesteralen area)
oo09_144b	Killer whale (*Orcinus orca*)	adult male	May 2009 at 10:52 UTC	12 hours	Norwegian continental shelf (Vesteralen area)

Table S2. Measured contribution of correlated and uncorrelated noise on total noise budget. Listed are the total sound pressure levels (SPL) measured in different depth ranges for different frequencies measured on two tagged killer whales (oo99_144a, oo09_144b) during a 30 min period. The table shows the mean (+/-1 SD) of the SPL_{tot} for all data points, and mean (+/- 1 SD) for times when the correlated part dominated the sound field (SPL_{corr}) and for when the uncorrelated dominated the correlated contribution (SPL_{uncorr}). The fractions of time of which the correlated or uncorrelated noise dominated the noise level are indicated in separate columns. The SPL_{corr} (indicated in bold) was considered to provide a reliable estimate of the ambient noise during the 30 min period.

Frequency	Depth range [m]	total $<SPL_{tot}>$ dB re 1 µPa² (+/- 1 SD)	correlated $<SPL_{corr}>$ dB re 1 µPa² (+/- 1 SD)	Fraction of time correlated noise dominant	uncorrelated $<SPL_{uncorr}>$ dB re 1 µPa²	Fraction of time uncorrelated noise dominant
Oo09_144a						
1 kHz (1/3 Oct)	2 – 20	100.2 (± 6.4)	**96.8 (± 2.5)**	0.31	106.8 (±6.9)	0.07
	20 – 400	110.6 (± 8.1)	**100.8 (±2.6)**	0.24	113.7 (±6.0)	0.63
2 kHz (1/3 Oct)	2 – 20	94.1 (±6.2)	**92.8 (±5.1)**	0.44	n/a	0
	20 – 400	104.0 (±7.0)	**99.7 (±4.9)**	0.61	109.3 (±1.1)	0.0005

Oo09_144b						
1 kHz (1/3 Oct)	2 – 20	97.5 (±10.9)	**88.7 (±3.5)**	0.13	105.2 (±8.9)	0.17
	20 – 400	116.8 (±10.3)	**100.4 (±3.2)**	0.14	119 (±7.6)	0.79
2 kHz (1/3 Oct)	2 – 20	92.0 (± 6.7)	**89.0 (± 3.7)**	0.20	98.0 (±7.2)	0.06
	20 – 400	107.8 (±9.2)	**98.0 (±5.2)**	0.25	110.6 (±7.1)	0.45