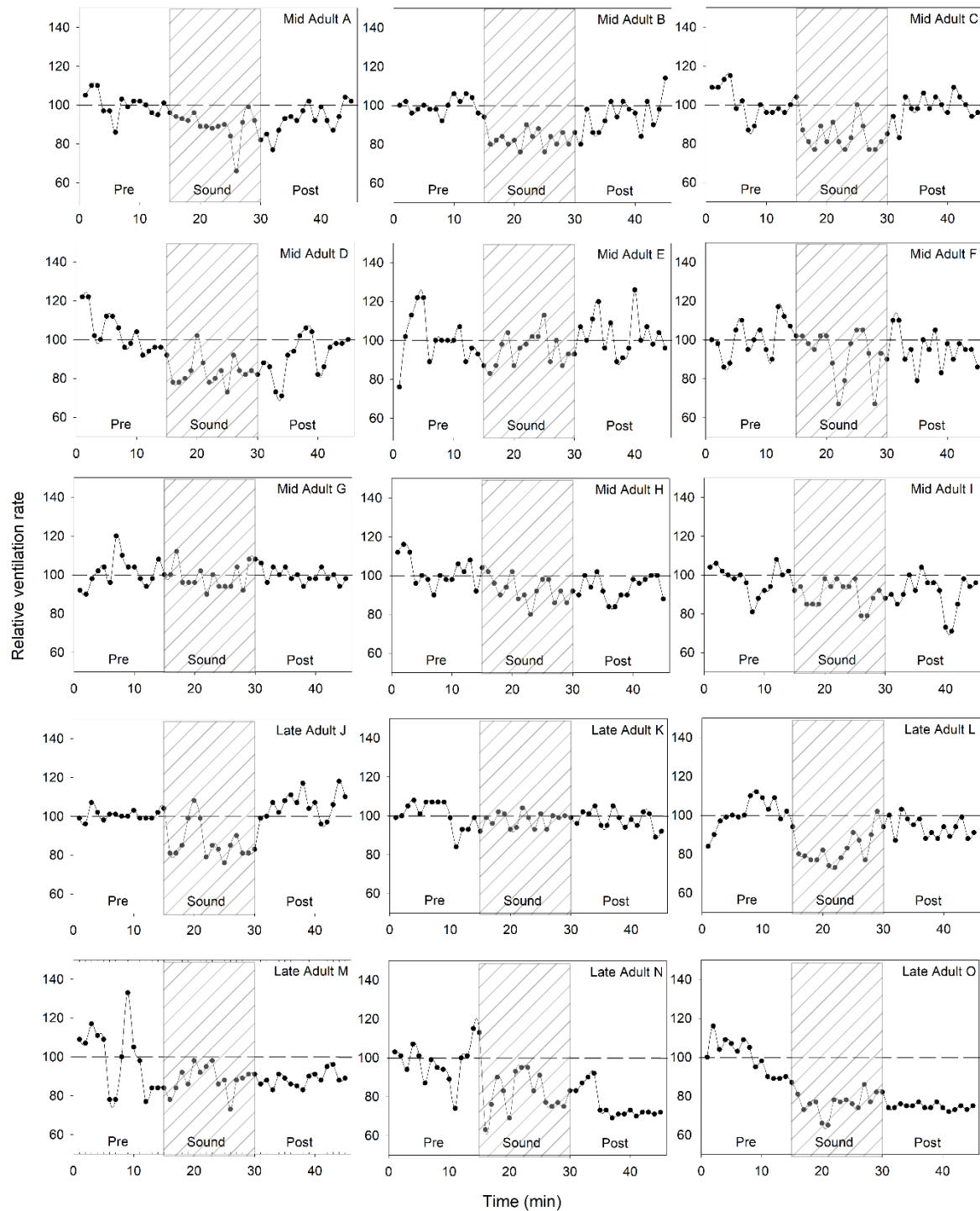


## **Supplementary Information**

**Title:** Vessel sound causes hearing loss for hummingbird bobtail squid (*Euprymna berryi*)

**Authors:** Rosalyn L. Putland <sup>1,2</sup>, T. Aran Mooney <sup>3</sup>, Allen F. Mensinger <sup>2,4</sup>

**Affiliations:** 1. Centre for Environment, Fisheries and Aquaculture Sciences, Lowestoft, Suffolk, UK, NR33 0HT; 2. Marine Biological Laboratory, Woods Hole, MA, USA, 02543; 3. Biology Department, Woods Hole Oceanographic Institution, Woods Hole, MA, USA, 02543; 4. Biology Department, University of Minnesota Duluth, Duluth, Minnesota, USA, 55812



**Supplementary Figure 1: Relative ventilation rate (breaths per minute/average pre) versus time for the nine mid adults observed (A – I) and six late adults observed (J – O). Grey boxes indicate sound exposure and dashed line indicates the relative ventilation rate of 100 breaths per minute.**

**Supplementary Table 1: Ventilation rates recorded for mid adult *Euprymna berryi***

		PRE														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Mid adult	A	125	131	131	116	115	102	122	118	121	121	119	114	113	120	114
	B	102	104	98	100	102	100	100	94	102	108	104	108	106	98	96
	C	102	102	106	108	92	96	82	84	94	90	90	92	90	94	98
	D	120	120	100	98	110	110	104	94	96	102	90	92	94	94	90
	E	70	94	104	112	112	82	92	92	92	92	98	82	88	86	80
	F	84	82	72	74	88	92	80	84	88	80	76	98	94	90	86
	G	92	90	98	102	104	96	120	110	104	104	98	94	98	108	100
	H	112	116	112	96	100	98	90	100	98	98	106	102	108	92	104
	I	100	102	98	96	94	96	92	78	84	88	90	104	96	98	88
		NOISE														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Mid adult	A	112	111	109	114	106	106	105	106	107	100	78	108	118	110	97
	B	82	84	86	82	84	78	92	86	90	78	86	82	88	82	88
	C	82	76	72	84	76	86	76	72	78	94	84	72	72	76	80
	D	76	76	78	82	100	86	76	78	82	72	90	82	80	82	80
	E	76	80	90	96	80	88	90	94	94	104	82	92	80	86	86
	F	86	82	80	86	86	74	56	66	82	88	88	78	56	78	76
	G	100	112	96	96	96	102	90	100	94	94	94	104	92	108	108
	H	102	96	90	94	102	88	90	80	92	98	98	86	92	86	92
	I	90	82	82	82	94	90	94	90	90	94	76	76	84	88	84
		POST														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Mid adult	A	101	92	103	111	112	110	115	121	110	118	110	104	112	124	121
	B	82	100	88	88	94	104	96	104	100	98	86	104	92	100	116
	C	88	78	98	92	92	100	92	98	94	90	102	98	94	88	90
	D	86	84	72	70	90	92	100	104	102	80	84	94	96	96	98
	E	98	92	102	110	88	100	82	84	88	116	92	98	90	96	88
	F	92	92	76	80	66	84	80	88	70	82	76	82	80	80	72
	G	106	96	104	100	104	98	100	94	98	98	104	98	100	94	98
	H	90	100	94	102	92	84	84	90	90	98	96	98	100	100	88
	I	86	82	86	96	88	100	92	92	88	70	68	82	94	90	92

**Supplementary Table 2: Ventilation rates recorded for late adult *Euprymna berryi***

		PRE														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Late adult	J	88	85	95	91	87	90	90	89	89	92	88	88	88	91	93
	K	82	83	87	90	84	89	89	89	89	82	70	77	77	82	76
	L	79	85	91	93	94	93	94	103	105	102	97	102	92	96	88
	M	140	137	150	142	139	100	100	128	170	135	126	98	108	108	108
	N	124	121	113	128	121	104	119	114	113	107	89	120	121	138	135
	O	100	116	104	109	107	103	109	105	95	98	90	89	89	90	87
		NOISE														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Late adult	J	72	72	76	88	96	88	70	76	74	68	76	80	72	72	74
	K	82	80	85	84	77	78	86	82	77	84	77	83	82	83	82
	L	75	74	72	72	77	70	69	73	78	86	82	72	85	96	88
	M	100	108	118	110	126	118	122	126	110	112	94	112	114	116	116
	N	76	91	108	100	83	111	114	114	99	109	92	90	92	90	100
	O	81	73	76	77	66	65	78	77	78	76	74	86	77	82	82
		POST														
		0-60	61-120	121-180	181-240	241-300	301-360	361-420	421-480	481-540	541-600	601-660	661-720	721-780	781-840	841-900
Late adult	J	88	89	95	91	96	99	95	104	93	95	85	86	94	105	98
	K	80	85	84	87	79	79	87	82	78	81	79	85	84	74	76
	L	94	82	97	92	89	92	83	86	83	88	84	88	93	83	86
	M	110	113	106	117	114	110	109	106	115	116	113	121	123	112	114
	N	100	104	108	110	88	87	83	85	85	88	84	86	86	85	86
	O	74	74	76	75	75	77	74	74	77	74	72	73	75	73	75

**Supplementary Table 3: Mean sound pressure thresholds for each age group at all frequencies examined.**

Frequency	Juvenile	Mid adult	Late adult
100	146.0 ± 0.0	136.3 ± 5.5	NR
200	143.7 ± 1.8	139.0 ± 4.5	146.3 ± 4.9
300	140.3 ± 1.2	135.3 ± 2.9	141.0 ± 2.9
400	137.3 ± 2.0	136.2 ± 2.4	139.3 ± 3.2
500	138.1 ± 2.6	135.3 ± 2.4	139.0 ± 5.1
600	140.6 ± 1.6	141.8 ± 6.0	141.3 ± 3.3
700	139.3 ± 1.6	142.0 ± 7.4	143.0 ± 2.9
800	141.0 ± 1.4	144.3 ± 6.6	146.5 ± 2.6
900	142.2 ± 1.5	143.0 ± 5.7	144.5 ± 2.6
1000	144.5 ± 1.5	142.8 ± 6.3	NR

Data are means ± 1 SD. NR=no response

**Supplementary Table 4: Mean particle acceleration thresholds for each age group at all frequencies examined.**

Frequency	Juvenile	Mid adult	Late adult
100	-16.6 ± 0.0	-20.3 ± 3.7	NR
200	-23.6 ± 1.6	-19.3 ± 1.4	-10.2 ± 1.0
300	-32.5 ± 1.0	-21.2 ± 1.9	-14.5 ± 4.6
400	-19.6 ± 0.9	-21.4 ± 1.7	-15.7 ± 5.2
500	-19.8 ± 1.3	-21.3 ± 1.4	-17.6 ± 3.9
600	-18.5 ± 1.3	-15.8 ± 3.8	-16.2 ± 2.6
700	-16.3 ± 1.3	-15.6 ± 5.5	-14.5 ± 2.5
800	-16.8 ± 1.2	-17.0 ± 3.1	-10.8 ± 1.7
900	-19.7 ± 1.0	-17.5 ± 2.7	-11.8 ± 1.8
1000	-21.4 ± 1.3	-16.5 ± 3.3	NR

Data are means ± 1 SD. NR=no response