

*Review*

# Noise in the Sea and Its Impacts on Marine Organisms

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**Abstract:**

**Keywords:**

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## **1. Introduction**

*The Silent World*

*etc.*

## *2.2. Sources of Sounds in the Sea*

*Pollachius pollachius* *Raniceps raninus* *Melanogrammus aeglefinus* *Gadus morhua*  
*Siluridae* *Cichlidae*  
*Alpheus* . and *Synalpheus* .

**Table 1.**

Types of the Anthropogenic Sound	Frequency	Intensity Level	References
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	
		μ	
		μ	
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>
		μ	<i>et al.</i>

### 2.3. Biological Significances of Sound in the Sea

## 3. The Effects of Anthropogenic Noise on Marine Organisms

*Halobatrachus didactylus*

*Pimephales promelas*

*Balaenoptera physalus*

*Zalophus californianus*

### 3.1. Acoustic Masking and Physiological Damage to Hearing System

*et al.*

*Mirounga angustirostris*

*et al.*

*Chromis chromis Sciaena umbra*

*Gobius cruentatus*

*Phocoena phocoena*

*Tursiops truncatus*

*Halobatrachus didactylus*

*et al.*

*Pagrus auratus*

*et al.*

*Loligo vulgaris* *Sepia officinalis* *Octopus vulgaris* *Illex coindetii*

$\mu$   
*Architeuthis dux*

**Table 2.**

Species	Types of Anthropogenic Noise	Effects	References
<i>M. angustirostris</i>			<i>et al.</i>
<i>C. chromis</i>			
<i>S. umbra</i>			<i>et al.</i>
<i>G. cruentatus</i>			
<i>H. didactylus</i>			<i>et al.</i>
<i>P. phocoena</i>			<i>et al.</i>

*Eumetopias jubatus*

*et al.*

*C. chromis*

*G. cruentatus*

*Neolamprologus pulcher*

*et al.*

*Dicentrarchus labrax*

*Chelon labrosus*

*Trisopterus luscus*

*G. morhua*

*P. pollachius*

*Trachurus trachurus*

*Anguilla anguilla*

*Clupea harengus*

*Gasterosteus aculeatus*

*Coenobita clypeatus*

*Carcinus maenas*

*Megaptera novaeangliae*

*T. truncatus*

*Eubalaena glacialis*

*E. australis*

*M. novaeangliae*

*et al.*

*T. truncatus*

*Balaenoptera acutorostrata*

**Table 3.**

Species	Types of Anthropogenic Noise	Effects	References
<i>D. labrax</i>			
<i>C. labrosus</i>			
<i>T. luscus</i>			
<i>G. morhua</i>			
<i>P. pollachius</i>			<i>et al.</i>
<i>T. trachurus</i>			
<i>A. Anguilla</i>			
<i>C. harengus</i>			
<i>P. dentex</i>			
<i>P. auratus</i>			
<i>S. australis</i>			
<i>C. pallasii</i>			
<i>N. pulcher</i>			



*Ziphius cavirostris*

*A. dux*

*Lepidochelys kempii*

*Tursiops truncatus*

*Ziphius cavirostris*

*M. densirostris*

*M. europaeus*

*O. orca*

*P. phocoena*

*T. truncatus*

*et al.*  
*Sebastes*

*G. morhua*

*M. aeglefinus*

*Pollachius virens*

*Panulirus cygnus*

*Micromesistius poutassou*

*Pecten novaezelandiae*

*Austroelice crassa*

*Hemigrapsus crenulatus*

*Metacarcinus magister*

*Crangon crangon*

3.4. The Other Physiological Impacts

*et al.*

*Morone chrysops*

*M. saxatilis*

*Delphinapterus leucas*

μ

*D. leucas*

*T. truncates*

μ

*et al.*

*C. maenas*

*et al.*

*Hippocampus erectus*

*C. crangon*

*D. labrax*

*D. labrax*

*Sparus aurata*

**Table 4.**

Species	Types of Anthropogenic Noise	Effects	References
<i>Z. cavirostris</i>			
<i>A. dux</i>			<i>et al.</i>
<i>O. orca</i>			
<i>P. phocoena</i>			<i>et al.</i>
<i>T. truncatus</i>			
<i>C. harengus</i>			<i>et al.</i>
<i>M. poutassou</i>			
<i>P. phocoena</i>			<i>et al.</i>
<i>G. flavescens</i>			
<i>P. minutus</i>			
<i>P. microps</i>			<i>et al.</i>
<i>T. bubalis</i>			
<i>M. scorpius</i>			
<i>S. goodie</i>			
<i>S. paucispinis</i>			<i>et al.</i>
<i>S. chlorostictus</i>			<i>et al.</i>
<i>G. morhua</i>			<i>et al.</i>
<i>M. aeglefinus</i>			
<i>P. virens</i>			
<i>M. aeglefinus</i>			<i>et al.</i>
<i>P. cygnus</i>			
<i>P. novaezelandiae</i>			<i>et al.</i>
<i>A. crassa</i>			
<i>H. crenulatus</i>			<i>et al.</i>
<i>C. crangon</i>			
<i>M. magister</i>			<i>et al.</i>
<i>Z. cavirostris</i>			
<i>M. densirostris</i>			<i>et al.</i>
<i>M. europaeus</i>			
<i>Z. cavirostris</i>			
<i>M. densirostris</i>			<i>et al.</i>
<i>M. europaeus</i>			
<i>Z. cavirostris</i>			
<i>M. densirostris</i>			<i>et al.</i>
<i>M. europaeus</i>			
<i>L. kempii</i>			
<i>T. truncates</i>			<i>et al.</i>
<i>C. caretta</i>			

**Table 5.**

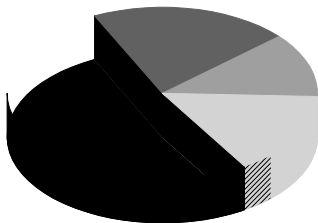
Species	Types of Anthropogenic Noise	Effects	References
<i>C. crangon</i>			
<i>D. leucas</i>			<i>et al.</i>
<i>T. truncates</i>			
<i>H. erectus</i>			<i>et al.</i>
<i>C. maenas</i>			<i>et al.</i>
<i>D. labrax</i>			<i>et al.</i>
<i>D. labrax</i>			<i>et al.</i>
<i>S. aurata</i>			
<i>D. leucas</i>			<i>et al.</i>
<i>P. elephas</i>			<i>et al.</i>
<i>M. chrysops</i>			
<i>M. saxatilis</i>			<i>et al.</i>

*et al.**Palinurus elephas**D. leucas**H. erectus*

#### 4. Discussion and Conclusions

*C. harengus**C. harengus N. pulcher M. novaeangliae*

*S. aurata*



## Acknowledgments

## Author Contributions

## Conflicts of Interest

## References

*Acoust. Res. Lett.* **2002**, *3*

*Dicentrarchus labrax*  
69

*Sparus aurata* *Mar. Environ. Res.* **2010**

*Fish. Res.* **2004**

67

*J. Mammal.* **2008** 89

*Mar. Environ. Res.*

**2008** 65

*Mar. Pollut. Bull.* **2009** 58

*Nucl. Instrum. Methods Phys. Res. Sect. A* **2009** 602

*Ecol. Lett.* **2011** 14

*Integr. Zool.* **2009**

4

*Trends Ecol. Evolut.* **2010** 25

*Anthropogenic Noise in the Marine Environment: Potential Impacts on the Marine Resources and Stellwagen Bank and Channel Islands National Marine Sanctuaries*

*Sensory Biology of Aquatic*

*Animals*

*Behaviour of Teleost Fishes*

*Fisheries Acoustics: Theory and Practice*

*The Diversity of Fishes: Biology Evolution*

*and Ecology*

*J. Mar. Biol. Assoc. UK* **1978** 58

*J. Acoust. Soc. Am.* **2005** 20

*J. Comp. Physiol. A* **1998** 182

*Sensory Processing in Aquatic Environments*

*Principles of Underwater Sound*

*J. Acoust. Soc. Am.* **2006** 120

*IEEE J. Ocean. Eng.* **2005** 30

*Acoustic Thermometry of Ocean Climate: Marine Mammal Issues*

*Proceedings: Workshop on the Effects of Anthropogenic Noise in the Marine Environment*

*Balaena mysticetus* vs.

*Mar. Mammal Sci.* **1995** 11

*Appl. Acoust.* **2010** 71

*J. Acoust. Soc. Am.* **2004** 116

*Auditory Scene Analysis: The Perceptual Organization of Sound*

*J. Fish Biol.*

**2009** 75

*et al*

*Bioacoustics* **2008** 17

*Gadus callarias* *Behaviour* **1961** 18

*Environ. Biol. Fishes* **1985**

13

*Lepomis macrochirus* *Comp. Biochem. Physiol. Part A* **2002** 133

*Crangon crangon*

*Mar. Biol.* **1982** 71

*Gadus morhua*

*ICES J. Mar. Sci. Symp* **1993** 196

*J. Acoust. Soc. Am.* **2003** 113

*Clupea harengus pallasii*

*Can. J. Fish. Aquat. Sci.* **1984** 41

*Sci. Rep.* **2013** 3

*Marine Fish Behaviour in Capture and Abundance Estimation*



- Gadus morhua* *Melanogrammus aeglefinus* *Can. J. Fish. Aquat. Sci.* **1996** 53
- Sebastes* *Can. J. Fish. Aquat. Sci.* **1992** 49
- Mar. Ecol. Prog. Ser.* **2009** 395
- Mirounga angustirostris* *Aquat. Mammal.* **2003** 29
- J. Exp. Biol.* **2007** 210
- Ziphius cavirostris* *Mar. Mammal Sci.* **2006** 22
- Phocoena phocoena* *J. Acoust. Soc. Am.* **2009** 125
- Tursiops truncatus* *Mar. Mammal Sci.* **2004** 20
- J. Acoust. Soc. Am.* **2005** 117
- Hear. Res.* **2001** 152
- et al* *Front. Ecol. Environ.* **2011** 9
- Architeuthis* *Biol. Conserv.* **2011** 144
- Mar. Pollut. Bull.* **2012** 64
- et al* *PLoS ONE* **2011** 6

*Endanger. Species Res.* **2012** 16

*In situ*

*Gobius cruentatus*

*Chromis chromis*

*J. Exp.*

*Mar. Biol. Ecol.* **2010** 386

*Anim. Behav.* **2013** 85

*Gasterosteus aculeatus* *PLoS ONE* **2011** 6

*Biol. Lett.* **2010** 6

*Anim. Behav.* **2013** 86

*Water Environ. J.* **2006**

20

*Nature*

**2000** 405

*J. Acoust. Soc. Am.* **2007** 122

*Megaptera novaeangliae*

*J. Acoust. Soc. Am.* **2000** 108

*Mar. Pollut. Bull.* **2010** 60

*Cont. Shelf Res.* **2001** 21

*Nature* **1998** 392

*Mar. Fish. Rev.* **1988** 50

*et al*

*J. Cetacean Res. Manag.* **2006** 7

*Ziphiidae*

*Vet. Pathol.* **2005** 42

*et al*

*Nature*

**2003** 425

*Orcinus orca*  
*ICES J. Mar. Sci.* **2002** 59

*Mar. Ecol. Prog. Ser.* **2006** 321

**2010** 60

*Mar. Pollut. Bull.*

*Bioacoustics* **2002** 12

*Fish. Res.* **2006** 79

*ICES J. Mar. Sci.* **2006** 63

**1994** 38

*Cancer magister* *Mar. Environ. Res.*

*PLoS ONE* **2012**

*Can. J. Fish. Aquat. Sci.* **2004** 61

*Biol. Lett.* **2013** 9

*Aquaculture* **2011** 311

*Dicentrarchus labrax*  
*Mar. Pollut. Bull.* **1999** 38

*PLoS ONE*

*Dokl. Biol. Sci.* **2011** 440

*s elephas* *Can. J. Zool.* **2014** 93

*Sparus aurata*

*Aquaculture* **2013** 414

*Sparus aurata*  
*J. Fish Biol.* **2008** 73