Echoortung im Wasser

Echoortung:

Mammalia

Chiroptera : Mikrochiroptera
Makrochiroptera (nur die Gattung Rousettus)

Cetacea: Odontoceti (Zahnwale)
Mysticeti (Bartenwale) – nicht -

Aves

Fettschwalm (Ordn. Nachtschwalben; Fam. Steatornithidae)

Bartenwale

Buckelwal  

Zwergwal (dwarf-minke) 

Finnwal, 5x beschleunigt 

Blauwal, 5x beschleunigt 

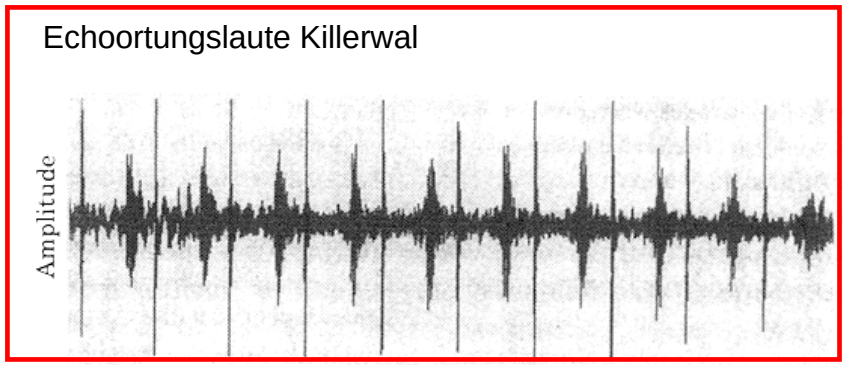
Zahnwale

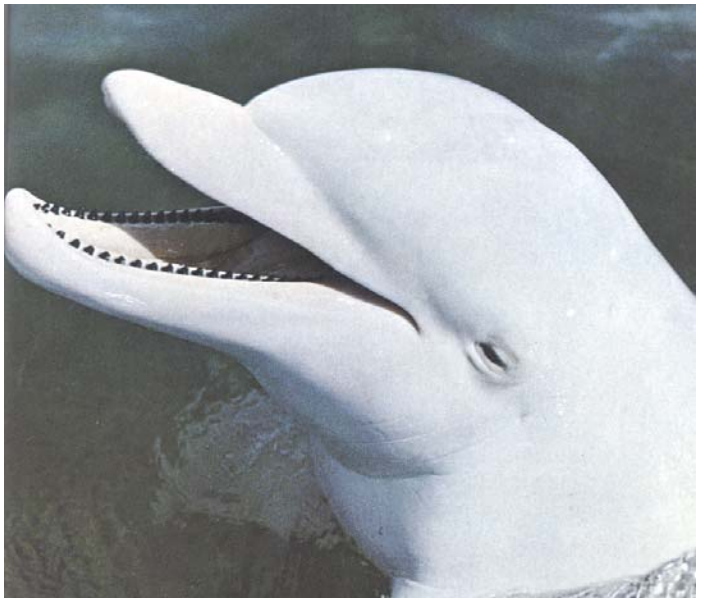
Delphin Kommunikation 

Delphin Echoortungspulse   

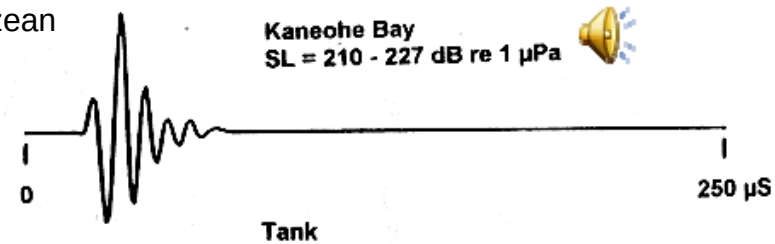
Pottwal - Echoortungspulse 

http://www.environment.gov.au/coasts/species/cetaceans/sound.html#songs
http://www.sandiegozoo.org/animalbytes/t-whale.html
http://soundboard.com/sb/Dolphin_Sounds_audio.aspx

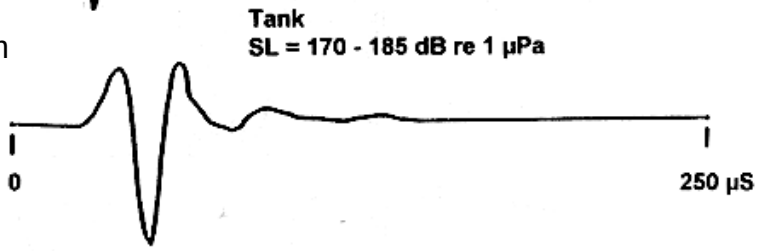


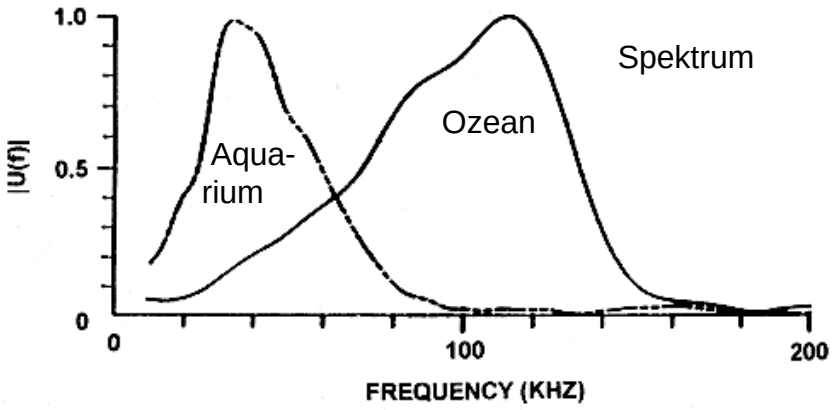


Freier Ozean



Aquarium





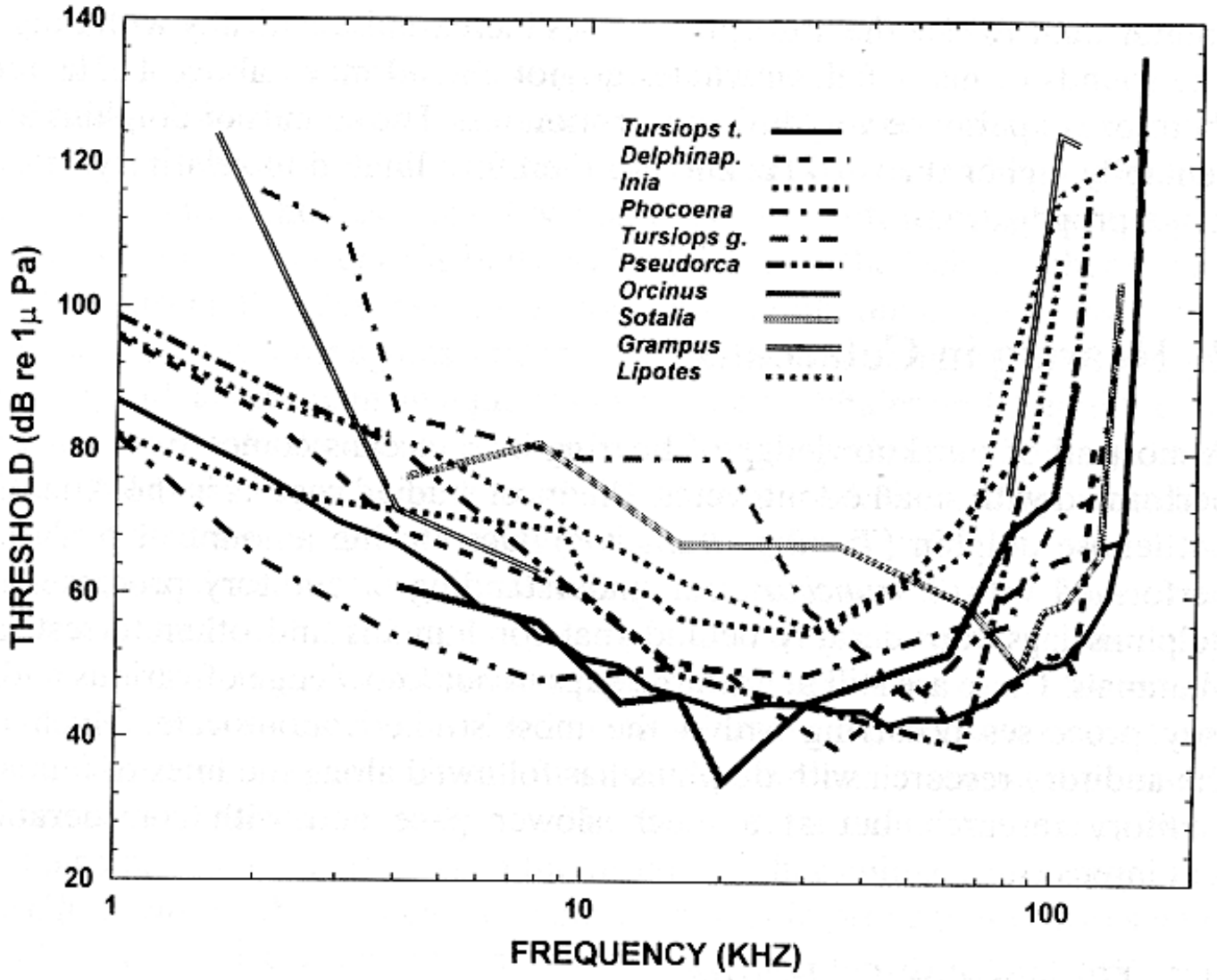
Tursiops truncatus

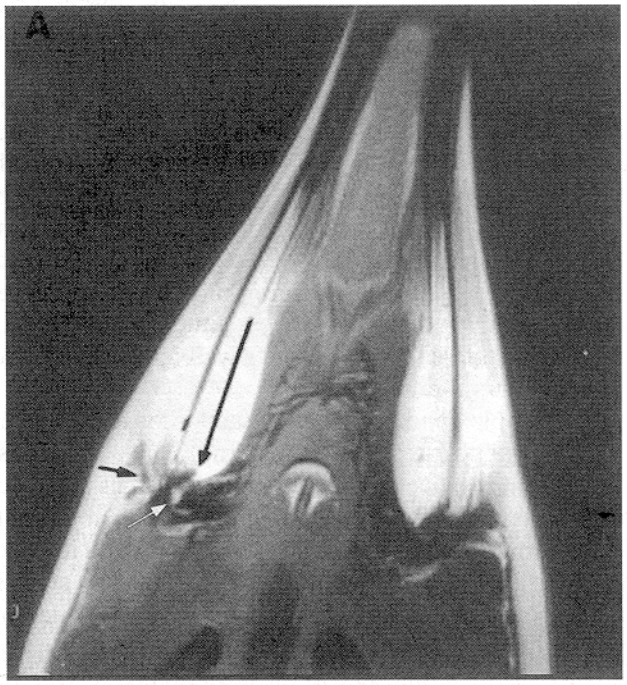
Echoortungslaute:
Clicks (Dauer 50- 250 µs; Hauptenergie 10-200 kHz

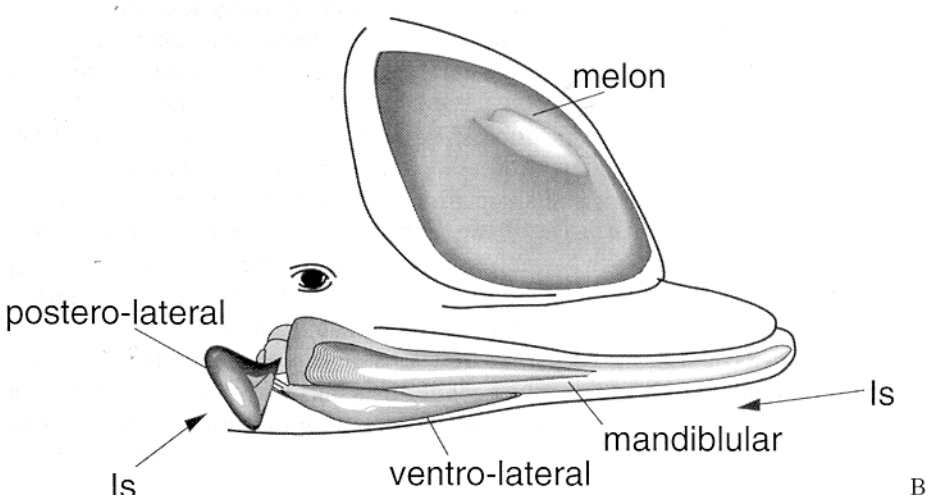
Lautproduktion:
Vibrierende innere Nasenklappen unterhalb des Blaslochs.

Lautaussendung:
Melone: akustische Linse

Audiogramme von Zahnwalen



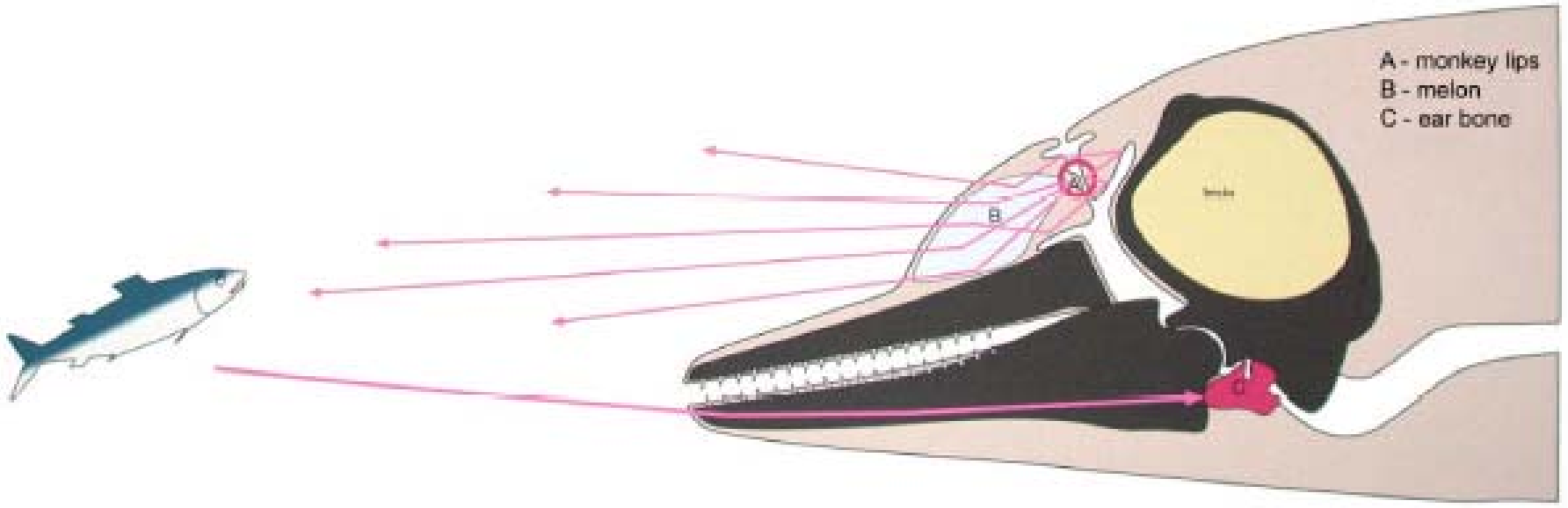




- Kein Außenohr
- rudimentärer Gehörgang

Schallübertragungswege auf Innenohr:

Spezialisierte fettgefüllte Kanäle im Bereich des Unterkiefers („akustisches Fett)
-posterolateraler Kanal
-Ventrolateraler Kanal
-Mandibulärer Kanal


A - monkey lips
B - melon
C - ear bone
A
B
C

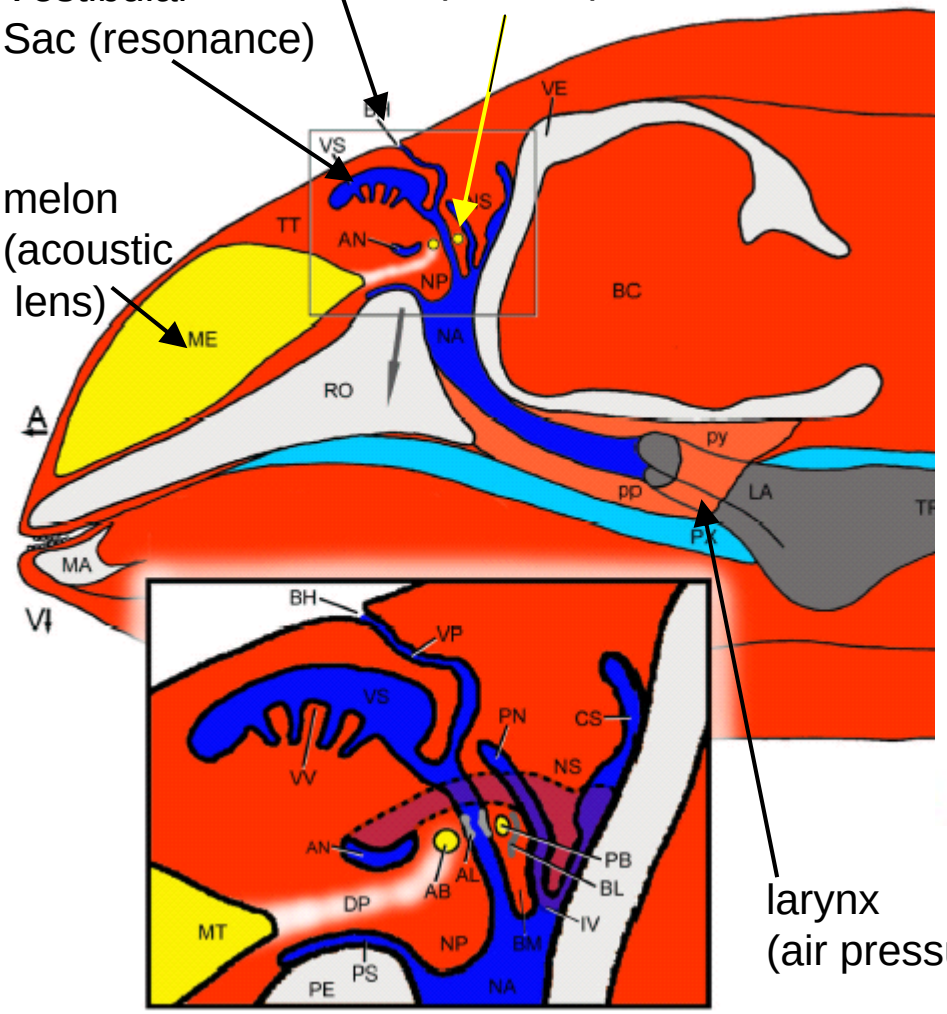
blow hole

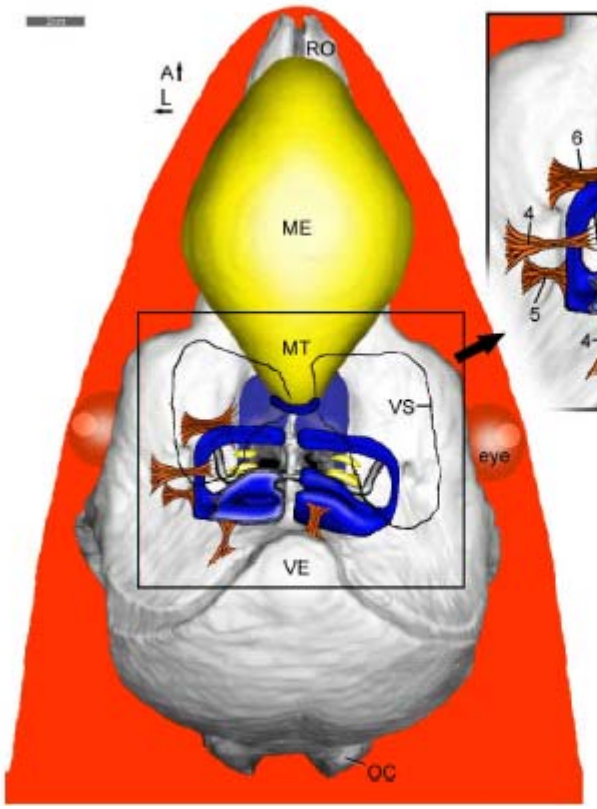
Bursae, monkey lips
(vibrator)

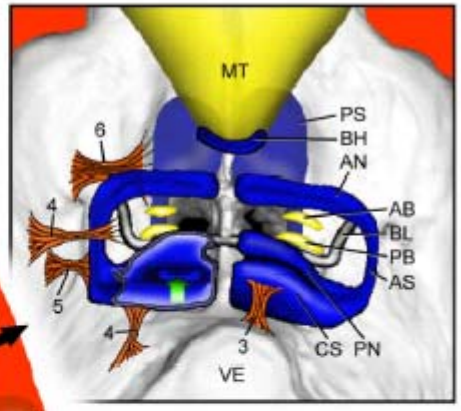
Vestibular
Sac (resonance)

melon
(acoustic
lens)

muscles for fine control

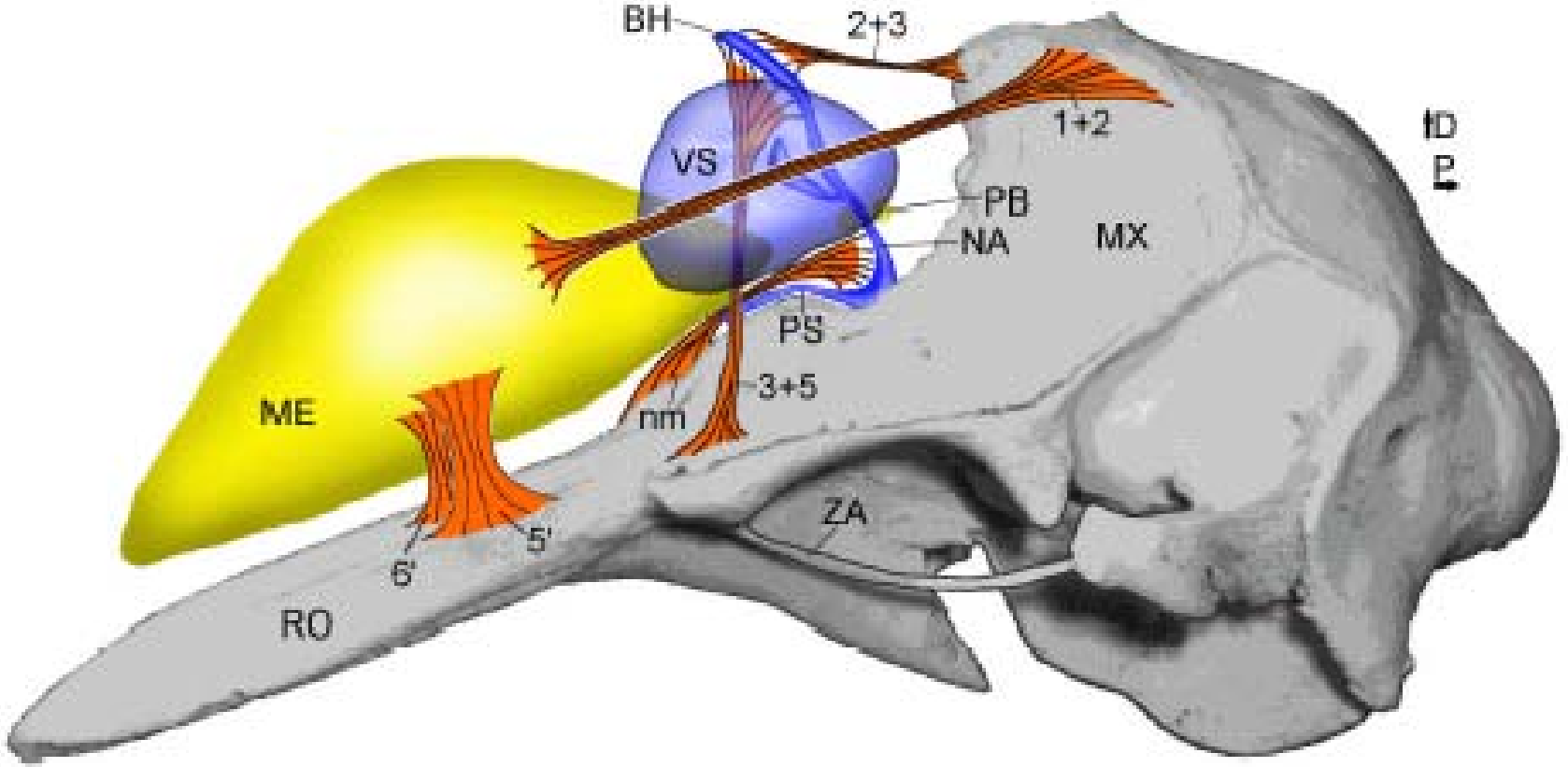






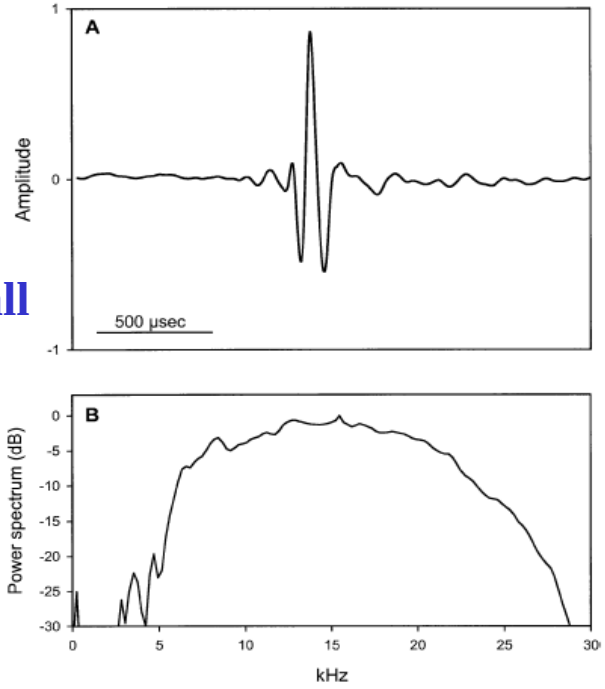
larynx
(air pressure generator)

CT-scan of Harbor porpoise (*Phocoena phocoena*), Huggenberger

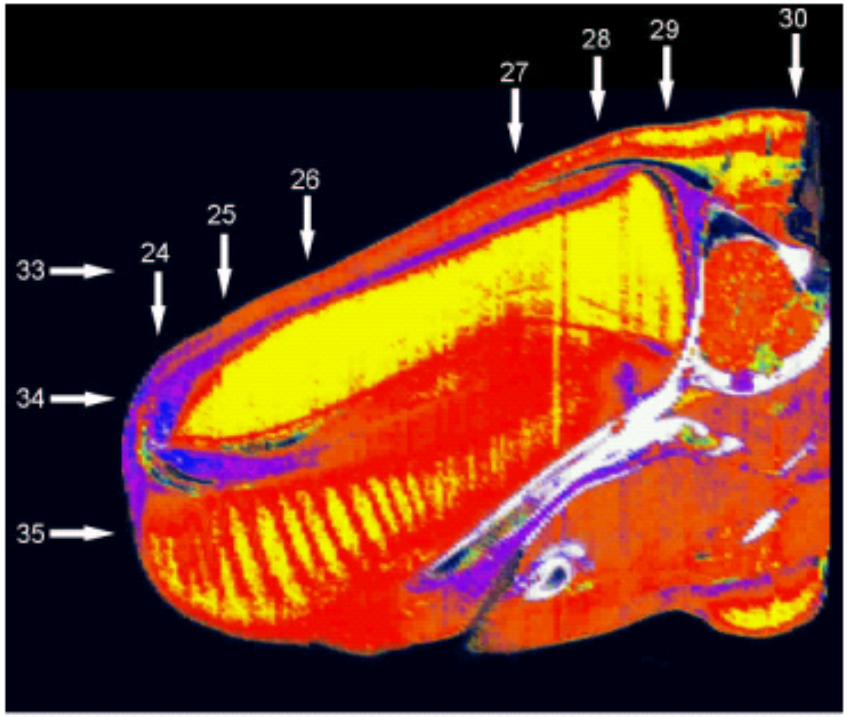


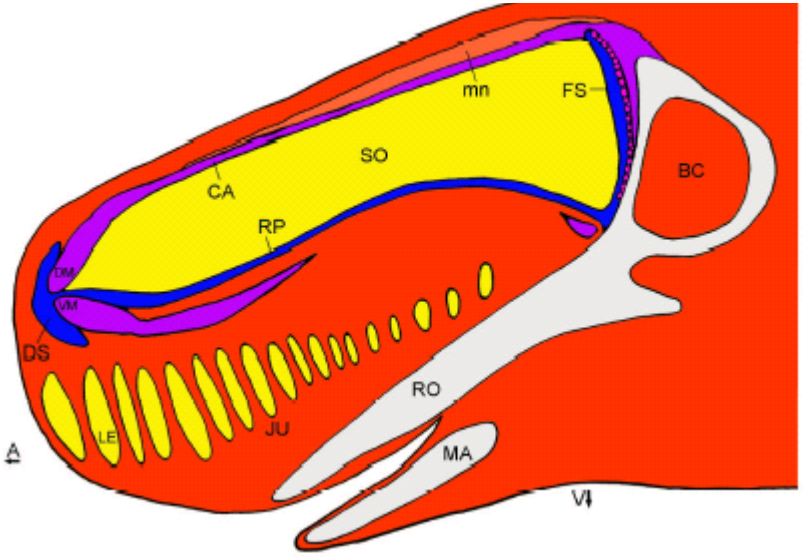
CT-scan of Harbor porpoise (*Phocoena phocoena*), Huggenberger

Sperm whale



echolocation call
(Madsen 2002)

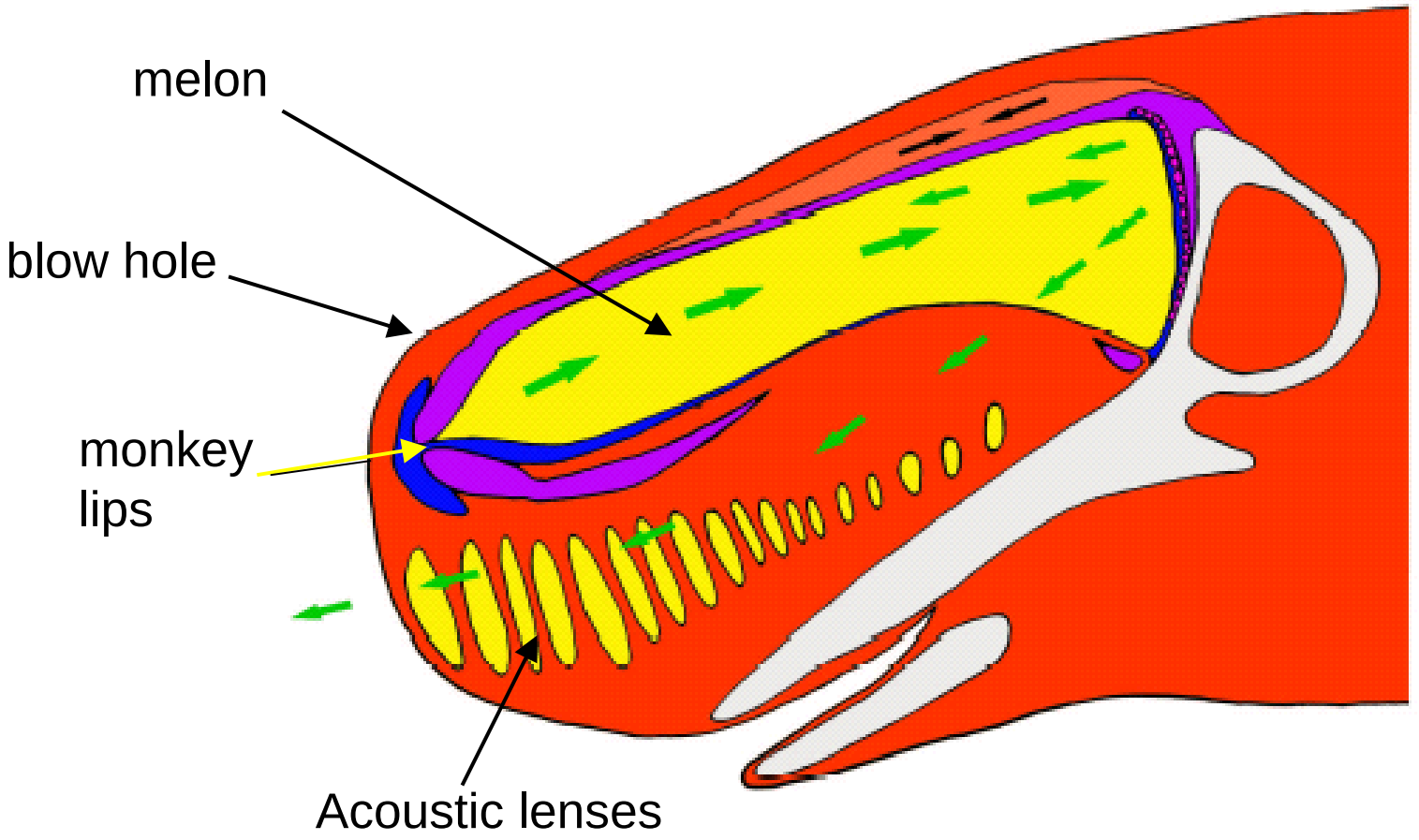




CT-scan of sperm whale (*Physeter macrocephalus*), Huggenberger

Sperm whale sound canon

generation of click trains (5 to 10 pulses of 15 kHz)
At levels of up to 223 dB re 1 µPa



sperm whale (*Physeter macrocephalus*), Huggenberger