Some philosophies about shipping noise and porpoises

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Shipping noise and Porpoises

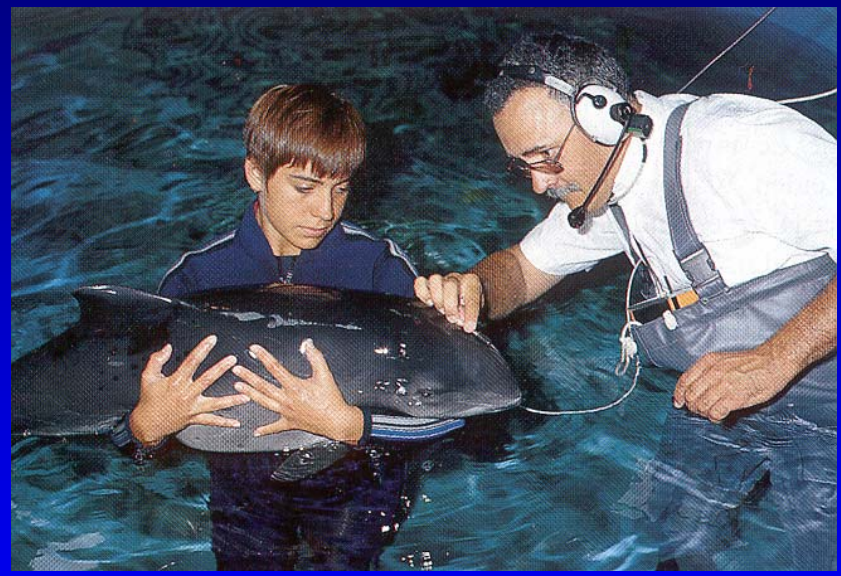
- Porpoise family is most sensitive for man-made noise disturbance and may be taken as ‘indicator’
- Porpoise Acoustic signals:
  - *Echolocation = 125 kHz*
  - *Omni-directional observation ?? = 1.5-2 kHz*
  - *Social sounds = around 1.2 kHz*
  - *Communication signals ?? = around 0.7 kHz*

Shipping noise may mask Porpoise LF signals

Influences shipping noise

- Direct influence around ship >> ***zone of discomfort***
- Audibility of shipping noise >> ***zone of audibility***
- Increase of Ambient noise >> ***capability of food detection***

Underwater noise



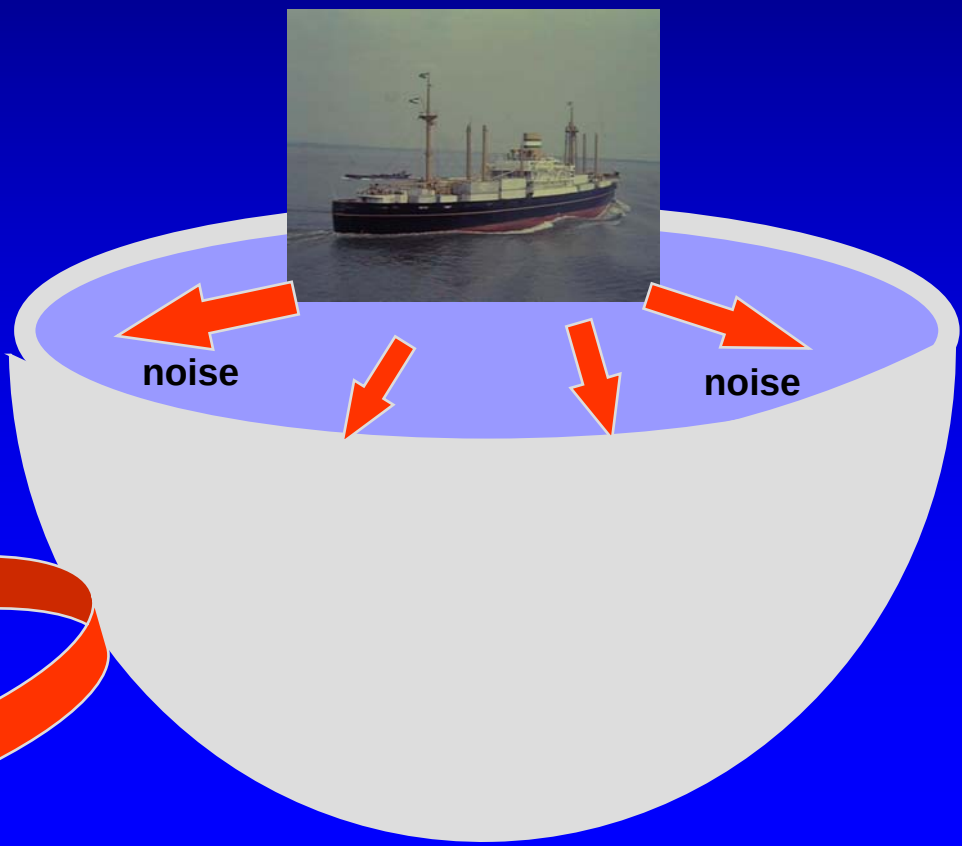
Examples of Shipping noise

Porpoise Social Sound

Porpoise Echolocation signals

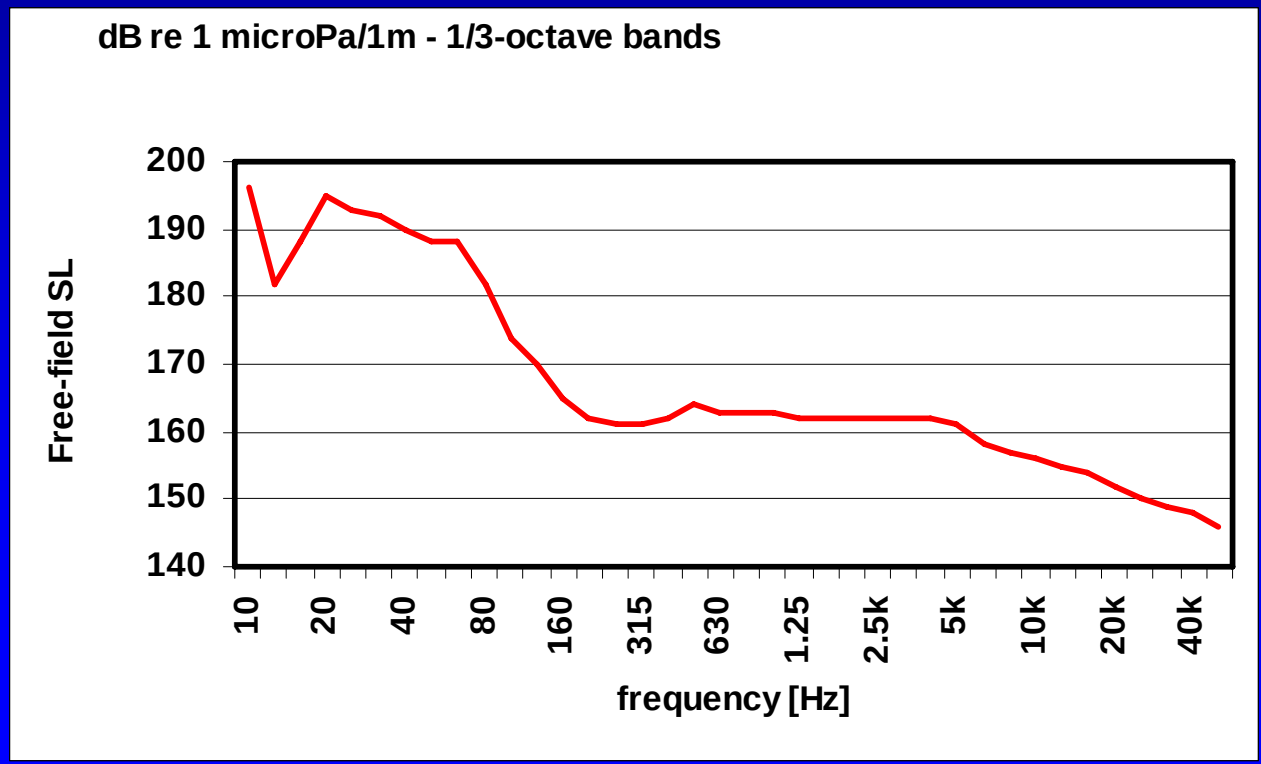
Part 1: Direct influence

- Under each ship there is half a sphere of noise
- A part is the *Zone of discomfort*, which is not entered by a porpoise



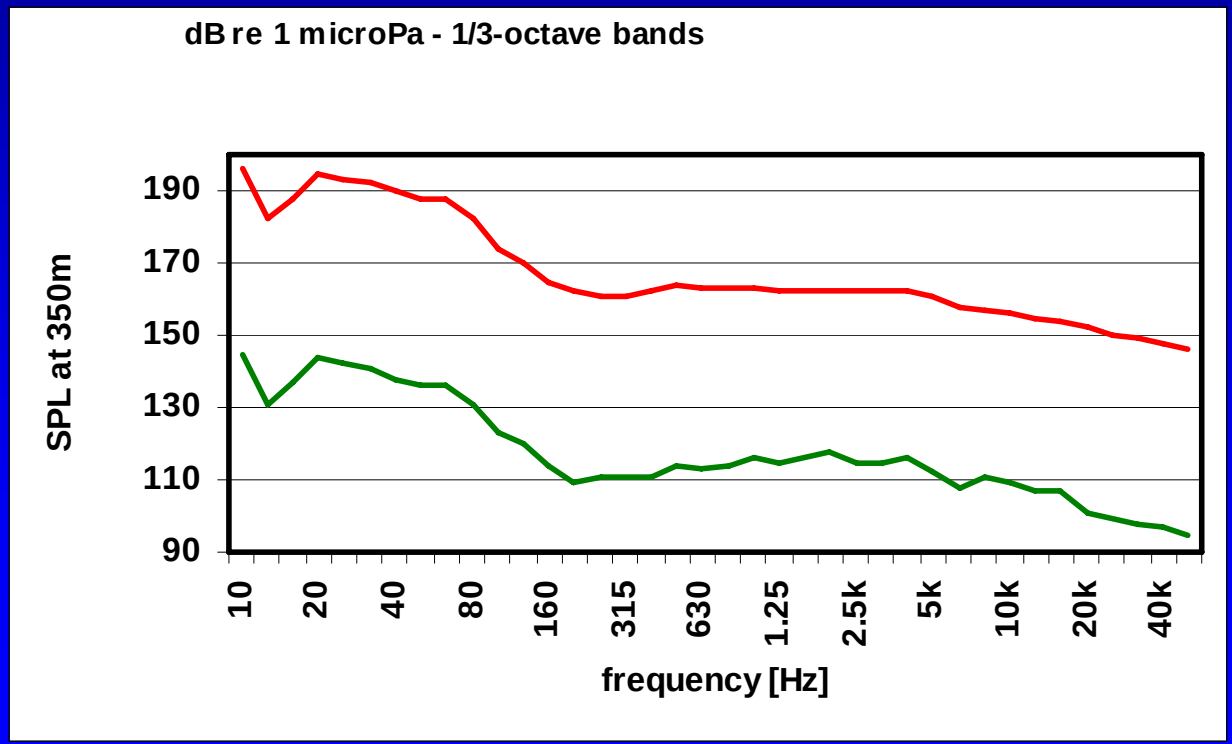
Step 1: Free-field source level

- 18600 DWT Tanker – Speed 17 knots
- Broadband SL = **202** dB re microPa/1m



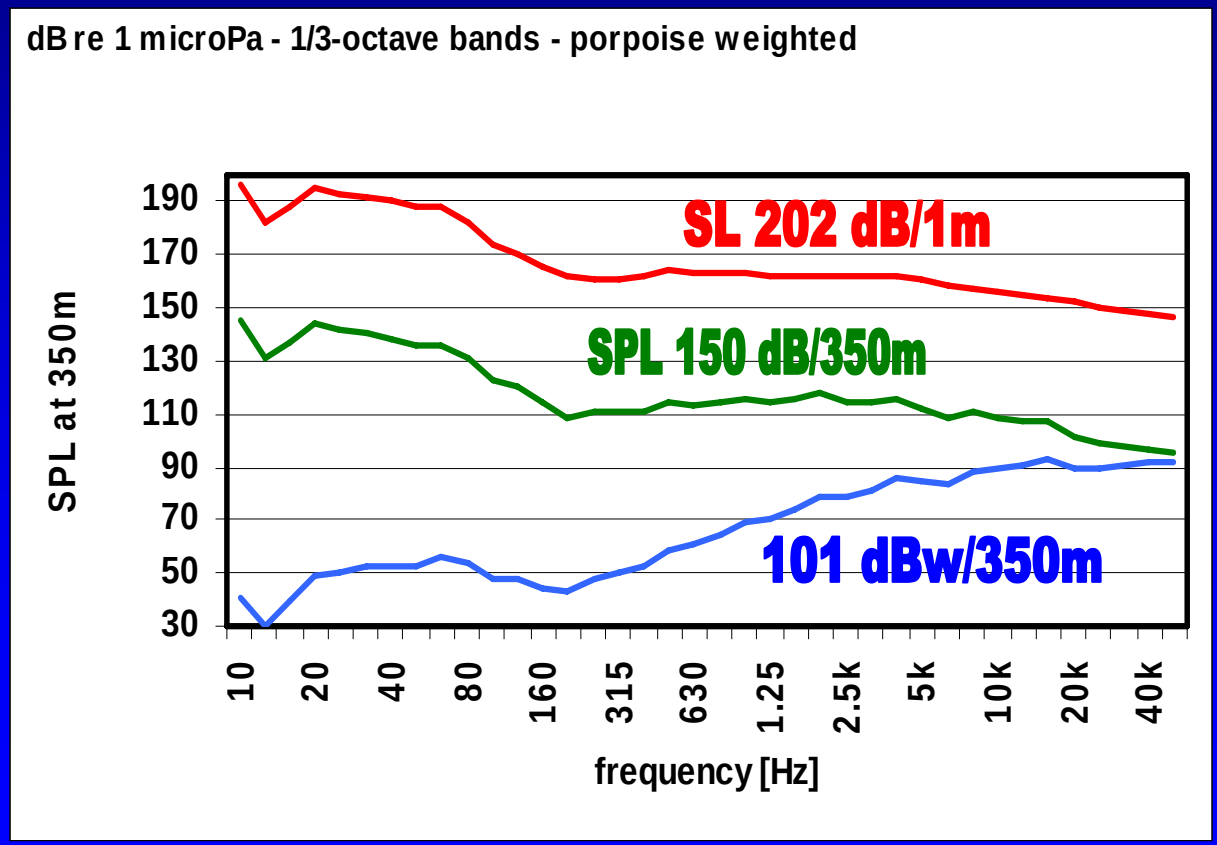
Step 2: Actual SPL at 350 m

- Water depth = 50m; wave height = 0.3m; porp. = 15m
- Rock bottom covered with 2m muddy sand
- FF SL_{1m} **202** dB
- SPL_{350m} **150** dB



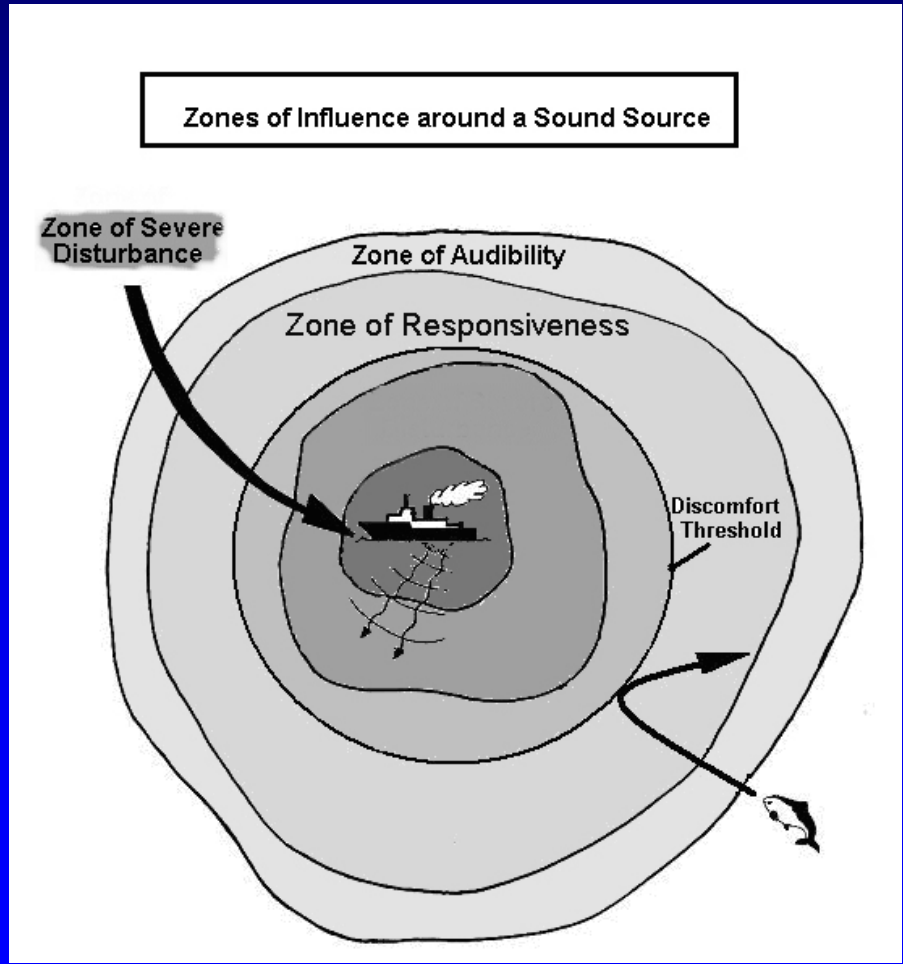
Step 3: What does a Porpoise hear at 350m ?

- Shipping noise is filtered by the hearing system
- FF SL_{1m} **202** dB
- SPL_{350m} **150** dB
- Porpoise **101** dB

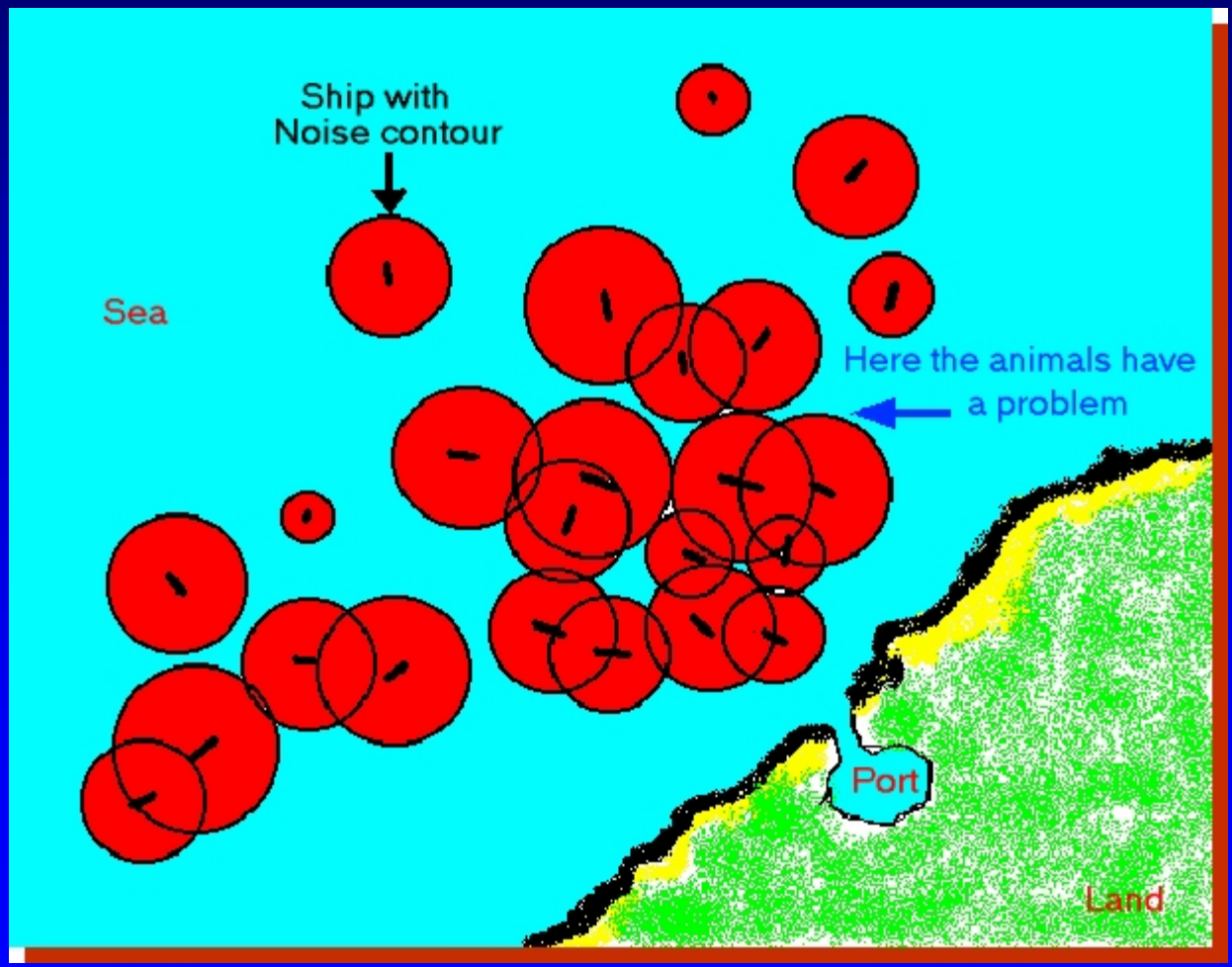


Step 4: Discomfort threshold

- Level at which the porpoise returns when approaching a sound source
- For porpoises: **100** dB weighted level
- ***A porpoise does not approach this tanker less than 350 m***



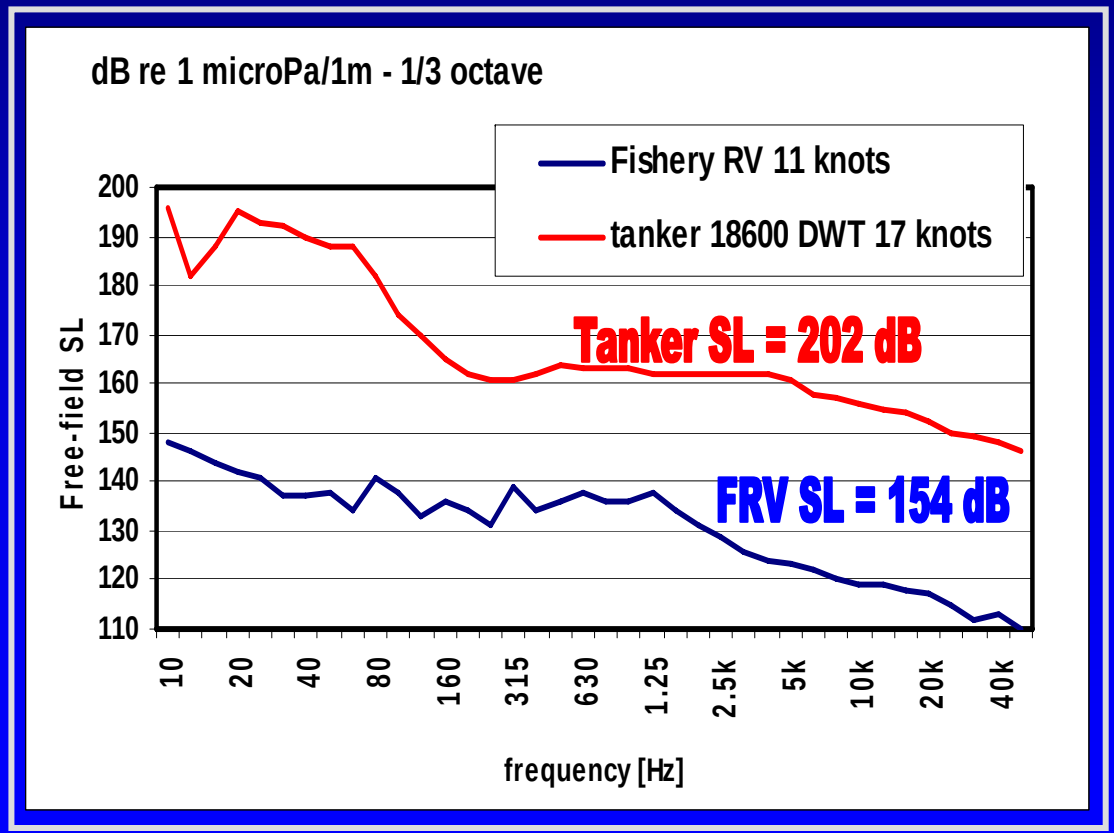
Concentrations of ships at sea



Step 5: Ship Noise Reduction

- **Fishery Research Vessel with considerable noise reduction measures**
- FF SL_{1m} **154** dB or
- **115** dB weighted
- level for porpoise

- ***Discomfort range =***
- ***less than 10 m***
- *(was 350m for tanker)*

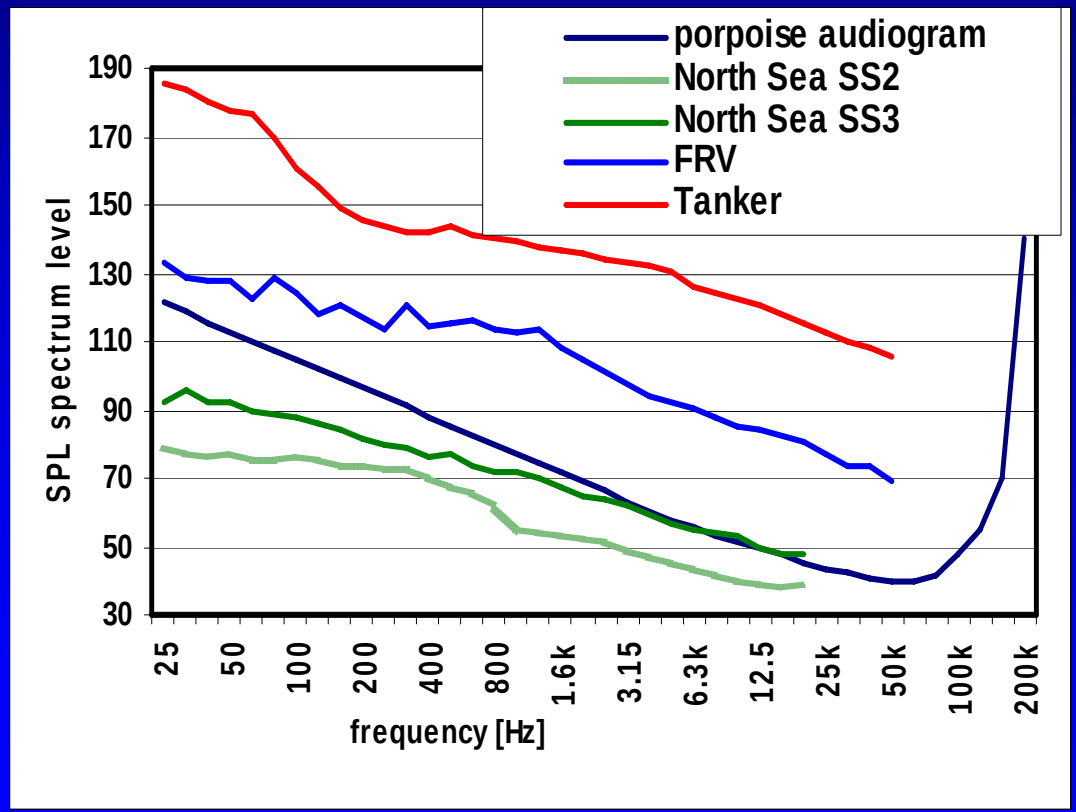


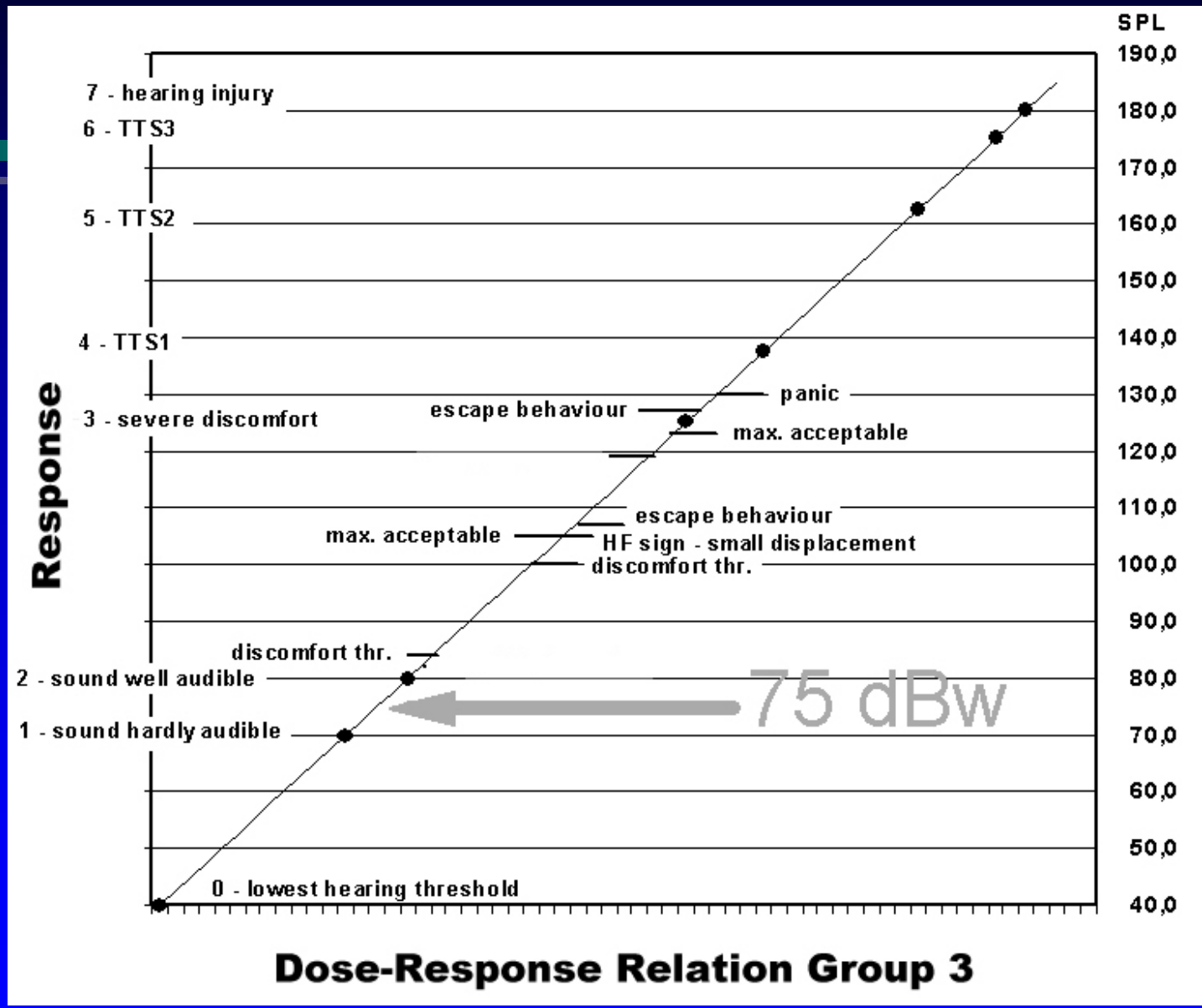
First conclusion

- The tanker has a ‘discomfort zone’ with a radius of 350m for porpoises
- This zone is reduced to 10m for the FRV
- The noise reduction shown for the FRV can be considered as a maximum; in practice reduction for commercial ships will be less, due to, for instance, rigidly mounted Main Gearboxes.

Part 2: Audibility of ship noise

- Ambient noise is (here) not a limiting factor for porpoises
- Audiogram is
- hearing threshold



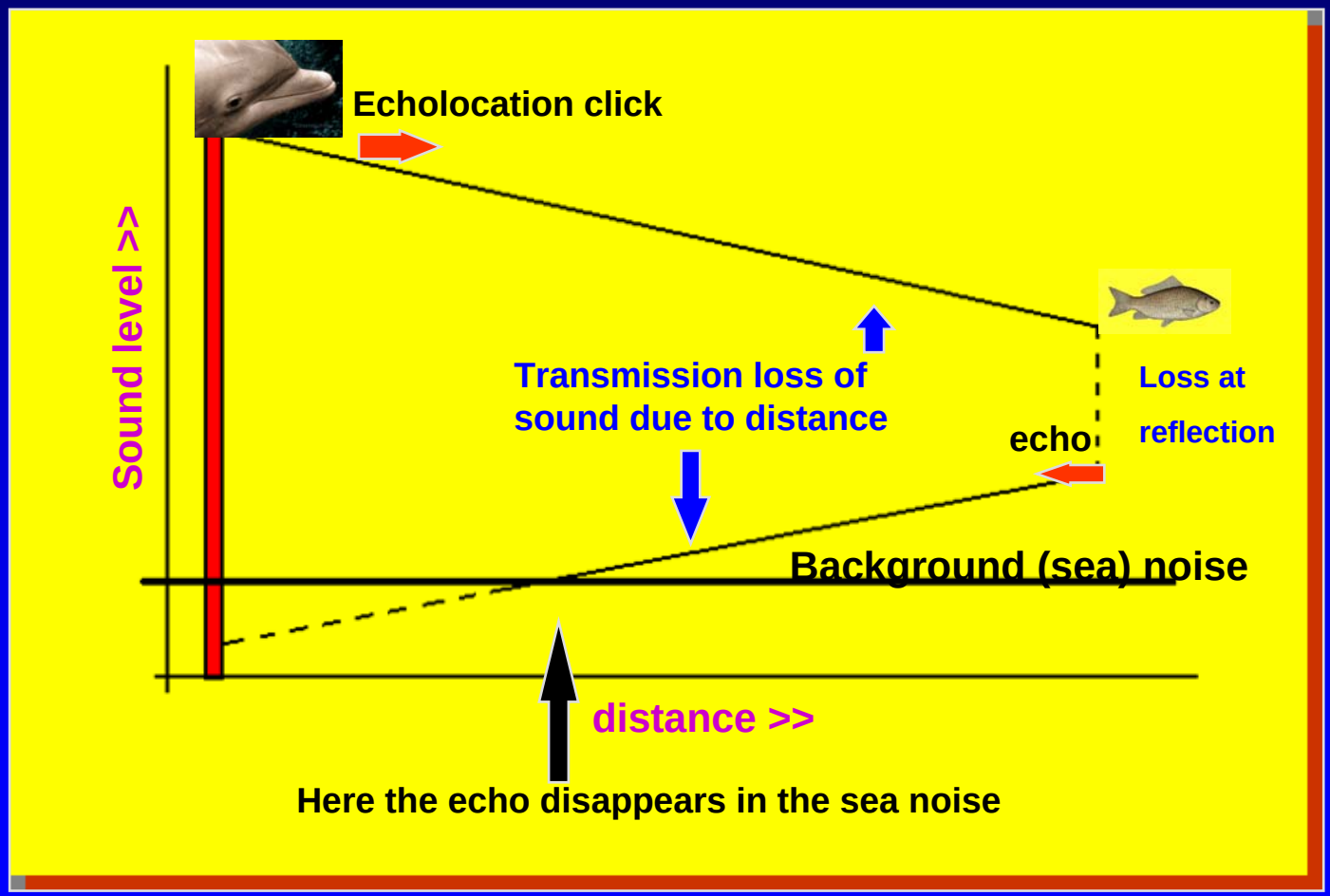


Dose-Response Relation Group 3

Zone of Audibility

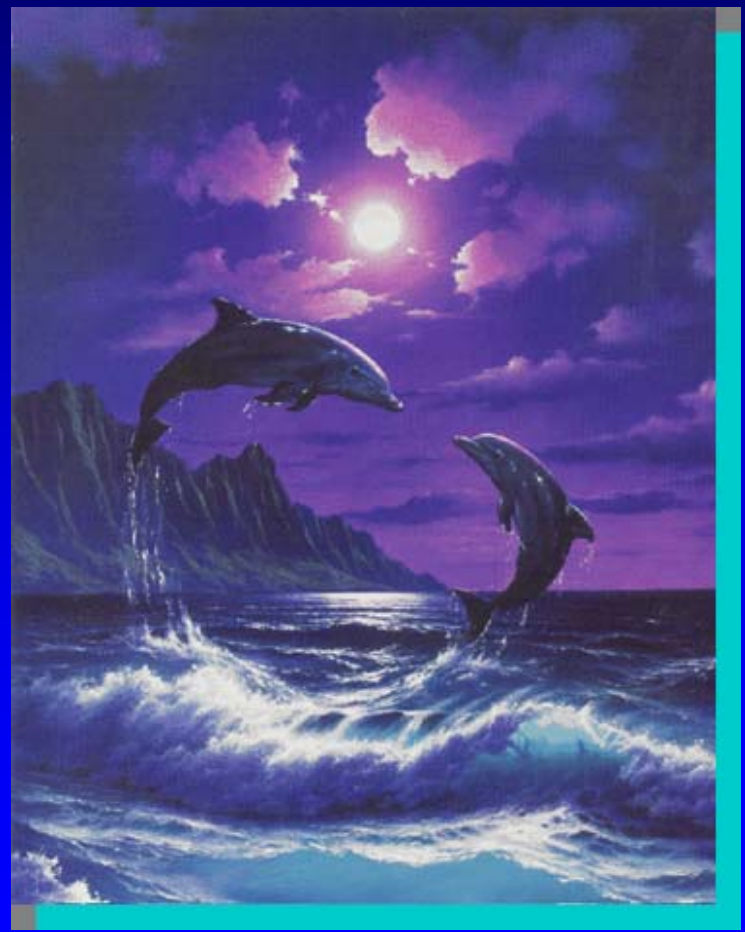
- When, for a porpoise, shipping noise would be ‘audible’ at a weighted level of 75 dB re 1 microPa, the zone of audibility has a radius of:
- approx. 3000 m for the tanker
- 200 m for the Fishery Research Vessel

Part 3:Echolocation: fish detection



END

- **QUESTIONS?**



- Wim Verboom
- Seamarco/TNO
- NOAA - May 2007