

**SUBMISSION TO THE  
AUSTRALIAN SENATE**

**ANTHROPOGENIC NOISE (ACOUSTIC POLLUTION) FROM  
SHIPPING ON THE GREAT BARRIER REEF.**

**Supplementary Information for Submission 15.**

**Geoff McPherson**

Marine Acoustic Biodiversity Solutions.

Adjunct Principal Research Fellow,  
Engineering & Physical Sciences, James Cook University  
[geoff.mcpherson@jcu.edu.au](mailto:geoff.mcpherson@jcu.edu.au)



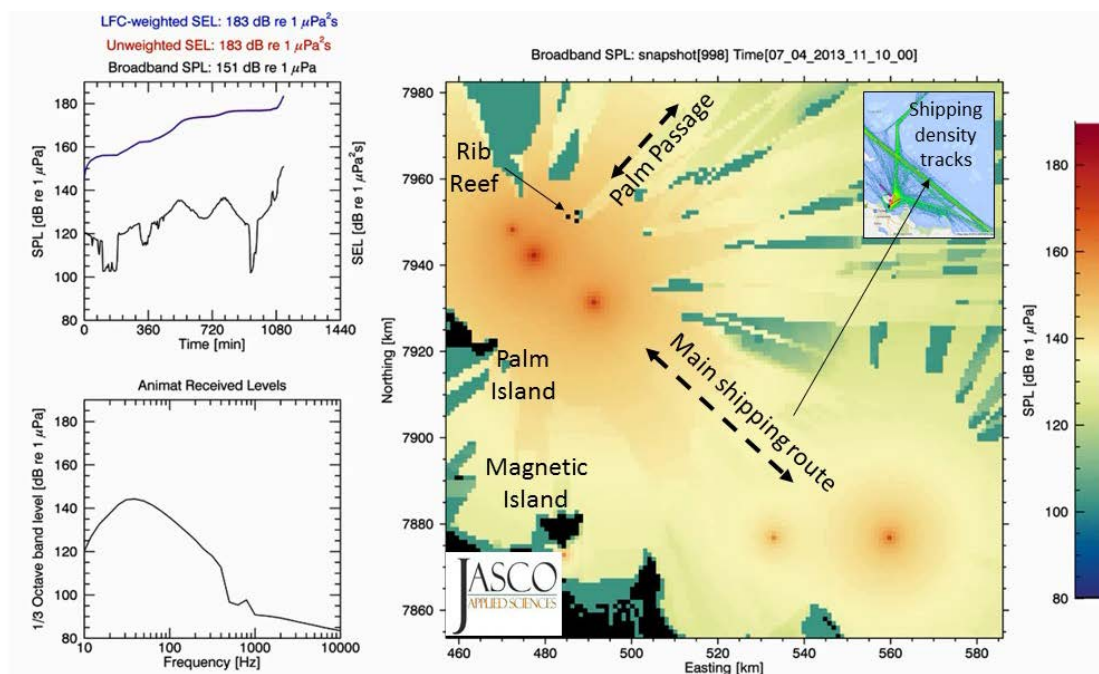
## MODELLING UNDERWATER SHIPPING NOISE IN THE GREAT BARRIER REEF MARINE PARK USING AUTOMATIC IDENTIFICATION SYSTEM SHIPPING DATA.

A JASCO Applied Sciences AMAR recorder provided the first baseline audio recording for the Great Barrier Reef in 2013. The AMAR was deployed by JCU Fish & Fisheries at Wheeler Reef off Townsville for three months.

The acoustic data recorded (containing shipping transits, migrations of humpbacks and minke whales, fish choruses). The data has been combined with acoustic propagation modelling for variable depth inter-reef waters using five months of Automated Identification System (AIS) shipping data. The result is a verified cumulative model of acoustic impacts of shipping for GBR waters, and is being presented by JASCO Applied Sciences and JCU Engineering & Physical Sciences at INTERNOISE 2014 in Melbourne in November.

A single 5 minute snapshot example of modelled underwater noise radiated from shipping off Townsville through reef waters is shown below. The snapshot shows,

- the instantaneous Sound Pressure Level (SPL) (in decibels colour coded) propagated across the region around reef areas.
- the instantaneous and cumulative SPL received by a simulated marine animal (coded as 'animat' and shown as the cluster of three black dots).
  - The instantaneous and cumulative data are representative of hearing capability of a low frequency cetacean, like a humpback whale.
  - The SPL metrics can be converted to a fish, turtle or other marine mammal receiving system.



**Figure 1.** Cumulative Acoustic Modelling snapshot. (Broadband SPL propagating through the area shown in colour. The graphs indicate the received and cumulative SPL specific to a low frequency hearing humpback whale.) (Inset - peak density of shipping routes).

This model can be used as an assessment and management tool, with the ability to incorporate current and anticipated increased shipping levels in order to predict future impacts.

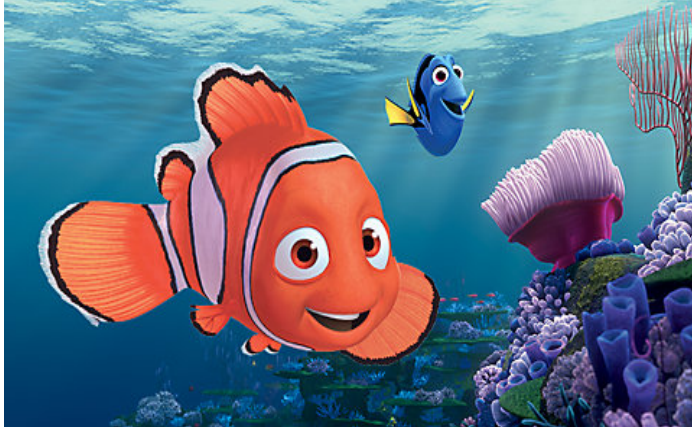
International scientifically accepted metrics and Sound Pressure Levels for the assessment of the impact of underwater sound on marine mammals have existed since 2007. These marine mammal metrics have recently been re-assessed, including for shipping, using recent marine mammal experimental and open water findings and they are being extensively reviewed.

A ground breaking American National Standards Institute acoustics standard for the assessment of a broad range of anthropogenic noise sources, including shipping, on fish, turtles and larvae, has just been published. It will set the international standard for non marine mammal acoustic impact assessment.

## NOISE IMPACT ON QUEENSLANDS AQUATIC EMBLEMS

IN 2005 the anemone fish, effectively *Nemo*, became Queensland's aquatic emblem.

*Nemo* the movie at least, taught us that *Nemo* can talk. In reality anemone fishes on the Great Barrier Reef and most other fish do 'talk' a lot in social and reproductive situations?



Most coral reef fish including *Nemo*, are totally reliant on sound.

- They rely on acoustic detection in their soundscape to survive.
- Fish also make sound in social and reproduction contexts.

It's not just marine mammals that make noise on the GBR.

Since 2010 researchers have been coming to the northern Great Barrier Reef to highlight the importance of the natural noise of reefs attracting larvae (of coral, and many fish species). Concern has always been expressed about the impact of shipping noise on disruption of those settlement recruitment patterns with the following headlines,

*Marine Pied Piper leads Nemo astray.*

.... and ....

*Boat noise stops fish finding home*

## **THE FUTURE FOR THE GREAT BARRIER REEF.**

### **An acoustic perspective**

The International Maritime Organisation (IMO) has acknowledged the impact of shipping noise on marine ecosystems.

- In April 2014 the IMO issued guidelines for the mitigation of shipping noise.
- Noise reduced shipping classes are being offered by ship classification societies; the new CSIRO vessel is a silent class vessel to “reduce impact on fish”.

Noise made by coral reef organisms is extremely important in maintaining healthy reef ecosystems.

1. Healthy coral reefs make noise that attracts coral and fish larval settlement, to keep them noisy.
2. Shipping noise has the potential to mask reef noise.
3. Algal reefs with limited coral are not noisy, they would not attract coral and fish larvae.
4. A July 2014 publication experimentally documented how playback of shipping noise to sea hares, in part responsible for macro algae control/grazing in reef ecosystems, reduced successful development of embryos by 21% and increased mortality of the larvae that hatched by 22%. This further increases the potential for shipping noise to impact coral cover on the GBR.

For the corals sake, and *Nemo*'s, we need to manage and mitigate shipping noise, especially through the narrowing shipping routes of the northern Great Barrier Reef.

## **RECOMMENDATIONS**

Major noise generating shipping routes are well identified.

The instantaneous and cumulative impact of ship noise on time/areas of the GBR for sensitive marine animals can be determined based on animal safety and reduced masking scenarios. .

Ship noise impact minimisation could be achieved two ways.

1. Reduction of individual ship noise signatures by AMSA acknowledging and supporting IMO. The process may be incremental but must commence as shipping levels increase.
2. Minimisation of individual ship impact on time/area in GBR waters. Ship rescheduling/rerouting/speed logistical combinations would be appropriate.

**Geoff McPherson**

Marine Acoustic Biodiversity Solutions.

[mcpherson.geoff@gmail.com](mailto:mcpherson.geoff@gmail.com) Phone 0421 198085

Adjunct Principal Research Fellow,

Engineering & Physical Sciences, James Cook University

[geoff.mcpherson@jcu.edu.au](mailto:geoff.mcpherson@jcu.edu.au)