

El Consorcio de Investigación del Golfo de México  
(CIGoM) invita

# **Marine Acoustics Workshop: Training in Acoustic Impacts of Anthropogenic Activity on Marine Life**

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Impartido por:

**JASCO Applied Sciences (Canada) Ltd.**  
2305-4464 Markham Street  
Victoria, BC V8Z 7X8 Canada  
[www.jasco.com](http://www.jasco.com)

Fecha:

**5 al 7 de septiembre de 2018**

Lugar:

**Centro de Investigación Científica y de Educación  
Superior de Ensenada, Baja California (CICESE)**

## **Descripción**

El taller será impartido por dos investigadores de JASCO Applied Sciences y abarcará los fundamentos de la acústica submarina, los efectos del ruido en la vida marina, regulación y mitigación, y el análisis de datos.

El taller está dirigido a investigadores, técnicos y estudiantes de posgrado interesados en conocer las bases del monitoreo acústico en el ambiente marino. La inscripción es gratuita y el cupo máximo es de 20 participantes.

El taller será impartido en inglés y los participantes deberán llevar computadora. Las diapositivas de los módulos se proporcionarán a los participantes en formato .pdf dos días antes del inicio.

Para mayores informes dirigirse a:

Dra. M. Concepción García Aguilar  
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# Workshop Agenda

## ***Day One:***

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Introductions and Overview: 8:30 – 9:00

Module 1. Acoustic Fundamentals: 09:00-10:30

- a. Source / Medium / Receiver model
- b. Decibels, reference pressure
- c. Acoustic metrics – peak SPL, rms SPL, SEL, cSEL, time, frequency dependence, decade, octave, 1/3 octave bands, including how and when it is appropriate to convert between measurements.
- d. Sound in water vs sound in air, how loud is loud?
- e. Impulsive versus continuous sounds
- f. Particle velocity, particle acceleration, and pressure

Module 2. Sound Sources; 10:45-12:00

- a. What is ambient sound? When are anthropogenic sounds background sounds? Are those ambient?
- b. Geologic sound sources – wind, waves, seismic activity, thunder, rain etc.
- c. Anthropogenic sound sources – shipping, sonars, seismic arrays, pile driving, marine construction, drilling, echosounders, multi-beam, boomers, pingers, side-scan etc.
- d. Biologic sound sources – marine mammals, fish, crustaceans.

Module 3. Propagation Modeling: 13:30 – 14:45

- a. Ocean properties & effects on sound speed – refraction / reflection
- b. Ways to model – geometric spreading, practical spreading model, numerical modeling
- c. Converting model outputs to metrics that matter
- d. Factors affecting modeling – bottom properties, daily changes in sound speed profiles, sound channels.
- e. Importance of sound source verifications.

Module 4. Effects of Noise on Marine Life 15:00-16:30

- a. Uses of sound by marine life – communications, foraging, navigation, predator avoidance.
- b. Basics of hearing in marine life – ear structures, sensitivities, audiograms, critical ratios and perception.
- c. Effects of noise on marine life: injury and stress, masking of important acoustic information, changes in acoustic perception and behavioural disturbance – theory and evidence of actual effects.
- d. TTS and PTS
- e. Methods employed by mammals to manage exposure to intense sounds
- f. Indirect effects – effects of noise on prey species.

Questions and Open Discussion 16:30 – 17:00

## Day Two:

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Day 1 Review and Questions: 8:30-09:00

- Module 5. Rms SPL Guidelines Vs Dual Criterion Guidelines: 09:00 – 10:30
- a. Overview of the motivation to move to the dual criterion
  - b. Use of M-weightings to account for hearing differences among marine mammal groups – why only for hearing injury?
  - c. Type I vs Type II M-weightings
  - d. How SEL accumulates in for stationary activities – drilling and pile driving.
  - e. How SEL accumulates for mobile activities – seismic and shipping.
- Module 6. Mitigation: 10:45 – 12:00.
- a. Mitigation methods: bubble curtains, pile-top cushions, cofferdams, seasonal avoidance, acoustic deterrents.
  - b. Ability to mitigate at long propagation distances
  - c. Shut downs & soft starts – effectiveness with pile driving vs seismic
  - d. Operating a “mitigation airgun” and how that would influence reaching SEL criteria sooner
- Module 7. Acoustic Monitoring Programs 13:30 – 14:45
- a. Types of Acoustic Monitoring Programs:
    - i. Sound Source Characterizations – removing uncertainties from SL, TL, and exclusion zones
    - ii. Acoustic Baseline monitoring of ambient sound levels, anthropogenic activity, and biological activity
    - iii. Passive Acoustic Monitoring for exclusion zones and compliance monitoring around anthropogenic activities.
  - b. Acoustic monitoring equipment
  - c. Specifying acoustic recorders – sensitivity, frequency range, recording duration, clock alignment, dynamic range, duty cycling, multi channels
  - d. Currently available acoustic recorders
  - e. Moorings
    - i. Basic topologies
    - ii. Components (releases, beacons, flotation)
    - iii. Special cases – high flow, deep, in water column.
- Module 8. Modeling of acoustic impacts on marine life 15:00-16:30
- a. Acoustic propagation modeling revisited
  - b. Animat modeling
  - c. Cumulative effects assessment
  - d. Using the results – take estimates and exclusion zones
  - e. Assumptions that go into effects assessment, including caveats about audiograms
  - f. Discussion use of animat modeling in GoM and how the Navy approaches take estimates.
  - g. Trade-offs in different approaches to take estimation

Questions and Open Discussion 16:30 – 17:00

## ***Day Three:***

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Day 2 Review and Questions: 8:30 – 9:00

Module 9. Offshore Acoustic Recordings 09:00 – 12:00

- a. Shallow water location
- b. Deep water location

Module 10. Acoustic Data Analysis 13:30 – 15:15

- a. PAMLab
- b. Sample recordings
- c. Identifying sound sources
- d. Differentiation of Biological and Anthropogenic Sources

Questions and Open Discussion: 15:30 – 16:00

Final Remarks and End of Training Workshop 16:00 – 16:30