





CMST Curtin University

Self funded research group within Uni., with governing board **Operating for 30 years**

- ~ 10 full time staff
- ~ 20 Honours, Masters & PhD students
- **Prefer research oriented work not** consultancy group
- Long history of working with Industry, Defence, Academia
- Largest group Australian underwater acousticians outside Defence

Research & teaching role

WWW.CMST.CURTIN.EDU.AU





Centre Marine Science & Technology, Curtin Uni.

- Strengths:
- **Underwater acoustics**
 - sonar & backscatter (sea floor map. & discr., biomass) passive acoustic monitoring (Australia wide, > 20 yrs) sound transmission (Defence, seismic & Industry related) biol. impacts noise (Industry, Gov., seismic & piling, 20 yrs) underwater comms. (ie. channel simulator)
- Stereo vision ie. HMAS Sydney / Kormoran work
- Ship motion, under-keel clear., hydrodynamics & modelling
- Marine Ecology whale & dolphin ecology

Ship motions measurement,

Under-keel clearance work – Tim Gourlay



Ship motion & squat for ukeel clearance – measures. Singapore, Geraldton, Torres St., Perth

RTK GPS receivers with fixed or moving base station



Ship motion - stability & ride control Accelerometers and angular rate sensors Underwater vision systems Andrew Woods HMAS Sydney / Kormoran 3D 'fly-through'



DOF Subsea, WA Museum Build 3D images from still series, generate Museum Exhibition

Sydney Kormoran Expedition 2015 - HMAS Sydney (II) damaged 'B' turret Image courtesy of WA Museum and Curtin University. Copyright WA Museum. The use of passive acoustics to study marine fauna with a focus on eastern Indian Ocean pygmy blue wha

Photo Curt & Micheline Jenner

Sound dominant sensory faculty, all fauna Used in communication Used passively – environment & biota Monitoring gives fauna presence behaviour, habits, numbers

Most effective sound production via gas bubbles, large acoustic impedance difference, ie fish,







CMST developed noise loggers 1999, Now commercially available Ours unique, fully calibrated, know all bugs, well proven, frequency range widened.









Perth Canyon – started sea noise 2000, still sampling (IMOS), little idea what to expect when started





Fish Chorus time patterns (IMOS data, 5.5 years) 2 kHz 1/3 octave level, evening's time zeroed to sunset Daily pattern clear although variation in start & peak time Lunar patterns? Definite seasonal trends



Pygmy blue whale song – initially thought 3 part, but many varieties of 3 parts (Joliffe). Prompted an investigation of inter-song increments.



To count # callers need song spacing. Look at call to call spacing (A):

set 2823 - 3175 29-Mar-2009 15:45:01 UTC + 8 hours



(B) Stack normalised curves of song spacing each season in Perth Canyon. Do not entirely get what expected.

Evidence that song variants are common, confounds call counts for abundance, increase in call spacing across years - not expected



Type I only song common

Seasonal trend pygmy blue callers, by calendar & whale-day.



- Use sea noise loggers to spatially track blue whales
- **IMOS started 2008 (Integrated Marine Observing System)**
- Passive Acoustics moorings got up
- so put one off NSW coast in 2010
- knew pygmy blue whales visited Qld coast
- Knew by then WA pygmy blue went north to Banda Sea, Indo.
- Expected WA pygmy blue to turn up off NSW coast
- **Did not happen**









Summary

Passive acoustics ideal for elucidating time series patterns Pygmy blue whale migration WA coast now well understood in process writing up, 2 PhD students working on Many idiosyncrasies pygmy blue calling possible females call, call function – feeding???? Multitude of other species recorded in sea noise, similar patterns expected, S. Right, Brydes, Minke, Fin Fish choruses common Perth Canyon, large spatial scale provides long range beacon for marine fauna **CMST** unique in Australia and world in capability, requires **Industry support**