Underwater video for surveying fauna

Description, environmental monitoring & uses
Benefits & constraints
Key research & researchers
Priorities for technique development
Sample videos

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER
CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH

Ebb
brendan.ebner@csiro.au
04 5792 5768

Northern Australia Environmental Resources Hub
National Environmental Science Programme

Underwater video for surveying fauna

Description, Environmental monitoring and uses

Focus: still images, motion (habitat coverage/condition, species identification, behaviour and processes)
Fixed or mobile applications (Diver, tethered, remote control, automated, animal)
Above and below water
Rapid deployments or surveillance (power supply, processing)

Monitoring a species (threatened species, other native species, pest species)
Monitoring an assemblage
Monitoring a process or interaction (e.g. pest species and native assemblage) (e.g. fish passage at a dam)
Bait v. no bait

Monitoring v communications

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER
CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH

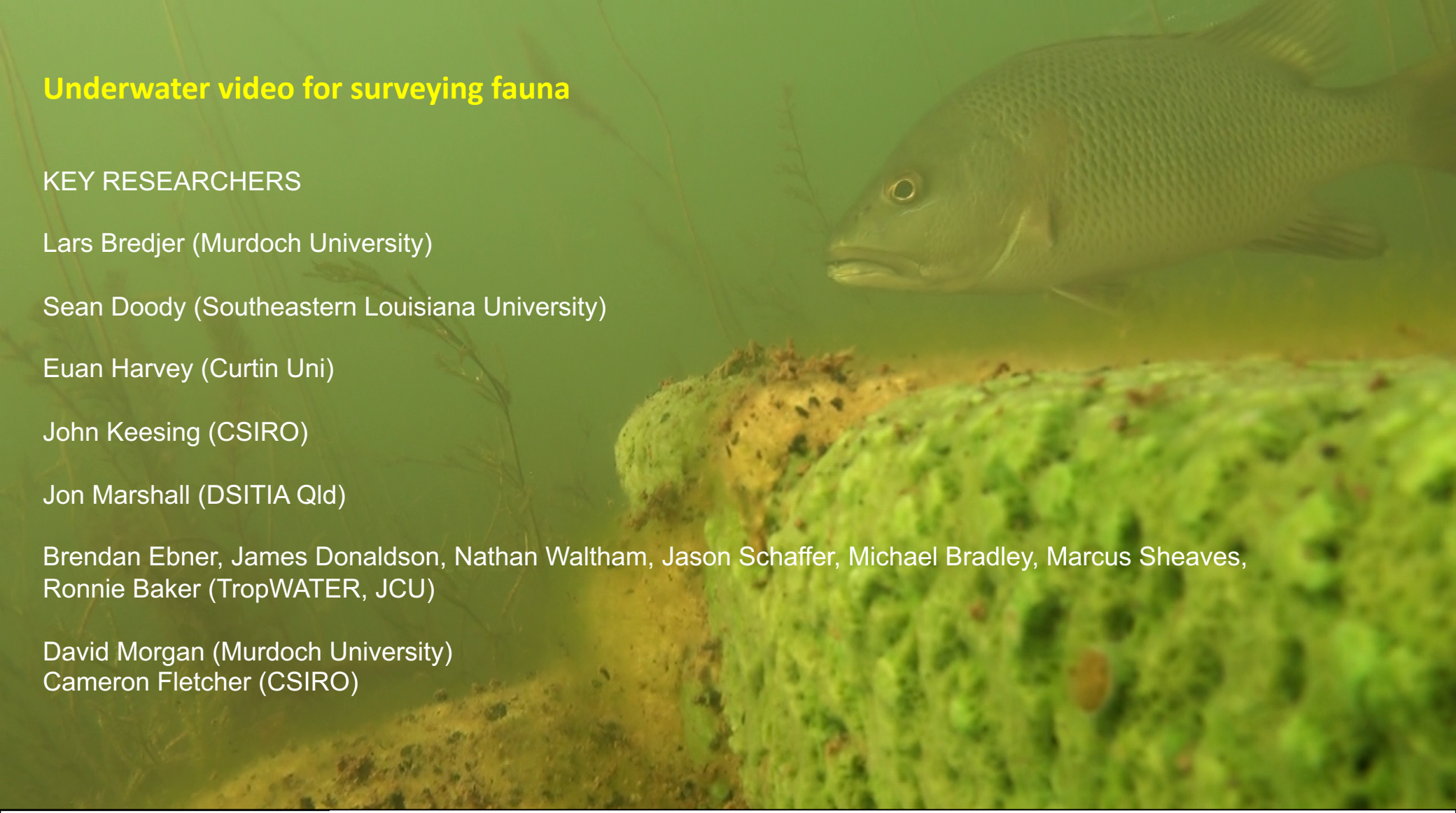
Underwater video for surveying fauna

BENEFITS
Affordability of cameras
Portability and flexibility in placement
For studying large bodied aquatic species
Minimal observer effect
Threatened species research
Overcomes human fatigue in the field
Safety (e.g. crocodiles)
Permanent record
Public communication: People love watching highlights

CONSTRAINTS
Visibility
Small field of view
Processing time, cost & expertise
Identification of small animals

JAMES COOK UNIVERSITY
AUSTRALIA

TropWATER
CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH



Underwater video for surveying fauna

KEY RESEARCHERS

Lars Bredjer (Murdoch University)

Sean Doody (Southeastern Louisiana University)

Euan Harvey (Curtin Uni)

John Keesing (CSIRO)

Jon Marshall (DSITIA Qld)

Brendan Ebner, James Donaldson, Nathan Waltham, Jason Schaffer, Michael Bradley, Marcus Sheaves, Ronnie Baker (TropWATER, JCU)

David Morgan (Murdoch University)
Cameron Fletcher (CSIRO)

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH

KEY RESEARCH PAPERS

Boom, B.J., He, J., Palazzo, S., Huang, P.X., Beyan, C., Chou, H.M., Lin, F.P., Spampinato, C. and Fisher, R.B. (2014). A research tool for long-term and continuous analysis of fish assemblage in coral-reefs using underwater camera footage. *Ecological Informatics* ***23***, 83-97.

Ebner, B., Clear, R., Godschalx, S., & Beitzel, M. (2009). In-stream behaviour of threatened fishes and their food organisms based on remote video monitoring. *Aquatic Ecology* **43**, 569–576.

Ebner, B. C. & Morgan D. L. (2013). Using remote underwater video to estimate freshwater fish species richness. *Journal of Fish Biology* **82**, 1592–1612.

Ebner, B. C., Starrs, D. Morgan, D. L., Fulton, C. J. Donaldson, J. A., Doody, S., Cousins, S., Kennard, M., Butler, G., Tonkin, Z., Beatty, S., Broadhurst, B., Clear, R. & Fletcher, C. (2014). Emergence of underwater video for field based study of freshwater fish and crustacean ecology in Australia. *Journal of the Royal Society of Western Australia* **97**, 287–296.

Harvey, E. S., Cappo, M., Butler, J. J., Hall, N., & Kendrick, G. A. (2007). Bait attraction affects the performance of remote underwater video stations in assessment of demersal fish community structure. Marine Ecology Progress Series ***350***, 245-254.

Holmes, J. A., Cronkite, G. M., Enzenhofer, H. J., & Mulligan, T. J. (2006). Accuracy and precision of fish-count data from a “dual-frequency identification sonar” (DIDSON) imaging system. *ICES Journal of Marine Science: Journal du Conseil* ***63***, 543-555.

Mallet, D., & Pelletier, D. (2014). Underwater video techniques for observing coastal marine biodiversity: a review of sixty years of publications (1952–2012). *Fisheries Research* ***154***, 44-62.

Misund, O. A. (1997). Underwater acoustics in marine fisheries and fisheries research. *Reviews in Fish Biology and Fisheries*, ***7***, 1-34.

Murphy, H. M., & Jenkins, G. P. (2010). Observational methods used in marine spatial monitoring of fishes and associated habitats: a review. *Marine and Freshwater Research* ***61***, 236-252.

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH

Broadhurst, B., Thiem, J. and Ebner, B. 2006. Video monitoring in upland streams. In An ecological approach to re-establishing Australian freshwater cod populations: an application to trout cod in the Murrumbidgee catchment. (Ebner, B., Thiem, J., Lintermans, M. and Gilligan, D., eds), pp.95 – 104. Final report to the Fisheries Research and Development Corporation (Project No. 2003/034). Canberra: Parks, Conservation and Lands

Cousins, S. (2011). Composition and structure of fish assemblages in the deep benthic zone of lowland rivers in the Wet Tropics of Far North Queensland, using Remote Underwater Video. Australian Rivers Institute, Griffith University, Brisbane. Unpublished Honours Thesis (57 pp.).

Cousins, S., Kennard, M. J. & Ebner, B. C. (In prep.). Depth related composition and structuring of tropical riverine fish assemblages revealed by baited video. *Marine and Freshwater Research*

Donaldson, J. D., Drews Jr, P., Bradley, M. J., Morgan, D., Baker, R. & Ebner B. C. (In prep.). Countering low visibility in video survey of an estuarine fish assemblage. *Journal of Fish Biology*

Ebner, B. C., Donaldson, J. D., Allen, G., & Keith, P. (In prep.). Testing an underwater video network and first record of *Sicyopterus cynocephalus* in Australia. *Cybium*

Ebner, B., Clear, R., Godschalx, S., & Beitzel, M. (2009). In-stream behaviour of threatened fishes and their food organisms based on remote videomonitoring. *Aquatic Ecology* **43**, 569–576.

Ebner, B. C., Fletcher, C., Donaldson, J. D., Fulton, C., & Seymour (In prep). Moray feeding modes and motifs. *J. Animal Ecology*

Ebner, B. C., Fulton, C. J., Donaldson, J. A., Cousins, S., Mecynecke, J-O., Schaffer J. & Kennard, M. J. (2015). Filming and snorkelling as mobile visual techniques to survey tropical rainforest stream fauna. *Marine and Freshwater Research* **66**, 120–126.

Ebner, B. C. & Morgan D. L. (2013). Using remote underwater video to estimate freshwater fish species richness. *Journal of Fish Biology* **82**, 1592–1612.

Ebner, B. C., Starrs, D. Morgan, D. L., Fulton, C. J. Donaldson, J. A., Doody, S., Cousins, S., Kennard, M., Butler, G., Tonkin, Z., Beatty, S., Broadhurst, B., Clear, R. & Fletcher, C. (2014). Emergence of underwater video for field based study of freshwater fish and crustacean ecology in Australia. *Journal of the Royal Society of Western Australia* **97**, 287–296.

Fulton, C. J, Starrs, D., Ruibal, M. P. & Ebner, B. C. (2012). Counting crayfish: active searching and baited cameras trump conventional hoop netting in detecting *Euastacus armatus*. *Endangered Species Research* **19**, 39–45.

Lintermans, M., Broadhurst, B. T., Thiem, J. D., Ebner, B. C., Wright, D., Clear, R. C., & Norris, R. H. (2010). Constructed homes for threatened fishes in the Cotter River catchment: Phase 2 final report. Report to ACTEW Corporation. Institute for Applied Ecology, University of Canberra, Canberra.

Starrs, D., Ebner, B. C., & Fulton, C. J. (2015). Ceasefire: minimal aggression among Murray River crayfish feeding on patches of allochthonous material. *Australian Journal of Zoology* **63**, 115–121.

Thiem, J. D., Ebner, B. C., & Clear, R. C. (2010). Validating variation in radio-signal strength as an index of aquatic fauna activity. *Australian Journal of Zoology* **58**, 50–55.

WINIFRED VIOLET SCOTT CHARITABLE TRUST

UNIVERSITY OF CANBERRA
AUSTRALIA'S CAPITAL UNIVERSITY

Griffith UNIVERSITY

NSW GOVERNMENT Department of Primary Industries

Arthur Rylah Institute for environmental research

Northern Australia Environmental Resources Hub
National Environmental Science Programme

JAMES COOK UNIVERSITY AUSTRALIA

TropWATER
CENTRE FOR TROPICAL WATER AND AQUATIC ECOSYSTEM RESEARCH

CSIRO

Murdoch UNIVERSITY

Freshwater Fish Group & Fish Health Unit
Centre for Fish & Fisheries Research

Australian National University

ACT PARKS CONSERVATION AND LANDS