The Abalone Industry Reinvestment Fund (AIRF) Committee is a Committee consisting of members from the abalone industry, the Tasmanian Department of Primary Industries, Parks Water and Environment (DPIPWE) and the Institute for Marine and Antarctic Studies (IMAS) which has been charged with the administration of $5.1 million allocated by the Tasmanian Government over 5 years to support and increase the sustainability of the abalone fishery.

The AIRF is designed to support and increase the sustainability and productivity of the abalone fishery both biologically and economically, while also addressing the impacts of the long spined sea urchin (Centrostephanus) to the marine environment.

As part of these objectives the fund will:

• support projects to increase abalone stock rates and productivity; and
• support projects to reduce the long spined sea urchin population on the East Coast.

AIRF 2020 Funding Round: applications for a project grant

The AIRF is now calling for applications for a project grant for the 2020 funding round.

Project must align with the objectives of the AIRF, and additional guidance on areas of priority are provided below.

Key areas for further projects which AIRF may support include:

• Recovering/rebuilding abalone stocks (ecology & system processes, strategies & objectives);
• Opportunities/methodologies for abalone stock enhancement;
• Abalone chain of supply and market/product development;
• Effects of global warming on abalone and associated habitat;
• Habitat/Centrostephanus survey and mapping;
• Monitoring/measuring habitat and abalone recovery;
• Mitigation measures for Centrostephanus including physical intervention;
• Deeper water urchin management - extraction and destruction;
• Fishery development (Centrostephanus);
• Market development and product diversification (Centrostephanus);
• Public outreach and communications;
• Centrostephanus dispersal and movement.
The AIRF has commissioned the development of a five year response strategy to the Centrostephanus issue. Such a strategy seeks to provide detailed guidance for directing a strategic response to the issue. The strategy is not designed just for AIRF activities, it is designed to provide guidance for a wider and cooperative long term response at a national level. It is hoped that the strategy will assist in supporting additional funding and activities to respond the Centrostephanus issue.

A preliminary summary of the overarching strategy which may be required is also attached to provide a level of assistance or guidance for applicants to design appropriate priority projects.

The AIRF is also keen to support projects which may also obtain funding from other sources to maximise the benefit from the AIRF investment.

**How to apply for a project grant**

The pro forma “Application for a Project Grant” must be used for all applications for the 2020 funding round.

Applications open on 18 June 2020, the closing date for applications for the 2020 funding round is **31 July 2020**.

A round of assessment will then be progressed by the AIRF. There is no onus on the AIRF to fund any particular project. The AIRF may seek to support a suite of projects across the priority areas - meaning quality projects in other areas may not be funded. However, the annual funding pool is limited and projects across the portfolio are sought. Applicants may be asked to provide additional information or detail around any application.

Applications should be forwarded to:

Attention: Vicki Waters  
AIRF Executive: AIRF 2020 Funding Round  
Department of Primary Industries, Parks, Water and Environment  
Marine Resources  
GPO Box 44  
Hobart Tasmania, 7001

Email: AIRF@dpipwe.tas.gov.au

Enquires may be made to Ms Vicki Waters Ph 616 53047
Overarching Response Strategy: preliminary issue summary

Research Priorities

The purpose of this document is to identify a preliminary list of research priorities for AIRF immediate investment that will contribute to the development and implementation of an effective management strategy for Centro in Tasmania. In identifying these priorities we recognize the need to both inform the control actions that will be undertaken in the immediate future, and to provide foundational research to underpin a more effective control program in the longer term.

In identifying these preliminary research priorities we have we have used the following considerations:

First, because Centro, the biodiversity, social and economic values it threatens, and, the capacity for management are variably distributed along the Tasmania east coast this becomes a spatial prioritization problem. Consequently, spatial information is fundamentally important to determining where and when we should invest in control.

Second, because the values upon which decisions are based come from a range of different metrics (biodiversity values, economic value, social return on investment, control capacity) this becomes a multi-criteria problem. We need to develop appropriate estimates for each of these.

Third, because the spatial biodiversity, social and economic values vary over time, in some cases unpredictably, the approaches adopted must be temporally dynamic and require appropriate analytical approaches, but also field appropriate monitoring and reporting mechanisms.

Finally, because there is uncertainty about almost all components of the Centro system this problem becomes a prioritization problem under uncertainty and warrants the use of adaptive management, “learning by doing” as a solution approach. Consequently, we seek the best possible solution at any given point in time, not the perfect solution.

In the short term: i) certain areas must be prioritised for manual control based on their relative values; ii) a targeted amount of control effort must be invested at those areas to achieve an ecologically meaningful reduction in Centro densities there; and iii) the outcomes of those efforts must be monitored and maintained over time.

Prioritising research that can improve our understanding of where and when to invest management effort to generate ecologically meaningful outcomes, and for how long, will be crucial to making effective decisions in the short term.

Key drives of these decisions are likely to be: distribution of Centro populations and habitat (kelp forests); biological parameters such as time to first reproduction, fecundity; spatial ecology parameters such as larval dispersal capacity and adult movement rates; management parameters such as control effectiveness and resource requirements, the associated values and management capacity.

THE SPATIAL CONTEXT FOR DECISION MAKING

As noted above, this is essentially a spatial problem and, as a consequence, spatial information on the distribution and dynamics of the ecological entities and processes, i.e. kelp, barrens and Centro, are fundamental to strategic decision making.

Just as important is an understanding of the spatial distribution of the social and economic values of the system, and of the capacity of potential control agents. An immediate research need is the best possible estimates of these parameters. Ideally these would be field validated estimates collected at the highest possible resolution.

In reality, and especially at the outset, they are more likely to be estimates and extrapolations based on sparse data and to have large associated uncertainties which would improve over time. The relevant scales of assessment would the Fishery Part, Block and the Site.

SPATIAL DISTRIBUTION, STATE AND DYNAMICS OF KELP FORESTS

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1 Dr David Westcott, CSIRO Senior Principal Research Scientist, preliminary 2020
The fundamental asset to be protected in this program are the kelp forests. Achieving this requires that we know i) where those kelp forests are, ii) their characteristics, iii) their trends at a site over time. Without this information to underpin strategic decision-making, management will inevitably be reactive.

- High resolution mapping of the distribution and trends in kelp forests based on monitoring or modelling.
- Development of methods for mapping kelp bed distribution and dynamics. For example, using remote sensing, google earth or other satellite images, etc;
  - Develop automated processes for this where appropriate;
  - get a timeline going back as far as possible along with patterns of variation.
- Predictive models of the distribution of kelp;
  - based on ecological and environmental modelling e.g. i) depth, ii) substrate, iii) slope;
  - predict presence and absence.

SPATIAL DISTRIBUTION, STATE AND DYNAMICS OF BARRENS

Barrens are the physical representation of impact and again, understanding their distribution and dynamics is fundamental to strategic decision making.

While barrens represent a key stage in the Centro impact, and have been the trigger for management action, they are not the starting point. Prior to the formation of barrens, kelp forests show marked changes in the density and the size of individual plants. Being able to detect incipient barrens as early as possible would allow for timely interventions.

- Remote sensing methods for mapping and monitoring of incipient and formed barrens. Might be based on:
  - Imagery;
  - Spectral data;
  - Human reporting – technologies and systems for formal surveillance, industry, and citizen science reporting.

DISTRIBUTION AND DYNAMICS OF CENTRO

Managing a threat requires knowing how that threat is distributed.

- Centro – mapping of Centro distribution that can be updated on appropriate time frames:
  - Developing the maps based on all data sources:
    • Formal Surveillance;
    • Citizen Science;
    • Industry.

SOCIAL, ECONOMIC AND BIODIVERSITY VALUES

An underpinning goal of the Centro strategy is the protection of values associated with healthy kelp-dominated ecosystems.

These values include a variety of commercial and recreational fisheries as well as tourism and biodiversity. These values are not distributed evenly along the coast.

For example, the value of a Block to a particular fishery will be a function of a range of factors that vary from location to location and in some instance over time. These include, but are not limited to, the distance to a harbour, the extent of suitable habitat, the biomass of the target species, fuel costs, and operating depth.

Developing a framework for assessing the spatial distribution and dynamics of these values for each stakeholder group is a key task:

- With stakeholders, develop an appropriate framework for assessing the spatial distribution of assets, values, costs and constraints associated with their sector (including the Social Return on Investment):
  - Conservation/Biodiversity;
  - Lobster;
  - Abalone;
  - Fin fisheries;
CENTRO CULL
Prediction of the costs, constraints and effectiveness of manual control.

CENTRO BIOLOGY AND ECOLOGY
Several aspects of Centro biology and ecology have a significant influence on processes that determine population spread, dynamics and impact. These have implications for the objectives of the program and for the strategies ultimately adopted. For example, if recruitment to the Tasmanian Centro population is primarily from local sources, then targeting the local larval source populations may be an effective strategy. If recruitment comes from the mainland, then a different strategy might be adopted.

DISPERsal
- Scale of Dispersal - mechanistic predictions of larval dispersal.

  Fine-scale modelling of ocean currents along the Tasmanian coast would enable estimation of physical connectivity between locations. Combined with network analyses this would enable predictions of connectivity between populations and the identification of putative ‘source’ populations for targeting. At the 2019 Forum the suggestion was made to link the TRITON ecosystem model (Sean Tracey) and the soon-to-be-developed larval dispersal model (Katie Cresswell) to provide mechanistic predictions of dispersal.

- Scale of Dispersal – Genetic Approach

  Genetics provides a means of directly estimating the relatedness between individuals and populations. This makes it useful for measuring effective (or actual) dispersal distances. This might be done using traditional micro-satellite approaches but would be more usefully done through whole-of-genome approaches. This is because rapidly expanding populations of a highly fecund and mass spawning species are likely to exhibit low levels of genetic variation. As a consequence, genomic approaches would ensure maximum probability of detecting sufficient variation and, additionally, would provide the tool set for the development of genetic tools for other aspects of the work, e.g. describing the secretome for the development of attractants.

  Additionally this work would allow for direct estimation of recruitment from outside Tasmania.

- Larval Biology and Ecology

  Using mechanistic models to estimate connectivity will require assessments of aspects of larval biology, including:
  - competency and factors influencing this;
  - larval development times in Tasmanian waters;
  - settlement cues and success.

POPULATION BIOLOGY
Key information for understanding thresholds for culling and revisitation, estimation of individual and population fecundity:

- Standard population and life-history parameters:
  - Including age to detectability relative to age at first reproduction.

- Influence of environmental factors on life history parameters, including:
  - Habitat;
  - Time since population establishment;
  - Population density;
  - Water temp (or latitude).
• Response in population structure to control:
  o Size frequency distribution;
  o Growth rates.
• Individual movement patterns:
  o Daily and weekly patterns of ranging (detectability);
  o Movement frequency and distance between foraging sites;
  o Movement frequency and distance across the depth profile;
  o Movement in response to control, e.g. into barrens, into controlled areas, from deep water.
• Age and habitat specific kelp consumption rates

**Monitoring**

**DEEP WATER MONITORING**

• ROVs/AUVs – for rapid assessment of sites, particularly deep water sites, to avoid unnecessary diving.

**BROADSCALE MONITORING**

• ROVs/AUVs – for surveillance and monitoring at larger spatial scales.
• Image recognition and processing systems to automate data analysis.

**REMOTE MONITORING**

Technologies that sample water and test for Centro DNA provide using eDNA analysis provide a means for remotely or automatically monitor for Centro spread. Particularly useful for monitoring range expansion and recolonization in deep water.

**Control Effectiveness and Efficiency**

**MONITORING CULL EFFORT**

Standardised methods for collecting and reporting of data related to cull effort, distribution, efficiency and effectiveness. Tailored for different stakeholders (recreational divers, cull divers, harvest divers) but reporting to a standardised database. By automating this through the use of apps data quality can be maximised, submission automated, and the effort required for data management minimised. Automatic upload allows for near real time decision making.

**ENHANCING MANUAL CULL**

Centro secretome/genetics - identification of attractants to simplify deepwater culling either by attracting them into diveable depths or to aggregate them to allow shorter bottom times or easier robotic culling.