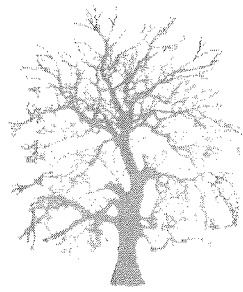
SUBMISSION NO. 17
Inquiry into the Role of Science for Fisheries and Aquaculture



tasmanian conservation trust inc

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Standing Committee on Agriculture, Resources, Fisheries and Forestry
House of Representatives
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INQUIRY INTO FISHERIES AND AQUACULTURE SCIENCE

Responsible and sustainable management of wild fisheries and aquaculture must be based on evidence and rational decision making processes. In Australia, these industries interact with the wider environment and may have significant impacts on that environment. To protect environmental values and amenity, as well as the long-term sustainability of these industries, development and management must be based on scientific research. Research must not only focus on industry needs, but must provide information that can be used to manage the wider environment as well.

There seems to be an increasing trend for research to be more directed towards solving industry problems and supporting industry objectives. Politicians and industry regularly call for research to more focussed on practical outcomes and fulfilling the needs of industry. Obviously this is not an issue if such research is funded by private enterprise. However, much research is funded to at least in part by taxpayers money and should therefore be open to scrutiny. If any funding is to be provided for industry by taxpayers, it can be argued that there is is justification to support research into environmental and other issues associated with that industry.

This submission will use the Tasmanian rock lobster fishery as a case study to illustrate the sorts of problems that may occur if research becomes too focussed on industry objectives and ignores wider environmental and social issues.

The Tasmanian rock lobster fishery is in crisis. It is currently unsustainable and its operation is systematically destroying much of the reef habitat upon which it depends. The operation of this fishery poses a direct threat to much of the Tasmanian commercial and recreational abalone fisheries, the recreational rock lobster fishery in the east and elements of the commercial rock lobster fishery

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itself. A large part of Tasmania's reef ecosystems are also threatened with destruction. Major changes need to be made to the way this fishery is managed immediately to make sure that it is sustainable, and to offer adequate protection to the abalone fishery and other fisheries, and the marine environment.

That such a situation could be permitted to develop in this fishery beggars belief. The Tasmanian commercial rock lobster fishery has had a long history and is based on a robust species that is capable of sustaining a reliable and relatively lucrative industry. Its associated management and research teams are relatively well resourced, and the responsible Minister for Fisheries has all the legislative power (through the *Living Marine Resources Act, 1995*) that might be needed to manage this fishery effectively and take whatever steps might be necessary to ensure that the fishery itself is sustainable and that the marine environment is adequately protected.

The problems facing Tasmanian commercial rock lobster fishery, and much of Tasmania's marine environment, are a direct result of the management and research being directed almost exclusively on the management of this fishery as a single species fishery, to the exclusion of ecological considerations. There has been a long-term failure to consider habitat impacts and issues beyond the narrow focus of managing rock lobster stocks according to the theoretical requirements and predictions of a mathematical model that is based on assumptions that appear to be overly optimistic.

The Tasmanian rock lobster fishery is based on the harvest of the southern rock lobster, *Jasus edwardsii,* It is Tasmania's being the state's second most important commercial wild harvest fishery with an estimated landed value (in 2009) of $72 million and provides employment for around 760 people in production, processing (Pecl et al 2009). This fishery also has a recreational sector (Lyle and Tracey 2010, and Pecl et al 2009) that is important to many Tasmanians. A poorly managed Tasmanian rock lobster fishery with unsustainable fishing practices and habitat destruction can be expected to directly affect many Tasmanians.

Problems

There are a number of serious problems associated with the Tasmanian rock lobster fishery. Most of these have been evident for many years, but the Tasmanian Government has so far failed to take any meaningful action that would lead to a solution.

Inshore fishing pressure is too high and is a result of market forces and ease of access.

The smaller red rock lobster preferentially targeted by the commercial fleet can be sold for a higher price per kilogram. In a quota fishery it obviously makes sense for fishers to target higher value fish, to maximise the value of there quota. Unfortunately, with no additional regulatory control or incentives this leads to a concentration of effort on inshore shallow reefs.

The recreational fishery also preferentially targets shallow inshore reefs due to ease of access. Shorter trip times and more sheltered waters are one explanation for this preference, but the lack of mechanical pot haulers on most recreational boats, and depth and shelter are also constraining factors for recreational divers.

Localised overfishing has become a problem along much of the east and southeast coasts of Tasmania. Legal sized rock lobster are all but absent from many areas, particularly those targeted by recreational fishers. As a regular diver in Tasmanian waters for over 30 years, I can say that many areas that were once productive fishing areas no longer have useful numbers of legal sized rock lobster and many rock lobster dens that were once regularly occupied are now empty. Recreational fishing continues to occur in these areas making any recovery very unlikely.

Knife edge fishing has been a characteristic of the fishery, particularly the east and southeast regions since at least the mid 1990s. This means that most rock lobster are taken by the fishery soon after they reach legal size. This means that the fishery relies heavily on new recruits making the fishery less able to withstand the effects of year where poor recruitment occurs and reducing the numbers of ecologically important individuals with carapace length of 140 mm or greater (see the section on *Centrostephanus rodgersii* urchin barrens below).

Variation in rock lobster populations in different regions within the Tasmanian jurisdiction makes management more difficult. Growth rates, size at maturity, fishing pressure and stock status is quite variable around Tasmania, and this means that that standardising fishery management procedures across the State is inappropriate (unless overly draconian regulations were to be introduced). An area based management that is more sensitive to biological factors and fishing pressure needs to be introduced. Bag limits, possession limits and size limits should be determined on a region by region basis, and access to these areas by both commercial and recreational fishers managed accordingly. The commercial fishery does have a system of large assessment areas, and very large scale management areas, but there is no are management process in place that can manage issues such as urchin barren related reef habitat destruction or localised overfishing.

Recruitment failure has been an issue since the 2008/09 season. The failure of larval and juvenile rock lobster to survive to enter the fishery has meant that the catch along much of the coast has exceeded recruitment into the stock. Up until this point, the Tasmanian rock lobster stock had been recovering from low points in the 1990's, encouraged by tighter controls on catch resulting from the introduction of quota management.

State-wide exploitable biomass has rapidly declined since the high reached in 2007 and is now only slightly greater than the lowest level of the last decade (Gardner et al 2011).

The causes of recruitment failure are unclear, but may be related to climate change or other environmental factors. A recent CSIRO study indicated a significant level of self recruitment associated with the Tasmanian rock lobster population, despite the long period larval life stages spend as drifting plankton (Bruce et al 2007) so locally reduced biomass of mature animals may be a contributing factor. Problems with rock lobster stocks in South Australia and elsewhere in southern Australia may also contribute to the falling recruitment. In Tasmania, there has been the loss of giant kelp, *Macrocystis pyrifera*, habitat along much of the east coast (Edyvane 2003) and increases in the size and number of urchin barrens (DPIPWE 2011b). These are large scale changes in the Tasmanian marine environment that might be expected to work against successful rock lobster recruitment.

Since the 2008/09 season, recruitment appears to have been less than the catch and the Tasmanian rock lobster fishery has essentially operated as a mining operation and has been unsustainable. Catch rates have also been falling in many areas (Gardner et al 2011).

Recruitment failure is not only a problem for the Tasmanian rock lobster fishery in its own right, but amplifies the effects of other problems associated with this fishery and makes developing and implementing solutions more challenging.

Inadequate TACC reduction has been the only response by fisheries management in the Department of Primary Industries, Parks, Water and Environment (DPIPWE). The only significant management tool that has been utilised in response to recruitment failure is to reduce the total allowable commercial catch (TACC). Since the 2008/09 season, when it was set at 1523 tonnes, the TACC has been successively reduced. In the 2009/10season there was a 3.5% reduction to 1470 tonnes, in 2010/11 there was a 10% reduction to 1323 tonnes and for 2011/12 TACC was reduced by a further 17% to 1103 tonnes. Since the 2008/09 season there has therefore been a 17%/420 tonne reduction in the TAC from 1470 tonnes to 1103 tonnes (DPIPWE 2011b).

Unfortunately, since recruitment failure was first identified, the TACC has been non constraining. This has been largely due to industry reluctance to reduce TACC in by a useful amount. Individual Transferable Quotas (ITQs) and quota based fishery management system appears to be a good way to manage levels of exploitation at a sustainable level (Costello et al 2008) and is a mechanism used in many Australian fisheries, but for a fishery with a quota based management system, such as the Tasmanian rock lobster fishery, it is widely recognised that a non constraining TACC is a meaningless management tool for the purposed of managing stock sustainability.

Last season (2011/12) the reduced TACC did turn out to be constraining, but only by a small (insignificant) amount. The impression remains that no hard decisions have been taken to limit catch and increase biomass quickly. There are no meaningful strategies in place that will deal with localised overfishing and high inshore fishing pressure or *Centrostephanus* urchin barrens (see below).

It needs to be emphasised that since recruitment failure was identified, fishery management has placed no significant constraints on the commercial fishery. In effect fisheries management has done nothing with any real impact on fishing activity since this problem was identified.

The recreational fishery has also experienced little restraint as a result of management strategies. One of the outcomes of a five year review of the rock lobster fishery has been to reduce bag limits to 3/day for recreational fishers. While there is no doubt that this will reduce the annual catch of some fishers, particularly on the northwest coast, the 3/day limit is actually greater than the average recreational take per day, and will therefore have marginal impact on the total recreational catch.

For example, in 2008/09, the overall average harvest rate for the season was 1.0 rock lobster per day, with daily harvest rates of 0.75 for pots, 2.27 for dive collection, and 2.88 for rings. The *(2008/09)* daily bag limit of five rock lobster was

rarely attained for pots (~1% of pot days) whereas the bag limit was attained in about one in five days based on dive and ring methods Lyle and Tracey 2010).

Failure of the fishery modelling process to take into account recruitment failure seems to have lead to some complacency amongst fishers, scientists and managers, and delayed reaction to this situation. Management of the Tasmanian rock lobster fishery is largely based on a mathematical model. While such models have become quite sophisticated in recent years, and are useful in informing fisheries managers about how stock structure may be effected by certain variables, it is important to remember that they do not necessarily reflect, or predict, real world events.

The ability to model the real world depends on our ability to collect real world data (Reynolds 2002). There is no data available to model the relationship between environmental variables and recruitment in the Tasmanian rock lobster fishery. Climate change appears to be having a measurable effect on the water temperature off southeast Australia (Lough 2009). Zooplankton also appear to be impacted (Richardson et al 2009). With Tasmanian rock lobster having live stages that spend many months drifting with other plankton, it should not come as any surprise that changing conditions due to climate change and or other factors have great potential to change survival rates and recruitment success.

Whatever the ultimate cause of the recruitment failure, it is clear that the current model does not adequately take into account recruitment variability. In fact the level of recruitment used in the model is the average from the last 10 years (Gardner et al 2011) and model outcomes would be very much worse if and average from the last 5 years was used instead (pers comm Dr Caleb Gardner).

The assumption that using the 10 year average is a realistic assumption seems to be very optimistic given that recruitment over the last 5 years was been much worse, and climate change continues to progress and the current biomass of mature rock lobster biomass is now less than has been over much of the 10 year period used to determine average recruitment.

Amongst the other assumptions used for the evaluation of future harvest strategies was that there would be no loss of productivity through expansion of urchin barrens (Gardner et al 2011). This assumption is incorrect. Urchin barrens are clearly increasing in size and number and exclude the commercial fishery.

It is noteworthy that if one accepts the model at face value, then according to Gardner et al (2011) "*only TACCs equating to 100 kg/unit (1050.7 t) or less appear to have reasonable probability of meeting most target and limit reference points*".

The current (2011/12) TACC is 1103 tonnes and the Tasmanian and the Tasmanian Rock Lobster Fishermen's Association (TRLFA) recently voted to support a one year moratorium on any further reduction in the commercial catch.

Urchin barrens formed by grazing *Centrostephanus rodgersii* urchins arguably pose the greatest threat to the Tasmanian rock lobster fishery. They also pose a direct threat to much of Tasmania's rocky reef environment. These barrens are also considered a threat to the Tasmanian abalone fishery (Tasmanian Abalone Council 2011).

While there are likely other factors at play (such as climate change and warmer water) it is clear that these barrens occur due to fishing removing large rock lobster (carapace length >140 mm) that are big enough to prey upon *Centrostephanus* urchins. Smaller rock lobster can't break through the spines of the urchins found in the open (small urchins are cryptic). Once these large rock lobster are removed from reef areas, urchin numbers explode. Grazing *Centrostephanus* urchins clear the large marine plants that are a feature of the shallow rocky reef habitat and urchin barrens are formed. These urchin barrens do not support commercial quantities of either rock lobster or abalone (Johnson et al 2005) and can therefore be expected to exclude both these important fisheries from affected reef areas, with a consequential economic impact. The environmental impact is devastating, as once productive and reefs are converted into underwater wastelands.

As a member of the Crustacean Fishery Advisory Committee (CFAC), I have seen a number of presentations on research on *Centrostephanus* and rock lobster given by Prof Craig Johnson (Institute for Marine and Antarctic Studies, University of Tasmania. More information can be found here:
www.zoo.utas.edu.au/urchin/index.html
and here: www.zoo.utas.edu.au/urchin/lobster.html).

It is clear from all available research (much not yet published but see Appendix 7 in DPIPWE 2011a) that the primary cause of *Centrostephanus* urchin barrens is the removal of large rock lobster and that a vital part of any solution is to increase the numbers of large (carapace length >140 mm) rock lobster on reef.

The suggestion, by some, that culling or commercial harvest by divers is a solution does not withstand critical scrutiny. While culling or harvesting may be useful in some situations, these activities can not be expected to control urchin barrens along much of the coast. Apart from anything else, OH&S considerations and the expense and logistics means that diver based methods of urchin control are limited by practicalities to relatively shallow depths (<20 M).

The company Seafood Tasmania harvested 70 tonnes of *Centrostephanus* urchins for commercial sale during a period in 2011 between the Bay of Fires and Triabunna, requiring approximately 70 man hours to collect each tonne that was processed (Brewer 2011).

If one *Centrostephanus* urchin weighs approximately 0.4 kg and there are approximately 2 urchins/m^2 on an urchin barren, it therefore takes about 70 man hours to clear 1250 m^2 and the collection or destruction of 70 tonnes of *Centrostephanus* urchins results in clearing 8.75 Ha of reef. At a recent forum (*Centrostephanus* Management Forum, 29 March 2011, Parliament House, Hobart) industry representatives suggested that a realistic annual harvest might be expected to be somewhere between 300 and 400 tonnes, which could be expected to clear approximately 49 Ha. Clearing an area of 49 Ha along the whole east and southeast coast would have little impact on this problem. This pessimistic assessment does not take into account the settlement of new urchins and commercial considerations such as preferential targeting of more accessible areas and higher quality urchins from incipient barrens and the edges of barrens rather than well developed barrens.

Another way of looking at this problem is to use the estimated urchin stock of 84 million urchins (DPIPWE 2011a) as a basis for calculating the impacts of

harvesting / culling. If each urchin weighs 0.4 kg that is a biomass of 34400 tonnes. A commercial fishery with an annual catch 400 tonnes makes an insignificant impact on the urchin stock even before one takes into account the the urchin stock's recruitment and growth.

The Tasmanian Abalone Council (TAC - the peak body representing the commercial Tasmanian abalone fishery) has commissioned a formal report investigation the economics and practicalities of culling and/or harvesting *Centrostephanus* urchins. This report is due out soon but is unexpected to provide an assessment that is any more optimistic than what I have just outlined.

Currently, *Centrostephanus* urchin barrens are a critical problem on shallow reef along the east and southeast coastlines. There is a view that shallow reefs on the south, southwest and west coasts will be protected by the heavy wave activity that is a feature of those areas. This is a reasonable argument although it is possible to see *Centrostephanus* urchin barrens on quite exposed areas of the east coast.

The impact of *Centrostephanus* on deeper (>30 m depth) reefs remains a mystery due to the difficulty in observing these areas. From my own observations whilst diving, I would suggest that there does not appear to be the same level of impact on deep reef as on adjacent shallow reef, but I have certainly observed barrens in down to at least 50 m (for example the southeast corner of Schouten Island) an observation supported by DPIPWE (2010).

The only practical management of *Centrostephanus* urchin barrens on reefs deeper than 20 m is by increasing the density of large rock lobster to levels that can adequately control urchin numbers. As much of the rock lobster fishery depends on deeper reef, I suggest that that deep reef also needs to be taken into account when considering the problem of *Centrostephanus* urchin barrens.

A government report (DPIPWE 2011a) provides some insight into the level of change in rock lobster density required to deal with *Centrostephanus* urchin barrens. Appendix 7 (Advice from IMAS on Maximum Size Limit and *Centrostephanus*) informs us that the density of large rock lobster (carapace length >140 mm - ie large enough to successfully prey on *Centrostephanus* urchins) in the no-take Maria Island MPA was approximately 1.0/100 m^2. At two experimental sites (where large rock lobster were translocated for research into the relationship between rock lobster and *Centrostephanus* urchins) the density was approximately 0.10/100 m^2, while outside these areas where rock lobster were subject to fishing (control areas) the density was about 0.01/100 m^2. *Centrostephanus* urchin barrens are not observed in the no-take section of the Maria Island MPA.

The southern experimental area showed statistically significant recovery of macroalgae coverage in urchin effected areas. The northern area also showed recovery of macroalgae coverage, but that recovery was not statistically significant (DPIPWE 2011a).

At both southern and northern control areas the size of patches of urchin barrens continued to grow on average by around 60% (DPIPWE 2011a).

One can reasonably infer from this evidence that a density of large rock lobster of 1.0/100 m^2 provides good protection from *Centrostephanus* urchin barrens, while a density of around 0.10/100 m^2, seems to provide adequate protection in the

south and may be a useful control in the north. When the density of large rock lobster is in the order of 0.01/100 m^2 there is substantial growth of urchin barrens.

To effectively control *Centrostephanus* urchins and barren formation, it therefore seems reasonable to aim for a density of large rock lobster of at least 0.10/100 m^2.

The rock lobster fishery model was used to assess a variety of methods to increase the density of large rock lobster. A table of results from Appendix 7 (DPIPWE 2011a) is shown at Table 1. It should be noted that the only single strategy that will bring rock lobster numbers to a level that have been shown to be useful in controlling *Centrostephanus* urchins and barren formation in 5 to 10 years (around 0.10/100 m^2) is to close the east coast fishery for somewhere between 5 to 10 years.

Table 1 Estimated change in lobster density and biomass under different management options (from DPIPWE 2011a).

	Density of large lobsters (>140 mm) per 100m^2	**Biomass (t) if extrapolated across estimated reef areas 1-3 of 560 km^2**
Maria Island park	1.000	8,400
Enhanced Experimental sites	0.100	840
2010 fishery stock	0.008	64
Maximum size limit (5 y)	0.008	64
Maximum size limit (10 y)	0.013	112
TACC reduction (1103 t, 5 y)	0.003	23
TACC reduction (1103 t, 10 y)	0.008	68
East coast cap (5 y)	0.009	78
East coast cap (10 y)	0.049	409
Reduce rec catch (-30%, 5 y)	0.002	18
Reduce rec catch (-30%, 10 y)	0.005	37
Close fishery (5 y)	0.051	428
Close fishery (10 y)	0.186	1,566
80 mm in SW (5 y)	0.014	117
80 mm in SW (10 y)	0.025	214
Translocate (5 y)	0.001	12
Translocate (10 y)	0.007	57

Urchin barrens formed by *Centrostephanus* urchins have been recognised by many as a potential threat to fisheries and reef ecosystems for many years. I informed the Tasmanian Government about this issue in the 1990's. The Tasmanian Abalone Council wrote in a submission that it "*... believes that the creation of Centro barrens represents a major threat to the long-term sustainability of the Eastern Abalone zone on Tasmania's East Coast. The existence of Centro in large numbers is a documented threat to the health of the benthic algal community upon which abalone and other inshore reef organisms depend. Recent*

research has demonstrated that large rock lobsters are the major predator in Tasmanian waters capable of helping control long spined sea urchin (Centro) populations" (Tasmanian Abalone Council 2011).

Considering the potential and actual direct threat urchin barrens represent to Tasmania's two most economically important fisheries, as well as the marine environment, it is strange that no action has been taken to deal with this problem.

The most recent Government survey is now over 10 years old, so exact information about the expansion of this problem is not available. However, observations by myself and many other divers (including many professional divers working in the abalone industry) suggest that this problem has become much worse over the last 5 years and is continuing to worsen.

Another indication of the speed at which this problem may be progressing is given by the outcomes from research into the relationship between rock lobster and *Centrostephanus* urchins. Observations indicate that the size of patches of urchin barrens at both northern and southern control areas continued to grow on average by around 60% during the experiment. This change occurred in the North Bay control area over the 2 year course of the experiment (DPIPWE 2011a).

Climate change is clearly a process that will change the marine environment off south-eastern Australia and challenge many species (for example Lough 2009 and Richardson et al 2009). In particular, climate change is expected to have a significant impact on Tasmanian rock lobster fishery (Pecl et al 2009). This fishery is ideally placed to act as an 'early warning signal' of climate change impacts for Australian fisheries generally (Pecl et al 2009). One problem with this is the difficulty associated with separating the effects of fishing and climate change.

Marine protected areas (MPAs) can be used as a reference point for understanding how historical and ongoing human activities have impacted on the marine environment (DSEWPC 2011). In the context of the Tasmanian Rock Lobster fishery, no-take MPAs could be used as a baseline reference area to differentiate between the impacts of fishing and climate change. There is a tendency within industry and Government to blame climate change rather than fishing itself when explaining changes to fish stocks or marine habitat.

Marine protected areas have already assisted in identifying the role of rock lobster as the only significant predator on *Centrostephanus* urchins in Tasmanian waters. The almost complete absence of *Centrostephanus* urchin barrens in existing no-take MPAs at Bicheno and Maria Island indicate that overfishing of rock lobster is directly related to the formation of these urchin barrens and habitat destruction.

At least one industry representative has claimed that an urchin barren in the Governor Island MPA is proof that there is no relationship between rock lobster predation and urchin barren formation. As one of the few people who have actually dived regularly in this area for more than 25 years, I can say that the "urchin barren" was clear of macroalgae in the mid 1980's, well before *Centrostephanus* urchins became established in large numbers along this part of the coast. I expect that this feature is largely a product of unrelated environmental conditions, and that the lack of kelp has allowed an aggregation of urchins to form. In any case, the apparent lack of urchin barrens in the remainder of this MPA (and the Maria Island MPA) is notable, and seems to me to indicate that even if the protection of large rock lobsters does not offer 100% protection against

the formation of urchin barrens, the situation is very much better than it is along the adjacent coast where a urchin barrens are expanding and multiplying at an alarming rate.

A comprehensive, adequate and representative system of marine protected areas could be used as a baseline reference area and increase understanding of impacts of rock lobster fishing and the formation of urchin barrens.

Currently Proposed Solutions

The Tasmanian Government and its fisheries manager, DPIPWE, have recognised the problems that confront the rock lobster fishery, but have made little progress towards finding practical solutions.

The primary mechanisms to deal with all problems associated with the rock lobster fishery has been to reduce catch. As outlined above, the TACC reduction has not constrained catch since the 2008/09 season when recruitment failure became obvious and the recreational bag limit is still greater than the average catch. The recreational limit may reduce the daily a catch of some divers or some in the northwest, but on the east coast where the most critical problems are developing rapidly, it will have little impact on the overall recreational catch, particularly if recreational fishers make more trips to compensate.

It is essential that the catch is less than the recruitment if stock are to recover, but the problem with taking such broad-based approach is that the Tasmanian rock lobster fishery is not homogenous. Different areas within the fishery experience different problems or the same problems but to differing degrees, and local rock lobster stocks have differences in, for example, growth rate and size at maturity.

This is identified in the latest stock assessment report that states "*Both fishing effort and biological parameters vary dramatically from region to region, which presents major challenges for fishery assessment and management. An important step towards meeting these challenges is the use of a spatially-explicit stock assessment model that considers different assessment areas separately and informs harvest strategies which incorporate regional differences*" (Gardner et al 2011). Currently the rock lobster fishery has 11 assessment areas (Gardner et al 2011).

Limiting the overall catch will not solve problems (such as inshore fishing pressure, localised overfishing, *Centrostephanus* urchin barrens) in many areas unless the catch is limited to such an extent that the commercial fishery is reduced to the point where it becomes uneconomic.

A working group (RecCom Working Group - of which I am a member), made up of stakeholders such as representatives of commercial and recreational sectors and managers, has been set up to consider a more targeted approach.

One current proposal being developed by DPIPWE is reducing seasons for the recreational and commercial fisheries in the 2012/2013 season. In my view (and the view of many others) there is no reason to expect that the season reductions being contemplated will significantly change catch in significant way in the most critical areas along the east and southeast coast. Commercial fishers are managed primarily by quota and restricting the season is unlikely to make much difference to the catch along eastern Tasmanian where weather is a much less limiting factor than on the west coast.

Recreational fishers are likely to simply compensate for seasonal changes by going at different times. The bulk of the recreational catch is usually caught early in the season, so the overall catch is not directly related to the length of the season.

Another strategy being considered is some kind of area management, with area-based TACs. Under the current management structure, progress on this mechanism has been very slow, to the point where it looks a lot like inaction, and the earliest it might be introduced is in the 2013/14 season. I must say that given the position of the commercial fishery and the speed at which important management changes are introduced, I have no expectation that area management will be introduced in time to prevent much of the east and southeast reefs from becoming devastated by urchin barrens.

One additional solution that is making progress is largely independent of normal fisheries management and involves the translocation of deepwater stock into shallow water where growth rates are higher and animals become more valuable (they turn red in the shallow marine environment and become more valuable in the marketplace). Translocation is at a preliminary trial stage and is, in any case, currently restricted to the west coast and will therefore have little impact in the east where problems are most critical.

Culling or harvesting has been embraced by the commercial sector and promoted by the Tasmanian Government as a solution to the *Centrostephanus* urchin barren problem, but as outlined above, has no realistic chance of having an impact.

No practical strategy has been proposed to increase the density of large rock lobster to control *Centrostephanus* urchins in a time frame that will actually stop the wholesale devastation of reef habitat.

Rock lobster catch has exceeded recruitment since recruitment failure was identified in the 2008/09 season. Repeated reductions in TACC have failed to correct this unsustainable situation.

The Tasmanian rock lobster fishery has all but eliminated large rock lobster from inshore waters along Tasmania's east and south-east coastline. Since large rock lobster(carapace length larger than approximately 140 mm) are the only significant predators of the sea urchin, *Centrostephanus rodgersii*, there has been a population explosion of urchins. In turn, this has resulted in the formation of so-called urchin barrens, which are areas of rocky reef where the normal covering of kelp and other seaweeds has been almost completely removed by grazing sea urchins.

Apart from the obvious environmental impact, urchin barrens do not support significant numbers of rock lobster or abalone and no longer support commercial or recreational fishing for these species.

The formation of *Centrostephanus* urchin barrens is an ongoing process. One research project has observed the increase in size of patches of urchin barrens by 60% in just two years DPIPWE (2011a).

The Role of Research

Research has played an important role in rock lobster management in Tasmania. Unfortunately, it has been too focused on managing the stock as a whole and for a long time ignored ecological impacts resulting from over fishing of large rock lobster and the consequent expansion of *Centrostephanus* urchin barrens. The failure to look at ecosystem impacts and other issues has resulted in the problems that are currently facing the fishery.

For example, managers and industry were made aware of the problem of *Centrostephanus* urchin barrens in the 1990's. An excuse often used (particularly by industry) for the lack of action has been that there was insufficient research to justify taking any action.

The TCT believes that there is now more than enough scientific evidence to support changes to management to increase the numbers of large rock lobster that can prey on *Centrostephanus* urchins in critical areas. However, it is important to note that much of this research was done in spite of the lack of support and funding from the mainstream fisheries research process in Tasmania.

Key research on *Centrostephanus* urchins and urchin barrens was carried out and coordinated by Professor Craig Johnson while he was based in the Zoology Department at the university of Tasmania. The Tasmanian Aquaculture and Fisheries Institute (TAFI) was notable for its lack of involvement in this issue, arguably the most critical that has ever faced Tasmania's marine environment or any Tasmanian fishery. The lack of involvement by TAFI occurred despite a number of senior researchers being concerned about the threat posed by *Centrostephanus* urchin barrens, and can only be explained as reflecting a structural failure of TAFI management and the Tasmanian Government to direct research resources to deal with this problem.

As a member of TAFI's Marine Environment Research Advisory Group (RAG), I helped designate Professor Johnson's research into *Centrostephanus* urchins and urchin barrens as a high priority and the relationship with rock lobster as having a high priority. Despite this, on at least two separate occasions, the Fisheries Research and Development Corporation (FRDC) turned down funding applications, although later on after research projects had started some funding apparently was made available through FRDC.

In the last 20 years there has not been any area of research in the area of fisheries or aquaculture in Tasmania that has been more important than *Centrostephanus* urchins and urchin barrens, yet FRDC delayed funding for a critical period.

There continues to be problems sourcing funding for critical research into *Centrostephanus* urchins and urchin barrens. The last comprehensive survey of urchin barrens was carried out in 2001, and there are no plans for funding a new survey, despite there being much anecdotal and other evidence to indicate that there has been a great expansion in urchin barrens since then.

It is to be hoped that since TAFI has become integrated into the new Institute of Marine and Antarctic Studies (IMAS) fisheries-related research will be less narrow

in its focus and that there will be more scope for research on impacts on the wider marine environment.

Discussion

The Tasmanian Government and its fisheries manager, DPIPWE, have made little practical progress towards finding solutions for the problems facing the rock lobster fishery. These include inshore fishing pressure, localised overfishing, knife-edge fishing, catch exceeding recruitment, *Centrostephanus* urchin barrens and the destruction of reef habitat that supports the rock lobster and abalone fisheries. These problems have mostly long-standing. All except recruitment failure have been apparent since the 1990's. Recruitment failure and excessive TACC have been identified problems since the 2008/09 season.

Since problems with recruitment were identified in the 2008/09 season, no management changes have been made to the commercial fishery that actually make any difference to any of these problems. The incremental reduction of TACC since the 2008/09 season has been the most significant management change but has so far not limited catch because the TACC has been non constraining by a big margin until last season.

It is worth restating this important point. The Tasmanian Government failed to take any meaningful steps to limit catch and safeguard rock lobster stocks since recruitment failure was identified in the 2008/09 season and the start of the 2011/12 season. The rock lobster fishery basically functioned as a mining operation since recruitment failure occurred.

This state of affairs is particularly surprising since a statutory 5 year review of the fishery was carried out in 2010 and completed in 2011. It failed to develop any meaningful solutions to the problems facing this important fishery.

Exploitable biomass of rock lobster had approximately doubled from the lows experienced in the 1990's, but then since declined to levels similar to the all time lows observed before quota management was introduced.

The causes of recruitment failure are unclear, but may be related to climate change or other environmental factors. It is clear that the model used to manage the rock lobster fishery has failed to adequately take into account recruitment failure, and is based on two questionable assumptions:

1. that future recruitment will be at the average of the last 10 years,

2. that fishery productivity will not be significantly altered by urchin barren development and consequential destruction of productive habitat.

The first assumption is optimistic, and perhaps unrealistic given the rate of climate change. The second is wrong. Urchin barrens are steadily destroying reef habitat that is vital to both the rock lobster and abalone fisheries.

At a number of Crustacean FAC meetings, myself and other members have been informed that in some inshore reef areas, exploitable biomass is 5% or less than the estimated virgin biomass.

The destruction of reef habitat as a result of overfishing of large rock lobster and the resultant population explosion of *Centrostephanus rodgersii* sea urchins

appears to be progressing rapidly, although the lack of a recent formal survey makes a rigorous assessment difficult. Research has shown that some patches of urchin barrens have experienced a 60% increase over approximately 2 years (DPIPWE 2011a).

The urchin barren problem is probably the most important issue facing the rock lobster fishery. It is clearly the greatest threat that has faced Tasmania's marine environment since European colonisation. It is also likely that the best solution to this problem will involve managing the rock lobster fishery with the aim of getting sufficient numbers of large rock lobster (carapace length >140 mm) to control the urchins. This outcome would probably do much to solve other issues and particularly those associated overall stock decline.

Temporary area closures to allow reefs to recover are likely to be a cost effective part of the solution. Translocation of rock lobster may also be of assistance, and even a commercial harvest or culling program might be useful in limited areas. It is important to note that neither culling or a commercial harvest can have a significant impact on numbers of *Centrostephanus* urchins under current circumstances, and that OH&S and logistical practicalities mean that these controls will have no impact at all in deeper water.

No-take MPAs are needed as baseline reference areas to assess fishery impacts and distinguish between the effects of fishing and climate change.

Area management is an essential tool for managing localised/inshore fishing pressure and the remediation reefs. Variations in growth rates, size at maturity and fishing pressure means that standardising fishery management procedures across the State is inefficient and often inappropriate. Area-based management that is sensitive to biological factors and fishing pressure needs to be introduced. Bag limits, possession limits and size limits should be determined on a region by region basis, and access to these areas by both commercial and recreational fishers managed accordingly.

Area based management needs to be at a scale that is appropriate for dealing with issues. I suggest that it should be able to direct effort to either side of the 30 m depth contour and to within a 500 m of a point along the coast. It is to be expected that the fishery would generally be managed in much larger blocks but that fine scale management such as that will be needed to address some situations. If no better system can be developed, then the area management system used by the Tasmanian abalone fishery could be used as a model.

Directing fishing effort away from problem areas can be achieved by VMS on commercial vessels and by area specific tags for the recreational sector. If it is too difficult

Keeping large rock lobster in the population to manage urchin numbers will always be difficult in areas open to fishing. A maximum size limit should be applied immediately across the entire Tasmanian jurisdiction to keep as many large rock lobster on the reef as possible. While a maximum size limit will not solve the urchin problem by itself, it will consolidate any gains that are made. In addition, there is little known about the impact of *Centrostephanus* on deep reefs. It is clear that wave action in deeper water can not be relied upon to control urchin numbers, so a precautionary approach that keeps as many large rock lobster as possible in that habitat seems to be a sensible precautionary idea.

The most critical areas for rock lobster management are found along the east and southeast coastline. Such is the concern about the impacts of overfishing rock lobster and *Centrostephanus* urchin barrens, that at a recent forum (*Centrostephanus* Management Forum, 29 March 2011, Parliament House, Hobart) a representative of the abalone fishery suggested that one solution might be for the abalone industry to buy out rock lobster industry entitlements for the east coast for 10 years to let rock lobster populations recover.

The Tasmanian Abalone Council " ... *supports any fishery management measures that are likely to result in an increase in the population of large rock lobster in Tasmania's east coast including a reduction in the commercial fishery TAC, a decrease in the annual recreational catch and the establishment of an upper size limit of 160mm carapace length for rock lobster harvested between Eddystone Point in the north and Whale Head in the south*" (Tasmanian Abalone Council 2011).

The only solution for the east coast problem *Centrostephanus* urchin barrens that has so far been proposed with any chance of working is a complete closure of the fishery for between 5 and 10 years. Modelling has shown that this would boost the density of rock lobster large enough to successfully prey on *Centrostephanus* urchins to a level where there is likely to be a useful in a reasonable length of time.

If this were to occur, the overall TAC would have to be reduced by approximately 20% to prevent overfishing in the areas open to fishing.

As a general principle, delays in fisheries management adjustments can lead to reduced yield, increased probability of stock collapse and longer rebuilding times (Shertzer and Prager 2007). The longer the Tasmanian Government fails to take action on the issues facing the Tasmanian rock lobster fishery, the more difficult it will be to deal with these problems in the future.

In the Tasmanian rock lobster fishery The failure to take adequate steps when recruitment failure (and other problems) were first identified means that the problems have been exacerbated, and solutions will have to be more severe to achieve similar outcomes with regard to sustainability and protect marine habitats.

While it is difficult to develop guaranteed solutions to the many problems facing the Tasmanian rock lobster fishery, it is easy to see that the Tasmanian Government's current strategy will certainly lead to failure as these problems become worse. It is also clear that narrowly focussed research that looks at the management of a single species and ignores wider ecological impacts is not a satisfactory way to manage a fishery and certainly not a responsible way to manage Tasmania's marine environment.

If major changes are not made to the way the Tasmanian rock lobster fishery is managed, we can expect to see its ongoing decline and great damage done to the Tasmanian abalone fishery as well as the conversion of large productive reef areas into underwater wastelands in the very near future.

Research is fundamental to finding a solution to this problem. It is clear that in the case of the Tasmanian rock lobster fishery, research focussed on fishery issues has failed to identify and deal with major ecological impacts. Fishery management

needs to be based on good science, but it is not enough for Governments and funding bodies to support only research that industry wants. There is a need to support research that looks at wider issues as well.

Yours sincerely

Jon Bryan
Tasmanian Conservation Trust

Attachments

Attachment A: References

Attachment B: Photographs

Attachment A

References

Brewer M (2011) *Seafood Tasmania develops new use for marine pest,* **Fishing Today** 24(4): 10-11.

Bruce B, Griffin DA, and Bradford RW (2007) *Larval Transport and Recruitment Processes of Southern Rock Lobster*, FRDC Project No: 2002/007, CSIRO Marine and Atmospheric Research, Hobart ISBN 1-921061-01-4.

Costello C, Gaines SD and Lynham J (2008) *Can Catch Shares Prevent Fisheries Collapse?* **Science** 26: 1678-1681.

DPIPWE (2011a) *Report to the Minister on the draft management plan for the Tasmanian Rock Lobster fishery - August 2011*, Department of Primary Industries, Parks, Water and Environment, Hobart.

DPIPWE (2011b) *Information Paper on the Rock Lobster Fishery Draft Management Plan - April 2011*, Department of Primary Industries, Parks, Water and Environment, Hobart.

DPIPWE (2010) *Rock Lobster Management Plan Review Preliminary Proposals for New Management Measures for the Tasmanian Rock Lobster Fishery Discussion Paper - April 2010*, Department of Primary Industries, Parks, Water and Environment, Hobart.

DSEWPC (2011) Marine Protected Areas Department of Sustainability, Environment, Water, Population and Communities, Canberra, Downloaded from www.environment.gov.au/coasts/mpa/about/index.html.

Edyvane K (2003) *Conservation, Monitoring & Recovery of Threatened Giant Kelp (Macrocystis pyrifera) Beds in Tasmania – Final Report*, Report to Environment Australia (Marine Species Protection Program), Resource Management & Conservation Division Department of Primary Industries, Water & Environment.

Gardner C, Hartmann K and Hobday D (2011) *Tasmanian Rock Lobster Fishery 2009/10,* Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

Johnson C, Ling S, Ross J, Shepherd S and Miller K (2005) *Establishment of the long-spined sea urchin (Centrostephanus rodgersii) in Tasmania: First assessment of potential threats to fisheries*, FRDC Project No: 2001/044 Tasmanian Aquaculture and Fisheries Institute, University of Tasmania. School of Zoology ISBN 1-86295-286-8.

Lough JM (2009) Temperature. In *A Marine Climate Change Impacts and Adaptation Report Card for Australia 2009* (Eds. ES Poloczanska, AJ Hobday and AJ Richardson) NCCARF Publication 05/09 ISBN 978-1-921609-03-9.

Pecl G, Frusher S, Gardner C, Haward M, Hobday A, Jennings S, Nursey-Bray M, Punt A, Revill H, van Putten I (2009). *The east coast Tasmanian rock lobster fishery – vulnerability to climate change impacts and adaptation response options,* Report to the Department of Climate Change, Australia.

Reynolds JD (2002) *Handbook of fish biology and fisheries* Blackwell, Oxford, ISBN 0-632-06483-8.

Richardson AJ, McKinnon D, and Swadling KM (2009) Zooplankton. In *A Marine Climate Change Impacts and Adaptation Report Card for Australia 2009* (Eds. ES Poloczanska, AJ Hobday and AJ Richardson) NCCARF Publication 05/09 ISBN 978-1-921609-03-9.

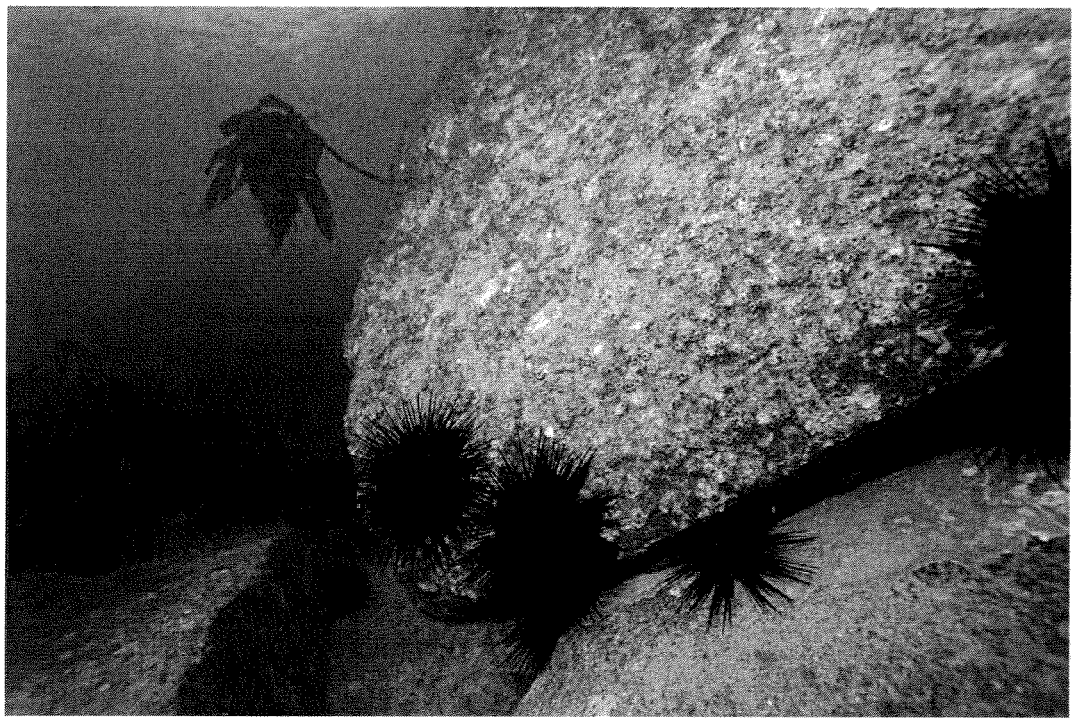
Shertzer KW and Prager MH (2007) *Delay in fishery management: diminished yield, longer rebuilding, and increased probability of stock collapse,* **ICES J Mar Sci** (2007) 64(1): 149-159.

Tasmanian Abalone Council (2011) *Submission on the Rock Lobster Fishery Draft Management Plan*, Tasmanian Abalone Council LTD, Hobart, Tasmania.

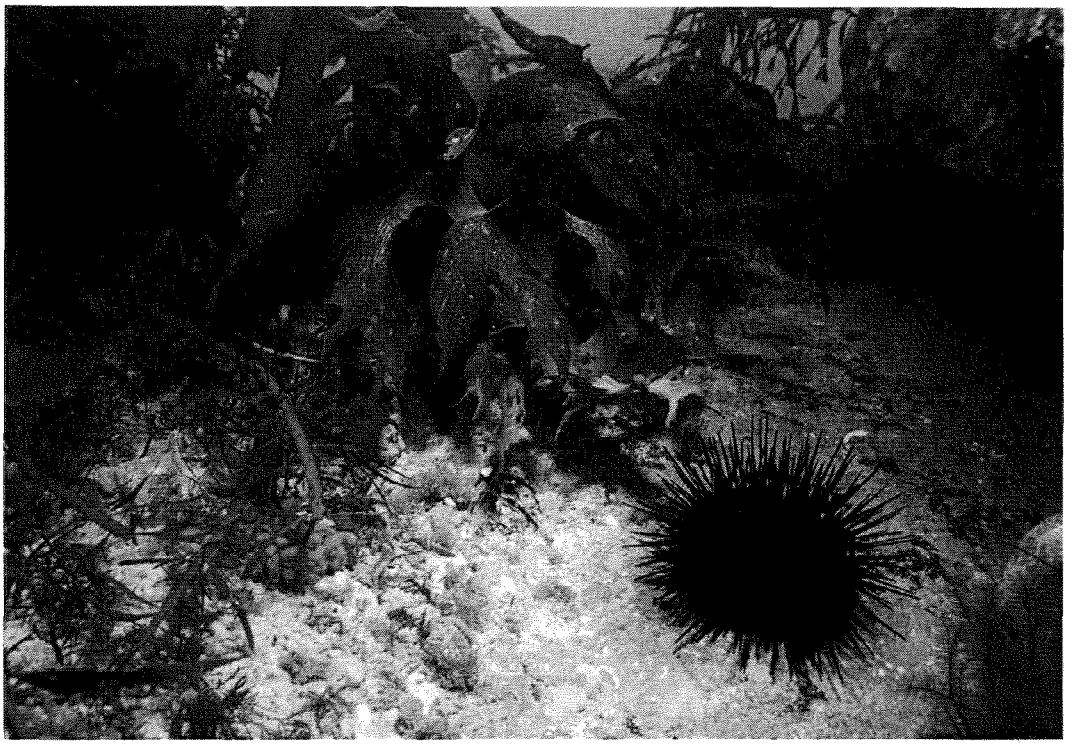
Attachment B

Photos

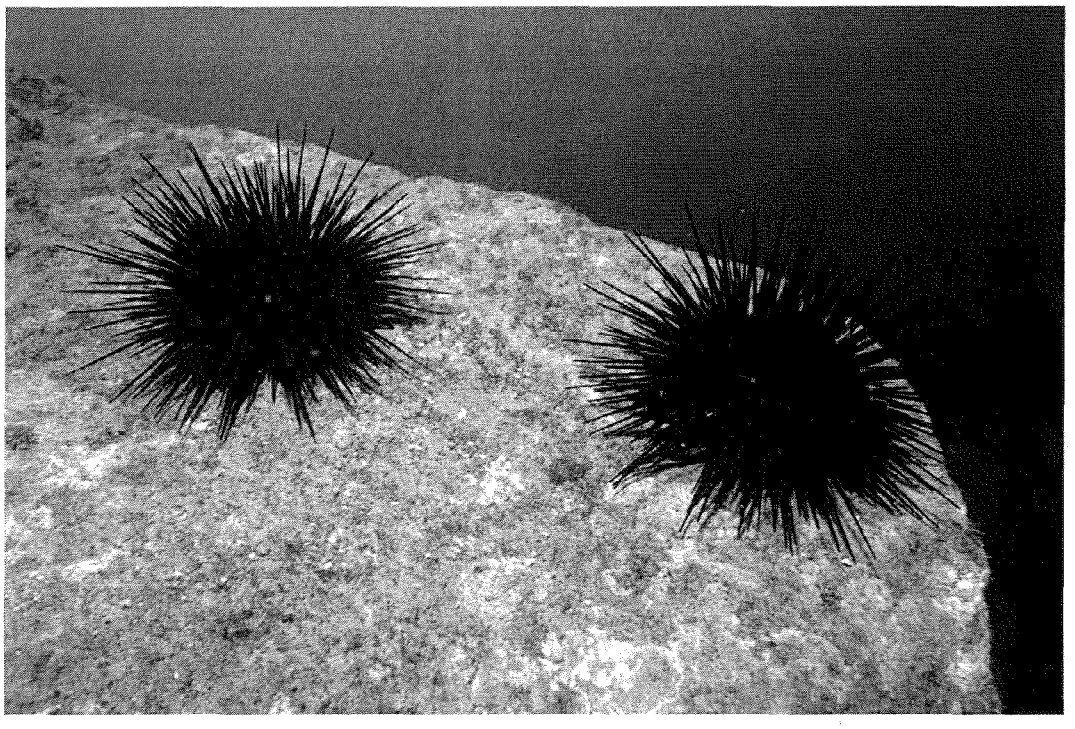
Still from video showing typical section of fully developed urchin barren just to the north of St Helens on Tasmania's east coast. Note complete lack of macroalgae that normally cover such shallow rocky reef areas.



Urchin barren with normal reef in background. This barren can be expected to extend further into the normal reef habitat.



Incipient urchin barren. Urchin grazing has just started to clear a patch of macroalgae on shallow reef. There must be thousands of these along the east and southeast coast and the numbers and size are increasing.



Detailed view of urchin barren. Urchin grazing has removed large macroalgae. Once urchin barrens do not support rock lobster or abalone to any useful extent and therefore exclude the rock lobster and abalone fisheries.

Typical shallow rocky reef with 100% of macroalgae.