

A management approach to the COTS question

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Abstract

Scientists and managers often view issues from different perspectives. Scientists as a group have traditionally wished to learn more about an issue for the sake of learning, for the sake of testing a hypothesis, for the sake of furthering their careers or for a combination of these reasons. While managers are also curiosity driven, they are usually required to focus their curiosity on those aspects of matters which are vital to the solution of management problems. From the manager's perspective, the fundamental question to be answered about the COTS phenomenon is whether or not it has been grossly affected by human activity. On the basis of the answer to that question, the manager will determine his response, particularly whether or not to interfere in the "natural" system or to refrain from interference. The logic of this position is discussed.

The Authority's policy on controlling COTS is not to interfere on a large scale unless it can be shown that outbreaks are caused or exacerbated by human activity. However local controls are initiated to protect sites of particular value to tourism or science. Every scientific review of this matter has supported our policy.

Many people adopt one of two fundamentally different explanations for why crown-of-thorns populations suddenly increase dramatically. One is that the phenomenon is entirely "natural". That is, it is not affected by human activity. The other is that it is entirely human-induced.

Of course, bearing in mind the pervasive effect that human activity is having on the world's biosphere, it is quite likely that the truth is a mixture of these two views, that is, that crown-of-thorns infestations are affected to some degree by human activity. We don't, however, know whether this is so, and if it is, whether human activity is contributing to the intensity, frequency or extent of the phenomenon positively or negatively.

The Authority recognises that long-term protection of the Reef ecosystem is the primary reason for the existence of the Authority and for everything that we do. Therefore we approach the crown-of-thorns issue from the perspective of risk.

We know that the animal is a natural inhabitant of the Reef and that it has been around for millenia. We know, therefore, that the Reef as we know and cherish it has developed in the presence of the starfish. That is not to say that there have always been recurrent population explosions, but there may have been.

The primary question is: should we undertake widespread and massive destruction of crown-of-thorns starfish whenever there is a primary outbreak?

What are the risks and benefits of non-interference? Clearly, an immediate benefit is the saving of an enormous amount of money. Experience has shown that it costs up to \$35 per starfish to kill large numbers of them using the best methods identified so far - copper sulphate injections (Johnson *et al.* 1990). Since there can be millions of starfish on a single reef, the people of Australia stand to save much more than the annual budget of the Authority by not embarking on massive starfish killing programs.

What are the risks? At the start of both recent starfish infestations we were told that, if the starfish numbers were not controlled, the entire GBR ecosystem would be at risk, with the possibility of a major phase-shift from a coral-dominated community to something else, with massive erosion of the existing reef structure and the adjacent mainland. In fact, thorough surveys have shown that in the last major wave of infestations starting in 1979 and evidently petering out now, only $17 \pm 4\%$ of all the 2900 or so reefs of the GBR were affected visibly by infestations and only about one third of these (ie. 6% of all of the GBR reefs) were seriously affected. It is hard to believe that permanent damage to the Reef ecosystem could be caused by an event of only this magnitude.

The conclusions from this last experience therefore are that very significant economic benefits accrued from the "non-interference" policy and that the risks from applying that policy were small.

What about the risks and benefits of applying a policy of massive starfish destruction programs? The benefits have to be conjectural because we cannot be sure that very large populations could be controlled. However I suppose we could assume that the number of reefs seriously affected by the starfish could have been reduced from the 6% that were so affected. But it's not so easy to argue that this is a benefit. Many people have conjectured that crown-of-thorns infestations might be beneficial to reefs in ways similar to the effect of bushfires on some Australian native forests. So perhaps there would have been no benefits.

There would have been great costs, however. Even if only Green Island Reef had been subject to starfish destruction action, the costs would have been many millions of dollars. Further, there is the possibility that our massive interference in what might be a natural element of the Great Barrier Reef system could have major unforeseen ecological effects. I would count such effects as costs because we value the Reef for what it is naturally, not for what human interference might make it. Further still, it is at least conceivable that such an action focussing on Green Island might have shortened the time for the next outbreak or have created a chronic elevated crown-of-thorns population state as has occurred in the Ryukyu Islands (Birkeland and Lucas 1990).

The conclusion is that the risks from adopting a policy of massive destruction of crown-of-thorns starfish are very significant and that the only potential benefits may turn out to be costs in the long run.

In contrast, no long-term risks to the whole GBR are identified in not interfering massively with infestations, unless they are much more extensive and intensive than the two that have been observed. In such a case, the Authority would definitely reconsider its policy. If, for instance, it appeared that 30% of all the reefs of the system were to be seriously affected, then I would be asking the Government for the resources to attempt population control.

This explains why the Authority has maintained the policy of not undertaking massive starfish killing programs. However, I should explain why we do encourage or cooperate in protecting small reef areas that are important for tourism or research. Again, the reasoning is based on benefits and costs. We can in such cases identify very clearly the economic benefits of protecting such reef areas. The costs are limited to the costs of killing comparatively few starfish. There is no risk that this small amount of human interference could have a significant unforeseen effect on the whole Reef ecosystem. So the benefits clearly outweigh the costs, both those that are identifiable and those that can be classified only in risk terms.

References

- Birkeland C and Lucas JS (1990)
Acanthaster planci: Major management problem of corals reefs.
CRC Press, Boca Raton, 257 pp.
- Johnson DB, Moran PJ and Driml S (1990)
Evaluation of a crown-of-thorns starfish (*Acanthaster planci*) control program at Grub Reef (central Great Barrier Reef).
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