Potential solution strategies to some sources of ocean noise

This page is a holding tank for ongoing and future work on solutions to various ocean noise sources. These strategies presented herein are food for thought only and do not represent any specific technology that is currently being specifically developed to address the ocean noise pollution problem.

Biomimicry

Many modern technologies have focused on output effectiveness without regard to input efficiencies. This has allowed great strides in our technological culture. We have been able to distribute vast quantities of goods around the globe; we can access gobs of information with just a few keystrokes; we have landed a man on the moon – and we have habituated to consume copious amounts of "stuff" without regard to where it really comes from, or where it ends up.

We have made these great strides because we have assumed that there was an infinite abundance of materials and energy available for us to exploit. We have lived as if our world was an open-loop system; that our objectives were supportable by the abundance of "resources," and that "waste" was only a downstream byproduct of our abundant life.

We are rapidly finding that this is not the case, and we need to modify our practices if our species is to survive. Fortunately many solutions exist to our mission which can be found in Nature. Nature is a closed-loop system, so all conversions and transfers of materials and energy are fully exploited. In nature there is no waste.

There are many places to look in nature to find efficient and effective solutions to our objectives.

Communication Technologies

One of the gravest threats to the ocean acoustic habitat is the development of high power mid frequency sonar – evident by coincident catastrophic marine mammal strandings. While these strandings are most associated with high-speed, very high power digital communication sonars used by the military, these same types of digital communication systems are increasingly being deployed in industrial and commercial applications as well – in autonomous vessels for research and work, as well as for underwater equipment control and navigation aids.

It is clear from the strandings that marine mammals are not biologically adapted to the sounds of these technologies.

Ocean Conservation Research is working on characterizing the sounds and impacts of modern sonar communication signals, under the assumption that if we can associate the impacts with the signal type, we can design communication signals that are more benign to the environment.

Some excellent candidates for benign communication signals can be found in nature. Various marine mammals use an array of sounds to navigate, communicate over long or short distances, echolocate to "see" their surroundings, intersect prey at high speeds, and avoid predation.

Many of our underwater operations have a similar array of purposes. If we adapt our technologies to the sounds that marine mammals have been using for millions of years, we might accomplish our missions using sounds that marine animals are biologically adapted to.

One candidate for mid frequency sonar communication might be the sounds of the beluga whale. Often called the "canaries of the sea:"

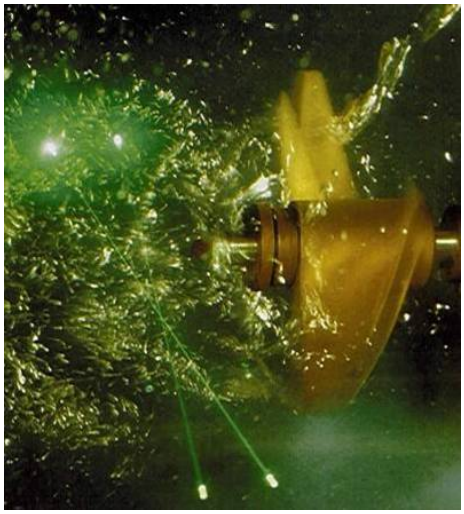
Their community vocalizations are data-rich and are in the frequency range of what is considered "mid-frequency sonar" (1kHz – 10kHz). We do know that these sounds played at biologically equivalent amplitudes would not harm the animals in their habitat, although we do not yet know if these signals would confound the belugas or mask their own vocalizations. We could assume that the sound might frighten the beluga's natural prey. The impacts of these possibilities need to be weighed against the impacts of the current technology.

A similar argument can, and has been made about Low Frequency Active Sonar – that it is analogous to mysticete vocalizations used for long distance communication and navigation. This may either prove harmless to these whales, or it may mask whale vocalizations.

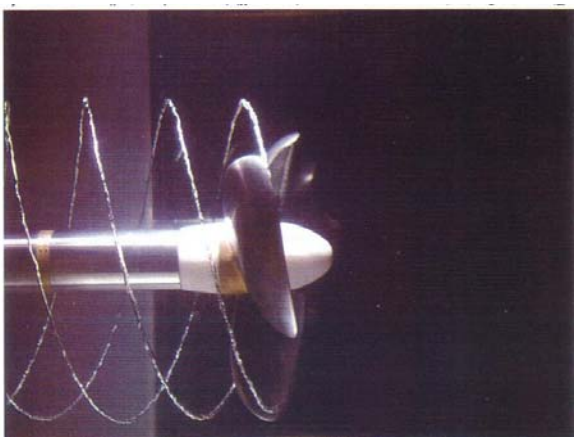
Vessel turbulence and propeller cavitation.

(see http://www.paxscientific.com)

The Pax Streamlining Principal ™ takes examples from natural fluid flow patterns and applies them to various applications. One line of development is in marine propellers.



Turbulence from a standard three blade propeller



Turbulence from a three blade Pax propeller.

This streamlining principal is also being developed for surfaces such as boat hulls. While these applications are being developed and applied to gain energy efficiencies, there is also a consequent decrease in mechanical noise with a decrease in turbulence.