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**THE NEWSLETTER OF THE FISHERIES CENTRE AT UBC**

# Killer whales and whale killers

*By Rob Williams*

Something primordial inhabits my field camp. I am not referring to primitive facilities, although our tarp-and-driftwood shacks are truly the stuff of a Martha Stewart nightmare. No, the magic of this site was surely evident before we arrived. Islands are like that: left alone, they develop unique characteristics. This island's charm lies in its ability to blur distinctions among the elements. Bioluminescence allows fire to live in water, if only for a moment. Thick, choking dust on the cliff can make the distinction between earth and air semantic. This place must have broken off before the four elements were born.

Perhaps that is what draws me back each year. A refuge for the urban-weary. A developing ground for the wilderness-wary. Hiking to my cliff-top observation post, I marvel at the cellulite skin of the forest. Spongy, lumpy, cedar loam cushions my steps, and muffles those of the cougars and bears that leave unmistakable signs that they are also using the trail that my crew and I built. Fortunately, I am nobody's Prey'

In fact, science can feel like hunting at times. Wending my way through the salal, I imagine that I am stalking my study animal. As I reach my cliff-top blind, I scan for my quarry: killer whales, and the boats that follow them. My task is to study how whales and whale-watchers get along. If this form of ecotourism is a modern-day whale hunt, then assessing the impact of human activity on the animals is the ultimate in politically-correct whaling.

In my lifetime, humans have reversed attitudes toward whales. Whalers once called grey whales devil

fish, referring to mothers' fierce defence of their calves. Now, friendly greys set whale-watching expectations. No encounter is deemed meaningful unless one can tickle the whale's chin. Killer whales, too, have launched a slick public relations campaign. Once more frightening than sharks, killer whales are now called orcas, and this has made them safe. But as fickle as this sea change was on the human side, the implications for whales were enormous. This shift in perception, a newfound willingness to view these togenic creatures as kin, forced us to switch ammunition. We never stopped shooting, but we replaced exploding harpoons with telephoto lenses.

Certainly, whales benefit immeasurably by the change in attitude that whale-watching has triggered. Whales and people both gain when urbanites glimpse wilderness. An interaction with a whale can forge a connection that some people hold as sacred. This bond prompts us to protect critical habitat, to adopt a whale; even to return to graduate school. I wonder what the encounter means to a whale?

So my crew and I sit on a cliff to watch the whale watchers. With us in our element, and the whales in theirs, we aim to allow the behaviour of the animals to tell us when boats are too close, too loud, too aggressive. Mostly, we wait. Armed with high-powered spotting scopes and surveying equipment, we wait for whales to come to the surface. A dorsal fin, unique as a fingerprint, marks the whale's emergence from its acoustic world into our visual one, and we fix our sights on its location. I line up the crosshairs of the theodolite on my cetacean target, and plot its location on the computer screen. If we hit the whale often enough, we learn how fast it is swimming, and how often it is breathing. We can see how the whale responds when we send in an experimental boat. And it occurs to me, as the locations are plotted, that the most important riddle I have been asked to solve resembles the very first ones we solved as children.

*(Continued on page 2 - Killer & leu)*

*Editor's Note This fall, the Fisheries Centre instituted an essay prize to encourage quality writing amongst graduate students. As part of the prize, the winning essays will be published in FishBytes. In this issue, the first prize essay is reproduced. Rob Williams is a graduate student at the Marine Mammal Research Unit, working under the supervision of Dr Andrew Trites. Rob is currently continuing his research in Antarctica, no doubt enjoying a balmy summer on the frozen continent. The second place essay, by Kristin Kaschner, will be published in the next issue of FishBytes.*

# Celebrating Fifty Years of Beverton and Holt

## By Tony Pitcher

A Special Issue of the quarterly journal, *Reviews in Fish Biology and Fisheries* (RFBF), the "Beverton and Holt Jubilee Issue", has just been published. The ten papers were assembled by one of the two regular RFBF editors, Tony Pitcher, and a Guest Editor, Daniel Pauly.

An introduction by the editors reviews the legacy of Ray Beverton and Sidney Holt's pioneering work, first published in 1947. In fact, papers by both Holt and Beverton are included among the nine contributions. Ray Beverton's paper was assembled from his speaking notes for the first Larkin Lecture at UBC in 1996, which was not delivered orally as he was too ill to come to Vancouver. Sadly Ray died later the same year. His widow, Kathy, says that he enjoyed working on the paper. Sidney Holt has also indicated his satisfaction with the special issue.

Beverton was optimistic while Holt is pessimistic, about the future of fisheries management. Both disavow that their intended legacy was yield-per-recruit analysis and both emphasise the analytical power of self-regenerating yield curves. Stimulated by the deceptive cover of the 1993 reprint of the Beverton and Holt bible, Tony Pitcher traces the development of the self-regenerating model, showing that it was far ahead of its time. One parameter expresses the amount of fishing that would cause local extinction, an issue that today divides the old and the new species of fisheries scientists.

Daniel Pauly describes how he modified Beverton and Holt's age-based theory to deal with tropical species that are difficult to age, in the process founding a length-based fisheries methodology that was approved of by the famous duo and, ironically, is today even applied to cold water species. Ray Hilborn and Martin Liermann, imagining themselves perched on

Beverton and Holt's shoulders, try to make parameter estimates in stock assessment transportable using Bayesian meta-analysis. Using such analysis of his large recruitment time series database, Ram Myers fails to find a link between recruitment volatility and environmental factors, except for species on the edge of their geographical range.

Beverton and Holt put forward a practical view of fisheries optimised through a synergy between science and management. Tim Smith contrasts their vision with the miserable track record, and diagnoses a failure to take account of human behaviour. Bill de la Mare describes a 'management-oriented paradigm' (MOP) system as the remedy, but warns that excessive reliance on quantifying uncertainty may lead to paralysis.

Sylvie Guenette, Tim Lauck and Colin Clark challenge Beverton and Holt's judgement that no-take areas don't help because of the diluting effect of fish movements and the mobility of fishing effort. This view has had much influence and is one reason why marine reserves have not been widely established in the face of repeated fishery disasters.

This is the first issue of RFBF produced by Kluwer Academic, who took over Chapman and Hall's journals last June. Apart from the cover grouper (*Epinephalus rufubufi*) losing part of a pelvic fin, all has gone reasonably well in the transfer of publication from London to Dordrecht. Bibliographic details of the papers in the Special Issue are available at Kluwer's web site [www.wkap.com](http://www.wkap.com), where subscribers may view the complete text.

### Reference.

Pitcher, T.J. & Pauly, D. (Eds) (1998) The Beverton and Holt Jubilee 1947-1997. Special Issue of *Reviews in Fish Biology and Fisheries* 8(3): 225-370, 145-~.

(Continued from page 1 - Killer whales)

Theodolite tracking the paths of boats and whales is a trigonometric, multivariate form of connect-the-dots.

My work has demonstrated that whales' paths become less predictable as boats approach. I do not know whether this subtle avoidance warrants changes to how boats ought to behave, nor if it helps to define respectful whale-watching. Maybe I have enjoyed the chase so much that I am afraid to end it. Perhaps I am hesitant to reduce the interpretation of the effect to a comparison of coefficients, because that model fails to incorporate delight as a variable. But as each day brings us closer to the impending Makah whale hunt and the commercial harvests that will follow, I am reminded of the fickle, changing relationship we have with whales. I wonder if other hunters will experience what this predator has given me, or if the joy disappears once the prey is consumed.

## Larkin Lecture

One last reminder regarding the Third Larkin Lecture, to be given by Dr Kevern Cochrane on Thursday, March 4, 1999 at 5:30 pm. The lecture will be held at UBC at the Woodward Instructional Resource Centre lecture hall 2. There will be an open forum with Dr Cochrane at the Fisheries Centre at 11:30 am on Friday, March 5.

For more information, visit the Centre's website, [www.fisheries.com](http://www.fisheries.com), or contact Gunna at (604) 822-0618, fax (604) 822-8934, email [event@fisheries.com](mailto:event@fisheries.com).

# The Galilean View of Aquatic Ecosystems

## By Tony Pitcher

Holding a conference in Florence is ambitious if you expect full attendance. When I wasn't wandering florentine streets in search of profound inspiration, last July I went to the 7th International Ecological Congress (INTECOL). One warm summer evening, steeply climbing a narrow lane on the south bank of the River Arno, and pausing for breath (the pasta! the pasta!), I looked up to find a solid, square Tuscan house, number 19 Costa di San Giorgio, bearing a plaque - "Galileo lived here". Galileo Galilei, 1564-1642, born and educated in Pisa, worked in Pisa, Florence and Padua, the powerhouses of the Renaissance, where he applied genius to gravity, acceleration, pendulums, clocks, light and telescopes, and used the essence of modern experimental science ("ordeals") to test his theories. His 1632 book "Dialogues concerning the two chief world systems.. ." which set out a painstaking and unanswerable mathematical case that our planet revolves around the sun, led directly to Galileo's house arrest by the Inquisition and a Papal decree that the Copernican view was only a "mathematical supposition".



Title page of Galileo's 1632 book "Dialogues."

Has our Director finally gone travel crazy? What's all this got to do with fisheries? Well - the answer is in the math. In an earlier book, dedicated in 1623 to Pope Urban, who received that one enthusiastically, Galileo wrote "The book of Nature is written in mathematical characters". Ecologists faced by ecosystems have been a bit like pre-Copernican astronomers trying to understand planetary orbits, overwhelmed by complexity, diversity and uniqueness. In fact, all aquatic ecosystems share common features that can be expressed mathematically. The Ecopath system of equations is the Galilean view of aquatic ecosystems. Of course, our many critics say, the concept of mass-balance is only a mathematical supposition.

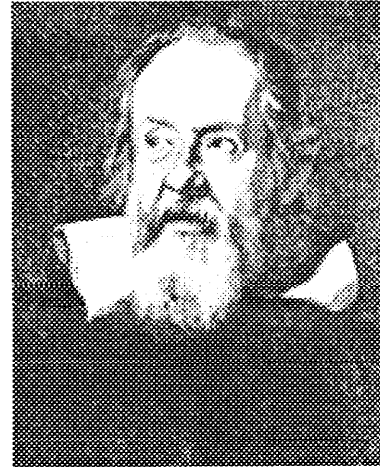
Jane Lubchenko from Oregon gave a plenary address at INTECOL that reminded me of the overriding power of mathematical expression when applied to problems in the natural world, as exemplified by Galileo's work. (Why do today's mathematicians not study such things?). Lubchenko reviewed quantitative

work on ecosystems that dispels three modern myths: that nature is infinitely resilient; that humans are not part of natural ecosystems and that humans will always circumvent limits with new technology. She recommends a goods and services approach to ecosystems. For example, Costanza and his co-workers (1997) estimate the global value of ecosystems at \$33 trillion, of which 63% is marine, mainly from services like nutrient recycling and refugia. In coastal waters, fishing (the goods) produces less than 5% of the economic value, yet fisheries sequester 33% of all algal cells (Pauly & Christensen 1995), and induce ratchet-like shifts that deplete biodiversity and resilience (the subject of my own INTECOL paper).

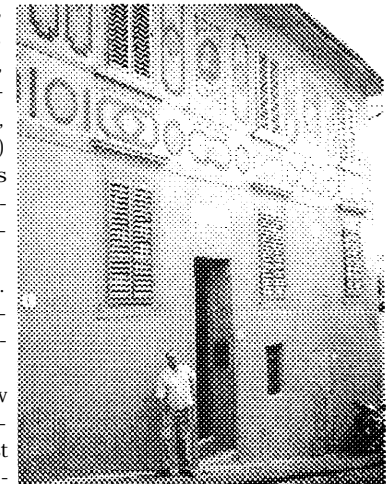
But these findings are controversial, ecological economics and ecosystem science are in their infancy, and, to make an unanswerable case, lots of painstaking work and powerful mathematical tools are needed. Galileo (before Newton) invented calculus to help solve his problems. Where do we go next? Down the hall, our graduate students are painstakingly building ecosystem models and playing with fuzzy logic. Watch this space.

### References:

- Costanza, R., d'Arge, R., de Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., Naeem, S., O'Neill, R.V., Paruelo, J., Raskin, R.G., Sutton, P. and van den Belt, M. (1997) The value of the world's ecosystem services and natural capital. *Nature* 387: 253-260.
- Pauly, D., and Christensen, V. (1995) Primary Production required to sustain global fisheries. *Nature* 374: 255-25.
- Pitcher, T.J. Rebuilding as a New Goal for Fisheries Management: Reconstructing the Past to Salvage the Future. Presented at INTECOL, 1998, and submitted.

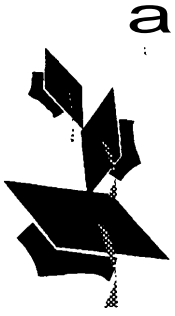


Galileo had to stay home in 1637, and got painted by Sostermans



Author taking rest on hill outside Galileo's house (Photo V. Pitcher)

## News and Notes



**a** **Congratulations to Hreidar Valtysson**, who successfully defended his MSc thesis in December. In his thesis, "An Assessment of Icelandic Flatfish Stocks", Hreidar presented a multi-species, multispatial assessment of megrim, witch flounder, American plaice, dab, lemon sole and plaice in Icelandic waters. At UBC, Hreidar was registered in Zoology and was supervised by Carl Walters. Hreidar has returned to Iceland, where he is working as a fishery biologist at the Marine Research Institute ([www.hafro.is](http://www.hafro.is)) and at the University of Akureyi ([www.unak.is](http://www.unak.is)).

**Congratulations to Johanne Dalsgaard**, who successfully defended her MSc thesis in January. Johanne's thesis, "Modelling the trophic transfer of beta radioactivity in the marine food web of Enewetak Atoll, Micronesia", used Ecopath to model the flow of radioisotopes in the marine food web of Atoll. A student of Daniel Pauly, Johanne was registered with Resource Management and Environmental Studies, and was recently named Best Young Scientist at the 1998 ICES Annual Science Conference in Portugal (see FiskBytes 4(6)). Johanne is returning to her native Denmark for a well-earned holiday.

### Conference Calls

A reminder of the **ICES/SCOR Symposium: "The Ecosystem Effects of Fishing"**, March 16-19, 1999, in Montpellier, France. For more information, contact one of the co-conveners: Mike Sinclair ([sinclairm@snar.dfo-mpo.gc.ca](mailto:sinclairm@snar.dfo-mpo.gc.ca)) and Henrick Gislason ([hg@dfu.min.dk](mailto:hg@dfu.min.dk)).

**Evaluating the Benefits of Recreational Fishing** - to be held June 1-4, 1999, organised by the Fisheries Centre and to be held at the University of British Columbia Conference Centre. Topics will include ecological benefits, sociological benefits, and legal and policy aspects. For more information, contact Gunna Weingartner, Events Officer, UBC Fisheries Centre, 2204 Main Mall, Vancouver, BC, V6T 1Z4, [event@fisheries.com](mailto:event@fisheries.com).

**Pandalid Shrimp Fisheries: Science and Management at the Millennium** - to be held September 8-10, 1999, in Halifax. The Symposium is hosted by the Scientific Council of the Northwest Atlantic Fisheries Organisation (NAFO) and co-sponsored by NAFO, The International Council for the Exploration of the Sea (ICES) and the North Pacific Marine Science Organisation (PICES). The Symposium will be co-convened by P. Koeller (NAFO), S. Tveite (ICES) and J. Boutillier (PICES), and organised by the NAFO Secretariat. For more information contact P. Koeller (902) 426-5379; [koellerp@mar.dfo-mpo.gc.ca](mailto:koellerp@mar.dfo-mpo.gc.ca) or visit the symposium web site at <http://www.mar.dfo-mpo.gc.ca/shrimp/>.

**Fourth International Symposium on Flatfish Ecology** - to be held October 18-23, 1999 in Atlantic Beach, North Carolina, USA. Topics will include hydrodynamics, trophodynamics, habitat quality, evolutionary biology and systematics and recruitment and management perspectives. Registration will be limited. Contact Susan Marchalk, Flatfish Symposium, North Carolina State University Zoology Department, Box 76 17, Raleigh, NC 27695-7617, USA, phone (919) 515-2741, fax (919) 515-527, email [flatfish@ncsu.edu](mailto:flatfish@ncsu.edu).

**17th Lowell Wakefield Symposium: Spatial Processes and Management of Fish Populations** - to be held October 27-30, 1999, in Anchorage, Alaska, USA. Abstracts are due February 15, 1999. For more information, contact Brenda Baxter, Coordinator, Alaska Sea Grant College Program, University of Alaska Fairbanks, PO Box 755040, Fairbanks, Alaska, USA, 99775-5040, phone (907) 474-6701, fax (907) 474-6285, [www.uaf.edu/seagrant/Conferences/symposia.html](http://www.uaf.edu/seagrant/Conferences/symposia.html).

**FishBytes** is the newsletter of the Fisheries Centre at the University of British Columbia. Contributions and queries should be sent to Melanie Power, Fishbytes Editor, Fisheries Centre, 2204 Main Mall, UBC, Vancouver, BC, Canada, V6T 1Z4, or by email to [melanie@fisheries.com](mailto:melanie@fisheries.com).

Be sure to visit the Fisheries Centre's website, [www.fisheries.com](http://www.fisheries.com), and follow the links

