

# CURRICULUM VITAE

## Ray William Hilborn

### Date of Birth

December 31, 1947

### Education

B.A. (Biology) Grinnell College, Grinnell, Iowa (1969)

Ph.D. Department of Zoology, University of British Columbia (1974)

### Employment History

2001-present	Richard C. and Lois M. Worthington Professor of Fisheries Management
1987-present	Professor, School of Aquatic and Fishery Sciences, University of Washington.
1996-1998	Director, Fisheries Research Institute, University of Washington
1985-1987	Senior Fisheries Scientist, Tuna and Billfish Program, South Pacific Commission, Noumea, New Caledonia
1980-1985	Adjunct Associate Professor, Institute of Animal Resource Ecology, University of British Columbia.
1975-1980	Policy Analyst, Departments of Environment and Fisheries, Government of Canada. Concurrently Honorary Lecturer, Institute of Animal Resource Ecology, University of British Columbia.
1974-1975	Research Scholar. International Institute for Applied Systems Analysis, Laxenburg, Austria.

### Major Professional Activities

2002 - present	Member Editorial Board, Canadian Journal of Fisheries and Aquatic Sciences
2003 – present	Member Editorial Board, New Zealand Journal of Marine and Freshwater Research
1999-present	Member Editorial Board, Fish and Fisheries.
1993-present	Member Editorial Board, Reviews in Fish Biology and Fisheries
1993-present	Member Editorial Board, Natural Resource Modeling.
1999-present	Independent Science Advisor, Commission for Conservation of Southern Bluefin Tuna

2002 – 2003	Chair, National Academy of Sciences/National Research Council Committee on Cooperative Research in the National Marine Fisheries Service
2002 - 2004	Member Scientific Advisory Board for Presidents Commission on Ocean Policy
1999-2001	Member Ocean Studies Board, National Research Council
1996-2000	Member International Committee for recovery of the vaquita ( <i>Phocoena sinus</i> )
1997-1998	Member National Academy of Sciences Panel on status of New England groundfish stocks.
1997-1999	Member NMFS panel to review fisheries closures to protect Steller's Sea Lions
1996-1997	Member National Academy of Sciences Panel on Fisheries Stock Assessment Methods
1989-1994	American co-chairman: Pacific Salmon Commission working group on mark-recovery statistics.
1988-1990	Editor for Fisheries, Marine Policy Reports.

### **Honors and Awards**

2005	Elected Fellow of Royal Society of Canada
2005	Recipient of American Fisheries Society 2005 National Award of Excellence
2005	Recipient of Western Division, American Fisheries Society, Award of Excellence
2001-2006	Richard C. and Lois M. Worthington Professor of Fisheries Management
1997	College of Ocean and Fisheries Sciences Distinguished Research Award
1988-1991	H. Mason Keeler Professor of Recreational Fisheries Management.
1985	Stevenson Memorial Lecture, Canadian Conference for Fisheries Research.
1976	Wildlife Society award for best paper in fisheries science. (Adaptive management of renewable resources with C. Walters).
1972-1974	National Research Council Canada. Graduate Fellowship.

### **Books and Monographs**

Punt, A. and R. Hilborn. 2002. Bayesian stock assessment methods in fisheries. FAO Computerized Information Series (Fisheries) No. 12. 56 p.

- Hilborn, R. and M. Mangel. 1997. *The Ecological Detective: confronting models with data*. Princeton University Press, Princeton, N.J. 315 pps.
- Punt, A.E. and R. Hilborn. 1996. *Biomass dynamics models*. FAO Computerized Information Series (Fisheries). No. 10. Rome, FAO. 62p.
- Hilborn, R. and C. J. Walters. 1992. *Quantitative Fisheries Stock Assessment: Choice, Dynamics and Uncertainty*. Chapman and Hall, New York. 570 p. Also available in Russian.
- Bazykin, A., P. Bunnell, W.C. Clark, G.C. Gallopin, J. Gross, R. Hilborn, C.S. Holling, D.D. Jones, R.M. Peterman, J.E. Rabinovich, J.H. Steele, and C.J. Walters. 1978. *Adaptive Environmental Assessment and Management*. John Wiley and Sons, New York. 375 pps.

### **Publications in refereed journals**

- Hobbs, N.T. and R. Hilborn. 2006. Alternatives to statistical hypothesis testing in ecology: a guide to self teaching. *Ecological Applications* 16: 5-19.
- Hilborn, R. Micheli, F. and DeLeo, G. 2006. Integrating Marine Protected Areas with catch regulation. *Canadian Journal of Fisheries and Aquatic Sciences*. 63: 642-649.
- Grafton, R.Q., Arnason, R., Bjørndal, T., Campbell, D., Campbell, H.F., Clark, C.W., Connor, R., Dupont, D.P., Hannesson, R., Hilborn, R., Kirkley, J.E., Kompas, T., Lane, D.E., Munro, G.R., Pascoe, S., Squires, D., Steinshamn, S.I., Turriss, B.R., Weninger, Q. 2006. Incentive-based approaches to sustainable fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*. 63: 699-710.
- Hodgson, S., Quinn, T.P. Hilborn, R., Francis, R.C. and D.E. Rogers. 2006. Marine and freshwater climatic factors affecting interannual variation in the timing of return migration to fresh water of sockeye salmon (*Oncorhynchus nerka*). *Fisheries Oceanography* 14:4 1-24.
- Hilborn, R., J. K. Parrish, K. Litle 2005. Fishing Rights or Fishing Wrongs? *Reviews in Fish Biology and Fisheries* 15, 191-198.
- Walters, C. J., and Hilborn, R. 2005. Exploratory assessment of historical recruitment patterns using relative abundance and catch data. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 1985-1990.
- de Valpine, P. and R. Hilborn. 2005. State-space likelihoods for nonlinear fisheries time-series. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 1937-1952.
- Hyun, S-Y, Hilborn, R. Anderson J. and Ernst, B. 2005. A statistical model for in-season forecasts of sockeye salmon (*Oncorhynchus nerka*) returns to the Bristol Bay districts of Alaska. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 1665-1680.
- Branch, T. A., Hilborn, R., and Bogazzi, E. 2005. Escaping the tyranny of the grid: a more realistic way of defining fishing opportunities. *Canadian Journal of Fisheries and Aquatic Sciences* 62: 631-642.

- Sharma, R., Cooper, A. and R. Hilborn. 2005. A quantitative framework for the analysis of habitat and hatchery practices on Pacific salmon. *Ecological Modelling*. 183: 231-250.
- Hilborn, R., J. M. Orensanz, and A. M. Parma. 2005. Institutions, incentives and the future of fisheries. *Philosophical Transactions of the Royal Society of London Series B-Biological Sciences*, 360:47-57.
- Hilborn, R. 2005. Fisheries management. *Issues in Science and Technology*, 21:10-11.
- Packer, C., Hilborn, R., Mosser, A., Kissui, B., Borner, M., Hopcraft, G., Wilmshurst, J., Mduma, S. and Sinclair, A R E. 2005. Ecological Change, Group Territoriality, and Population Dynamics in Serengeti Lions. *Science* 307: 390-393
- Valero, J., C. Hand, J.M. Orensanz, A. M. Parma, D.Armstrong, R. Hilborn. 2004. Geoduck (*Panopea abrupta*) recruitment trends in the Pacific northwest: long-term changes in relation to climate. *California Cooperative Oceanic Fisheries Investigations Report* 45: 80-86.
- Boatright, C., T. Quinn, and R. Hilborn. 2004. Timing of adult migration and stock structure for sockeye salmon in Bear Lake, Alaska. *Transactions of the American Fisheries Society*, 133:911-921.
- Orensanz, J. M., C. M. Hand, A. M. Parma, J. Valero, and R. Hilborn. 2004. Precaution in the harvest of Methuselah's clams — the difficulty of getting timely feedback from slowpaced dynamics. *Can. J. Fish. Aquat. Sci.* 61: 1355-1372.
- Hilborn, R., Punt, A.E., Orensanz, J. 2004. Beyond band-aids in fisheries management: fixing world fisheries. *Bulletin of Marine Science* 74(3): 493-507.
- Hilborn, R., Stokes, K. Maguire, J.J., Smith, A.D.M., Botsford, L.W., Mangel, M., Orensanz, J., Parma, A., Rice, J., Bell, J., Cochrane, K.L., Garcia, S., Hall, S.J., Kirkwood, G.P., Sainsbury, K., Stefansson, G., Walters, C. J. 2004. When can marine reserves improve fisheries management? *Ocean and Coastal Management*. 47/3-4 pp. 197-205.
- Hilborn, R. 2004. Ecosystem-based fisheries management: the carrot or the stick? *Marine Ecology-Progress Series*, 274:275-278.
- Flynn, L. and R. Hilborn. 2004. Test fishery indices for sockeye salmon (*Oncorhynchus nerka*) as affected by age composition and environmental variables. *Canadian Journal of Fisheries and Aquatic Sciences* 61: 80-92
- Gende, S.M., Quinn, T.P., Hilborn, R., Hendry A.P. and Dickerson, B. 2004. Brown bears selectively kill salmon with higher energy content but only in habitats that facilitate choice. *Oikos*. 104: 518-528.
- Norse, E. A., C. B. Grimes, S. Ralston, R. Hilborn, J. C. Castilla, S. R. Palumbi, D. Fraser, and P. Kareiva. 2003. Marine reserves: the best option for our oceans? *Frontiers in Ecology and Environment*. 1: 495-502.
- Hilborn, R., T.A. Branch, B. Ernst, A Magnusson, C.V. Minte-Vera, M.D. Scheuerell, and J.L. Valero. 2003. State of the world's fisheries. *Annual Review of Environment and Resources* 28: 359-399.

- Magnusson, A. and R. Hilborn. 2003. Estuarine influence on survival rates of coho (*Oncorhynchus kisutch*) and chinook salmon (*Oncorhynchus tshawytscha*) released from hatcheries on the U.S. Pacific coast. *Estuaries* 26: 1094-1103.
- Butterworth, D.S., J.N. Ianelli, R. Hilborn. 2003. A statistical model for stock assessment of southern bluefin tuna with temporal changes in selectivity. *South African Journal of Marine Science* 25: 331-361.
- Cooper, Andrew B., Hilborn, Ray, Unsworth, James W. 2003: An approach for population assessment in the absence of abundance indices. *Ecological Applications*: Vol. 13, No. 3, pp. 814–828
- Barrowman, Nicholas J., Myers, Ransom A., Hilborn, Ray, Kehler, Daniel G., Field, Chris A. 2003: The variability among populations of coho salmon in the maximum reproductive rate and depensation.. *Ecological Applications*: Vol. 13, No. 3, pp. 784–793.
- Flynn, L., R. Hilborn and A.E. Punt. 2003. Identifying the spatial distribution of stocks of migrating adult sockeye salmon using age composition data. *Alaska Fishery Research Bulletin* 10: 50-60.
- Stewart, I.J. R. Hilborn and T.P. Quinn. 2003. Coherence of observed adult sockeye salmon abundance within and among spawning habitats in the Kvichak River watershed. *Alaska Fishery Research Bulletin* 10: 28-41.
- Hilborn, R. 2003. The state of the art in stock assessment: where we are and where we are going. *Scientia Marina* 67 (supplement 1): 15-20.
- Breen, P.A., R. Hilborn, M. Maunder, S. Kim. 2003. Comparing alternative harvest rules to minimise the effects of squid fishery bycatch on Hooker's sea lions (*Phocarctos hookeri*) in New Zealand. *Canadian Journal of Fisheries and Aquatic Sciences* 60: 527:541.
- Hilborn, R., T.P. Quinn, D.E. Schindler and D.E. Rogers. 2003. Biocomplexity and fisheries sustainability. *Proceedings of the National Academy of Sciences*. 100: 6564-6568.
- Cooper, A. B., J. C. Pinheiro, J.W. Unsworth and R. Hilborn. 2002. Predicting hunter success rates from elk and hunter abundance, season structure, and habitat. *Wildlife Society Bulletin* 30: 1068-1077.
- Hilborn, R. 2002. The Dark Side of Reference Points. *Bulletin of Marine Science*. 70: 403-408
- Myers, R.A., N.J. Barrowman, R. Hilborn and D.G. Kehler. 2002. Inferring Bayesian priors with limited direct data: applications to risk analysis. *North American Journal of Fisheries Management* 22: 351-364.
- Hilborn, R. 2002. Marine reserves and fisheries management. *Science* 295: 1233-1234.
- Hilborn, R., A. Parma and M. Maunder. 2002. Exploitation rate reference points for west coast rockfish: are they robust and are there better alternatives. *North American Journal of Fisheries Management* 22: 365-375.
- Schindler, D., T.E. Essington, J.F. Kitchell, C. Boggs and R. Hilborn. 2002. Sharks and tunas: fisheries impacts on predators with contrasting life histories. *Ecological Applications* 12: 735-748.

- Essington, T.E., J.F. Kitchell, C. Boggs, D.E. Schindler, R.J. Olson and R. Hilborn. 2002. Alternative fisheries and the predation rate of yellowfin tuna in the eastern Pacific Ocean. *Ecological Applications* 12: 724-734.
- Rose, K.A., J.H. Cowan Jr., K.O. Winemiller, R.A. Myers and R. Hilborn. 2001. Compensatory density dependence in fish populations: importance, controversy, understanding and prognosis. *Fish and Fisheries* 2: 293-327.
- Sharma, R. and R. Hilborn. 2001. Empirical relationships between watershed characteristics and coho salmon (*Oncorhynchus kisutch*) smolt abundance in 14 western Washington streams. *Canadian Journal of Fisheries and Aquatic Sciences* 58:1453-1463.
- Gerber, L.R. and R. Hilborn. 2001. Catastrophic events and recovery from low densities in populations of otariids: implication for risk of extinction. *Mammal Review* 11: 131-150.
- Hilborn, R. and D. Eggers. 2001. A review of the hatchery programs for pink salmon in Prince William Sound and Kodiak Island, Alaska: response to comment. *Transactions of the American Fisheries Society* 130: 720-724.
- Liermann, M. and R. Hilborn. 2001. Depensation, evidence, models and implications. *Fish and Fisheries* 2: 33-58.
- Hilborn, R. 2001. Calculation of biomass trend, exploitation rate and surplus production from survey and catch data. *Canadian Journal of Fisheries and Aquatic Sciences* 58: 579-584.
- Hilborn, R., J.J. Maguire, A. M. Parma, and A. A. Rosenberg. 2001. The precautionary approach and risk management: can they increase the probability of success in fisheries management. *Canadian Journal of Fisheries and Aquatic Sciences*. 58:99-107
- Hilborn, R. and D. Eggers. 2000. A review of the hatchery programs for pink salmon in Prince William Sound and Kodiak Island, Alaska. *Transactions of the American Fisheries Society* 129: 333-350.
- Hamon, T.R., C.J. Foote, R. Hilborn and D.E. Rogers. 2000. Selection on morphology of spawning wild salmon by a gill-net fishery. *Transactions of the American Fisheries Society* 129: 1300-1315.
- Maunder, M., Starr, P.J. and R. Hilborn. 2000. A Bayesian analysis to estimate loss in squid catch due to the implementation of a sea lion population management plan. *Marine Mammal Science*: 16: 413-426.
- Mduma, S. Sinclair, A.R.E. and R. Hilborn. 1999. Food regulates the Serengeti wildebeest: a forty-year record. *Journal of Animal Ecology* 68: 1101-1122.
- Hilborn, R., B.G. Bue, and S. Sharr. 1999. Estimating spawning escapements from periodic counts: a comparison of methods. *Canadian Journal of Fisheries and Aquatic Sciences* 56:888-896.
- Hilborn, R. 1999. Confessions of a reformed hatchery basher. *Fisheries* 24: 30-31.
- Hilborn, R. and M. Liermann. 1998. Standing on the shoulders of giants: learning from experience. *Reviews in Fish Biology and Fisheries* 8: 273-283

- Coronado, C. and R. Hilborn. 1998. Spatial and temporal factors affecting survival in coho salmon (*Oncorhynchus kisutch*) in the Pacific Northwest. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 2067-2077.
- Hilborn, R. 1998. The economic performance of marine stock enhancement projects. *Bulletin of Marine Science* 62: 661-674
- Coronado, C. and R. Hilborn. 1998. Spatial and temporal factors affecting survival in coho and fall chinook salmon in the Pacific northwest. *Bulletin of Marine Science* 62: 409-425.
- Orensanz, J.M., J. Armstrong, D. Armstrong and R. Hilborn. 1998. Crustacean resources are vulnerable to serial depletion – the multifaceted declines of crab and shrimp fisheries in the Greater Gulf of Alaska. *Reviews in Fish Biology and Fisheries* 8: 117-176
- Starr, P., J.H. Annala and R. Hilborn. 1998. Contested stock assessment: two case studies. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 529-537.
- Prince J. and R. Hilborn. 1998. Concentration profiles and invertebrate fisheries management. *Canadian Special Publication of Fisheries and Aquatic Sciences*. 125: 187-196.
- Hilborn, R. 1997. Statistical hypothesis testing and decision theory in fisheries science. *Fisheries* 22 (10): 19-20
- Pascual, M.A., P. Kareiva and R. Hilborn. 1997. The influence of model structure on conclusions about the viability and harvesting of Serengeti wildebeest. *Conservation Biology*: 11: 966-976.
- Starr, P.J., Breen, P.A., Hilborn, R. and T.H. Kendrick. 1997. Evaluation of a management decision rule for a New Zealand rock lobster substock. *Mar. Freshwater Res.*, 48: 1093-1101.
- Hilborn, R. 1997. Lobster stock assessment: report from a workshop; II. *Mar. Freshwater Res.*, 48: 945-947
- Liermann, M. and R. Hilborn. 1997. Depensation in fish stocks: a hierarchic Bayesian meta-analysis. *Canadian Journal of Fisheries and Aquatic Sciences* 54: 1976-1984.
- Fogarty, M.J., Hilborn, R. and D. Gunderson. 1997. Chaos and parametric management. *Marine Policy* 21: 187-194.
- Punt, A.E. and R. Hilborn. 1997. Fisheries stock assessment and decision analysis: the Bayesian approach. *Reviews in Fish Biology and Fisheries*. 7: 35-63.
- Hilborn, R. 1997. Recruitment paradigms for fish stocks. *Canadian Journal of Fisheries and Aquatic Sciences* 54: 984-985
- Hilborn, R. 1996. Risk analysis in fisheries and natural resource management. *Human Ecology and Risk Assessment* 2: 655-659.
- Hilborn, R. 1996. Do principles for conservation help managers? *Ecological Applications* 6:364-365.
- Hilborn, R. and D. Gunderson. 1996. Chaos and paradigms for fisheries management. *Marine Policy* 20: 87-89.

- Hilborn, R., C.J. Walters and D. Ludwig. 1995. Sustainable exploitation of renewable resources. *Annual Review of Ecology and Systematics* 26: 45-67.
- Pascual, M. A., and R. Hilborn. 1995. Conservation of harvested populations in fluctuating environments: the case of the Serengeti wildebeest. *Journal of Applied Ecology* 32: 468-480.
- McAllister, M.M, E.K. Pikitch, A.E. Punt and R. Hilborn. 1994. A Bayesian approach to stock assessment and harvest decisions using the sampling/importance resampling algorithm. *Canadian Journal of Fisheries and Aquatic Sciences* 51: 2673-2687.
- Anganuzzi, A., R. Hilborn and J. R. Skalski. 1994. Estimation of size selectivity and movement rates from mark-recapture data. *Canadian Journal of Fisheries and Aquatic Sciences* 51: 734-742
- Punt, A.E. and R. Hilborn. 1994. A comparison of fishery models with and without cannibalism with implications for the management of the Cape hake resource off southern Africa. *ICES Journal of Marine Science* 51: 19-29
- Winton, J. and R. Hilborn. 1994. Lessons from supplementation of chinook salmon in British Columbia. *North American Journal of Fisheries Management* 14:1-13
- Hilborn, R., E. K. Pikitch, and M. K. McAllister. 1994. A Bayesian estimation and decision analysis for an age-structured model using biomass survey data. *Fisheries Research* 19: 17-30
- Schnute, J. T. and R. Hilborn. 1993. Analysis of contradictory data sources in fish stock assessment. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 1916-1923
- Polacheck, T., R. Hilborn and A. E. Punt. 1993. Fitting surplus production models: comparing methods and measuring uncertainty. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 2597-2607.
- Hilborn, R. and J. Winton. 1993. Learning to enhance salmon production: lessons from the salmonid enhancement program. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 2043-2056
- Hilborn, R. and D. Ludwig. 1993. The limits of applied ecological research. *Ecological Applications* 3: 550-552
- Ludwig, D., R. Hilborn, and C. Walters. 1993. Uncertainty, resource exploitation, and conservation: lessons from history. *Science* 260: 17/ 36.
- Hilborn, R., E. K. Pikitch, M. K. McAllister, and A. E. Punt. 1993. Use of Risk Analysis to Assess Fishery Management Strategies - a Case-Study Using Orange Roughy (*Hoplostethus-Atlanticus*) on the Chatham Rise, New-Zealand - Comment. *Canadian Journal of Fisheries and Aquatic Sciences*, 50:1122-1125.
- Hilborn, R., E.K. Pikitch, and R.C. Francis. 1993. Current trends in including risk and uncertainty in stock assessment and harvest decisions. *Can. J. Fish. Aquat. Sci.* 50: 874-880.
- Hilborn, R. 1992. Current and future trends in fisheries stock assessment and management. *South African Journal of Marine Science* 12: 975-988.

- Hilborn, R. 1992. Can fisheries agencies learn from experience? *Fisheries* 17:6-14.
- Hilborn, R. 1992. Hatcheries and the future of salmon in the northwest. *Fisheries*. 17: 5-8.
- Hilborn, R. 1992. Institutional learning and spawning channels for sockeye salmon (*Oncorhynchus nerka*). *Canadian Journal of Fisheries and Aquatic Science* 49:1126-1136.
- Hilborn, R. and R. Kennedy. 1992. Spatial pattern in catch rates: a test of economic theory. *Bulletin of Mathematical Biology*. 54: 263-273.
- Hilborn, R., and C. J. Krebs. 1992. Bias in the Minimum Number Alive Estimator - a Reply. *Canadian Journal of Zoology*. 70:632-632.
- Hilborn, R. 1991. Modeling the stability of fish schools: exchange of individual fish between schools of skipjack tuna (*Katsuwonus pelamis*). *Canadian Journal of Fisheries and Aquatic Sciences* 48: 1081-1091.
- Hilborn, R. 1990. Determination of fish movement patterns from tag recoveries using maximum likelihood estimators. *Canadian Journal of Fisheries and Aquatic Sciences*. 47: 635-643.
- Hilborn, R. 1989. Yield estimation for spatially connected populations: an example of surface and longline fisheries for yellowfin tuna. *North American Journal of Fisheries Management*. 9: 402-410.
- Hilborn, R. 1989. Models of tag dynamics with exchange between available and unavailable populations. *Canadian Journal of Fisheries and Aquatic Sciences*. 46: 1356-1366.
- Hilborn, R. 1989. International Management of Tuna. *Marine Policy*, 13:166-166.
- Hilborn, R. and P. Medley. 1989. Tuna purse seine fishing with fish aggregating devices: models of tuna FAD interactions. *Canadian Journal of Fisheries and Aquatic Sciences*. 46: 28-32.
- Hilborn, R. and J. Sibert. 1988. Is international management of tuna necessary? *Marine Policy*. January 1988 pp. 31-39.
- Hilborn, R. and J. Sibert. 1988. Adaptive management of developing fisheries. *Marine Policy*. April 1988 pp. 112-121.
- Hilborn, R. 1988. Determination of tag return from recaptured fish by sequential examination for tags. *Transactions of the American Fisheries Society*. 117: 510-514.
- Starr, P.J. and R. Hilborn. 1988. Reconstruction of harvest rates and stock contribution in gauntlet salmon fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*. 45:2216-2229.
- Hall, D.L, R. Hilborn, M. Stocker and C.J. Walters. 1988. Alternative harvest strategies for Pacific Herring (*Clupea harengus pallasii*). *Canadian Journal of Fisheries and Aquatic Sciences*. 45: 888-897.
- Fried, S.M. and R. Hilborn. 1988. A Bayesian approach to inseason run size estimation for Bristol Bay, Alaska, Sockeye Salmon (*Oncorhynchus nerka*). *Canadian Journal of Fisheries and Aquatic Sciences*. 45: 850-855.

- Hilborn, R. and W. Luedke. 1987. Rationalizing the irrational: a case study in user group participation in Pacific salmon management. *Canadian Journal of Fisheries and Aquatic Sciences*. 44: 1796-1805.
- Hilborn, R. 1987. Living with uncertainty in resource management. *North American Journal of Fisheries Management*. 7: 1-5.
- Shardlow, T., R. Hilborn, and D. Lightly. 1987. Components analysis of instream escapement methods for Pacific Salmon. *Canadian Journal of Fisheries and Aquatic Sciences*. 44: 1031-1037.
- Hilborn, R. and C.J. Walters. 1987. A general model for simulation of stock and fleet dynamics in spatially heterogeneous fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*. 44: 1366-1370.
- Hilborn, R. and C.J. Walters. 1987. Microcomputer simulation for training and teaching. *Environmental Software*. 1: 156-163.
- Hilborn, R. 1986. A comparison of alternative harvest tactics for invertebrate fisheries, p. 313-317. In: G.S. Jamieson and N. Bourne [ed.] *Canadian Special Publication in Fisheries and Aquatic Sciences* 92.
- Hilborn, R. 1986. Some Remarks on Determinants of Catching Power in the British-Columbia Salmon Purse Seine Fleet by Hilborn and Ledbetter - Reply. *Canadian Journal of Fisheries and Aquatic Sciences*, 43:1086-1088.
- Moussalli, E. and R. Hilborn. 1986. Optimal stock size and harvest rate in multistage life history models. *Canadian Journal of Fisheries and Aquatic Sciences*. 43: 135-141.
- Renyard, T.S. and R. Hilborn. 1986. Sport angler preferences for alternative regulatory methods. *Canadian Journal of Fisheries and Aquatic Sciences*. 43: 240-242.
- Lawson, T.A. and R. Hilborn. 1985. Equilibrium yields and yield isopleths from a general age-structured model of harvested populations. *Canadian Journal of Fisheries and Aquatic Sciences*. 42: 1766-1771.
- Hilborn, R. 1985. Simplified calculation of optimum spawning stock size from Rickers' stock recruitment curve. *Canadian Journal of Fisheries and Aquatic Sciences*. 42: 1834-1835.
- Hilborn, R. 1985. Fleet dynamics and individual variation: why some people catch more fish than others. *Canadian Journal of Fisheries and Aquatic Sciences*. 42: 2-13.
- Hilborn, R. 1985. Apparent stock recruitment relationships in mixed stock fisheries. *Canadian Journal of Fisheries and Aquatic Sciences*. 42: 718-723.
- Shardlow, T. and R. Hilborn. 1985. Density dependent catchability coefficients. *Transactions of the American Fisheries Society*. 114: 436-438.
- Hilborn, R. and M. Ledbetter. 1985. Determinants of catching power in the B.C. salmon purse seine fleet. *Canadian Journal of Fisheries and Aquatic Sciences*. 42: 51-56.
- Hilborn, R., C.J. Walters, R.M. Peterman and M.J. Staley. 1984. Models and fisheries: A case study in implementation. *North American Journal of Fisheries Management*. 4: 9-15.
- Walker, K.D., R.B. Rettig, and R. Hilborn. 1983. Analysis of multiple objectives in Oregon coho salmon policy. *Canadian Journal of Fisheries and Aquatic Sciences*. 40: 580-587.

- Argue, A.W., R. Hilborn, R.M. Peterman, M.J. Staley, and C.J. Walters. 1983. The Strait of Georgia Chinook and Coho fishery. *Canadian Journal of Fisheries and Aquatic Sciences*. Bulletin 211.
- Ludwig, D. and R. Hilborn. 1983. Adaptive probing strategies for age structured fish stocks. *Canadian Journal of Fisheries and Aquatic Sciences*. 40: 559-569.
- Stocker, M. and R. Hilborn. 1982. Comment on "Short-term forecasting in marine fish stocks." *Canadian Journal of Fisheries and Aquatic Sciences*. 39: 1071-1072.
- Hilborn, R. and S. Stearns. 1982. On inference in ecology and evolutionary biology: the problem of multiple causes. *Acta Biotheoretica*. 32: 145-164.
- Hilborn, R. and C.J. Walters. 1981. Pitfalls of environmental baseline and process studies. *Environmental Impact Assessment Review*. 2: 265-278.
- Stocker, M. and R. Hilborn. 1981. Short term forecasting in marine fish stocks. *Canadian Journal of Fisheries and Aquatic Sciences*. 38: 1247-1254.
- Yom-Tov, Y. and R. Hilborn. 1981. Energetic constraints on clutch size and time of breeding in temperate zone birds. *Oecologia*. 48: 234-243.
- Hilborn, R. 1979. Comparison of fisheries control systems that utilize catch and effort data. *Journal of the Fisheries Research Board of Canada*. 36: 1477-1489.
- Hilborn, R. 1979. Some failures and successes at applying systems analysis to ecological problems. *Journal of Applied Systems Analysis*. 6: 25-31.
- Hilborn, R. and M. Ledbetter. 1979. Analysis of the British Columbia salmon purse seine fleet: dynamics of movement. *Journal of the Fisheries Research Board of Canada*. 36: 384-391.
- Hilborn, R. 1979. Some long term dynamics of predator-prey models with diffusion. *Ecological Modelling*. 6: 23-30.
- Walters, C.J., R. Hilborn, R.M. Peterman and M. Staley. 1978. A model for examining early ocean limitation of Pacific salmon production. *Journal of the Fisheries Research Board of Canada*. 35: 1303-1315.
- Walters, C.J. and R. Hilborn. 1978. Ecological optimization and adaptive management. *Annual Review of Ecology and Systematics*. 8: 157-188.
- Hilborn, R. and C.J. Walters. 1977. Differing goals of salmon management on the Skeena River. *Journal of the Fisheries Research Board of Canada*. 34: 64-72.
- Hilborn, R., C.J. Krebs, and J.A. Redfield. 1976. On the reliability of enumeration for mark and recapture census of voles. *Canadian Journal of Zoology*. 54: 1019-1024.
- Hilborn, R. and C.J. Krebs. 1976. Fates of disappearing individuals in fluctuating populations of *Microtus townsendi*. *Canadian Journal Zoology*. 54: 1501-1520.
- Hilborn, R. 1976. Optimal exploitation of multiple stocks by a common fishery. *Journal of the Fisheries Research Board of Canada*. 33: 1-5.
- Walters, C.J. and R. Hilborn. 1976. Adaptive control of fishing systems. *Journal of the Fisheries Research Board of Canada*. 33: 145-159.

- Krebs, C.J. I. Wingate, J. LeDuc, J. Redfield, M. Taitt and R. Hilborn. 1976. *Microtus* population biology: dispersal in fluctuating populations of *Microtus townsendi*. *Canadian Journal of Zoology*. 54: 79-95.
- Hilborn, R. 1975. Similarities in dispersal tendency among siblings in four species of voles (*Microtus*). *Ecology*. 56: 1221-1225.
- Hilborn, R. 1975. The effect of spatial heterogeneity on the persistence of predator-prey interactions. *Theoretical Population Biology*. 8: 346-355.
- Walters, C.J., Bunnell, F., Hilborn, R., and R.M. Peterman. 1975. Computer simulation of barren ground caribou dynamics. *Ecological Modelling*. 1: 303-315.
- Himamowa, Bubu. 1975. The Obergurgl model: a microcosm of economic growth in relation to limited ecological resources. *Nature and Resources*. 2: 10-21. (Himamowa is a pseudonym for myself and six other authors)
- Hilborn, R. 1974. Inheritance of skeletal polymorphism in *Microtus californicus*. *Heredity*. 33: 81-83.
- Walters, C.J. R. Hilborn, E. Oguss, R. Peterman and J. Stander. 1974. Development of a simulation model of Mallard duck populations. *Canadian Wildlife Service Occasional Paper No. 20*: 1-34.
- Hilborn, R. 1973. A control system for FORTRAN simulation programming. *Simulation*. 20: 172-175.

### **National Research Council Reports**

- National Research Council. 2003. Cooperative Research with the National Marine Fisheries Service. NRC Press. 131 pps. Chairman of committee.
- National Research Council. 1998. Improving fish stock assessment. NRC Press. 188 pps. Member of Committee.
- National Research Council. 1998. Review of Northeast fishery stock assessments. NRC press. 136 pps. Member of committee.

### **Book Chapters**

- Hilborn, R. 2005. Are sustainable fisheries achievable? Pps 247-259 in Norse, E.A. and Crowder, L.B. (eds.) *Marine Conservation Biology*. Island Press, 575 p.
- Hilborn, R. 2004. Population management in stock enhancement and sea ranching. In *Stock enhancement and sea ranching: developments, pitfalls and opportunities*. Edited by K. M. Leber, S. Kitada, H. L. Blankenship and T. Svasand. Blackwell, Oxford, U.K. pp. 201-209.
- Anderson, JL, RW Hilborn, RT Lackey, D Ludwig. 2003. Watershed restoration--adaptive decision making in the face of uncertainty. Pages 203-232 in RC Wissmar, PA Bisson (eds), *Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems*. Am. Fish. Soc., Bethesda.

- Hilborn, R. 2001, Stock, recruitment and reference points: assessment and management of Atlantic salmon. Prevost, -E.-(ed.); Chaput, -G.-(ed.) Paris France. Institut National de la Recherche Agronomique 2001 pp. 177-193
- Hilborn, Ray. 1998. Challenges and progress in sustainable fisheries .pps 82-88. In The Brundtland Commission's Report – 10 Years. Edited by Guri Bang Sjøfting, George Benneh, Kjetil Hindar, Lars Walløe and Anders Wijkman. Scandinavian University Press, Oslo, Norway. 234 p.
- Mduma, S.A.R., Hilborn, R. & Sinclair, A.R.E. 1998. Limits to exploitation of Serengeti wildebeest and implications for its management. *Dynamics of tropical communities, the 37<sup>th</sup> Symposium of the British Ecological Society* (eds D.M. Newbery, H.B., H.H.T. Prins & N.D. Brown) pp. 243-265. Blackwell Science, Oxford.
- Hilborn, R. 1997. Uncertainty, Risk, and the Precautionary Principle. Pps 100-106 in Pikitch, E.K, Huppert, DD. And M.P. Sissenwine (eds). *Global Trends: Fisheries Management*. American Fisheries Society Symposium 20.
- Hilborn, R. 1996. Computers in fisheries population dynamics. Pps 176-189 in B.E. Megrey and E. Moksness (eds). *Computers in Fisheries Research*. Chapman and Hall, London 254 p.
- Hilborn, R. 1995. A model to evaluate alternative management policies for the Serengeti-Mara ecosystem. pps 617-637 in (A.R.E. Sinclair and P. Arcese eds). *Serengeti II: dynamics, management and conservation of an ecosystem*. University of Chicago Press.
- Hilborn, R. 1990 Marine Biota. pps 371-386 In : B.L. Turner III (ed.). *The Earth as Transformed by Human Action*. Cambridge University Press.
- Hilborn, R. and A.R.E. Sinclair. 1979. A simulation of the wildebeest population, other ungulates and their predators. pps 287-309 In: *Serengeti: Dynamics of an Ecosystem*. A.R.E. Sinclair and M. Norton-Griffiths, eds. University of Chicago Press.
- Hilborn, R., and R. M. Peterman. 1977. Changing management objectives. pps 68-98 In: *Pacific salmon: management for people*. D. V. Ellis ed. University of Victoria, Western Geographic Series, Vol 13. Victoria, Canada

## Reviews

- Hilborn, R. 2005. Review of "Namibia's fisheries: economic, economic and social aspects". *Fish and Fisheries* 6: 88.
- Hilborn, R. 2003. Review of "Conservation of exploited species." By Reynolds, J.D., G.M. Mace, K.H. Redford and J.G. Robinson. *Conservation Biology* 17: 340-341.
- Hilborn, R. 2000. Review of "Dynamics of pelagic fish distribution and behaviour: effects on fisheries and stock assessment." By P. Freon and O. A. Misund. *Transactions of the American Fisheries Society* 129: 887-887.
- Hilborn, R. 1999. Review of "Stocking and introductions of fish." Edited by I.G. Cowx. *Reviews in Fish Biology and Fisheries* 9: 121-122.

- Hilborn, R. 1995. Review of "Fishing for Truth: A sociological Analysis of Northern Cod Stock Assessments from 1977 to 1990" by A.C. Finlayson. *Reviews in Fish Biology and Fisheries* 5: 461-462.
- Hilborn, R. 1995. Review of "Scaling Fisheries: The Science of Measuring the Effects of Fishing, 1855-1955" by T.D. Smith. *Reviews in Fish Biology and Fisheries* 5: 122-123.
- Hilborn, R. 1994. Review of "On the Dynamics of Exploited Populations [reprint]" by R.J.H. Beverton and S.J. Holt. *Reviews in Fish Biology and Fisheries* 4: 259-260.
- Hilborn, R. 1992. Review of "Catch effort sampling strategies" edited by I.G. Cowx, in *Reviews in Fish Biology and Fisheries* 2: 273-275.
- Hilborn, R. 1990. Review of "Mathematical analysis of fish stock dynamics by E. Edwards and B. Megrey" in *Transactions of the American Fisheries Society*.
- Hilborn, R. 1990. Review of "Salmon production, management and allocation" edited by W. J. McNeil" in *Transactions of the American Fisheries Society*.
- Hilborn, R. 1981. Review of "Management and analysis of biological populations by B. Goh". *Quarterly Review of Biology* 56:357.

### **Papers in Peer Reviewed Conference Proceedings and Peer Reviewed Reports**

- Hilborn, R. 2004. Incentives, the key to solving fisheries problems. Chapter 26 in *World Summit on Salmon*. Edited by P. Gallagher and L. Wood. Simon Fraser University, Burnaby, B.C. Canada.
- Orensanz, J.M., R. Hilborn and A.M. Parma. 2000. Harvesting Methuselah's clams – is the geoduck fishery sustainable, or just apparently so. *Canadian Stock Assessment Secretariat Research Document 2000/175*. ISN 1480-4883. 68 pps.
- Hilborn, R. 1997. The frequency and severity of fish stock declines and increases. Pps 36-38 in Hancock, D.A., Smith, D.C. Grant, A. and J.P. Beumer, eds. *Developing and sustaining world fisheries resources. Proceedings of the 2<sup>nd</sup> World Fisheries Congress*, CSIRO Publishing PO Box 1139 Collingwood, Victoria, Australia.
- Hilborn, R. and R.M. Peterman. 1996. The development of scientific advice with incomplete information in the context of the precautionary approach. Pps 77-101 in *FAO Fisheries Technical Paper. No. 350. Part 2*. Rome, FAO. 210 p.
- Hilborn, R. 1996. Detecting population impacts from oil spills: a comparison of methodologies. *American Fisheries Society Symposium* 18:639-644.
- Hilborn, R., J. Skalski, A. Anganuzzi and A. Hoffman. 1995. Movements of juvenile halibut in IPHC regulatory areas 2 and 3. *International Pacific Halibut Commission Technical Report No. 31*. 44 pps.
- Hilborn, R., Walters, C. J., Jester, D. B. Jr. 1990. Value of fish marking in fisheries management. *American Fisheries Society Symposium* 7:5-7.

- Hilborn, R. 1990. Estimating parameters of full age-structured models from catch and abundance data. In Proceedings of the Symposium on the Application of Stock Assessment Techniques to Gadids. Bulletin No. 50, International North Pacific Fisheries Commission.
- Hilborn, R. 1987. Spatial models of tuna dynamics in the western Pacific. pp 276-286 In: T.L. Vincent, Y. Cohen, W.J. Grantham, G.P. Kirkwood and J.M. Skowronski (eds.) Modeling and Management of Resources under Uncertainty, Proceedings of the Second U.S.-Australia Workshop on Renewable Resource Management. Lecture Notes in Biomathematics #72, Springer-Verlag, Berlin.
- Hilborn, R. 1985. A comparison of harvest policies for mixed stock fisheries. pp 75-88 In: Proceedings of the second Ralf Yorque conference, M. Mangel (ed.). Lecture notes in Biomathematics #61. Springer Verlag..
- Hilborn, R. and P.J. Starr. 1984. Making stock and recruitment work. In: P.E.K. Symons and M. Waldichuk (eds.) Proceedings of the workshop on stream indexing for salmon escapement estimation. Canadian Technical Report of Fisheries and Aquatic Sciences. No. 1326. pps 227-244.
- Hilborn, R., C.S. Holling and C.J. Walters. 1980. Managing the unknown: approaches to ecological policy design. pps 103-113 In "Biological Evaluation of Environmental Impacts." U.S. Dept. of the Interior FWS/OBS-80/26.
- Hilborn, R. 1979. Troubled waters over Pacific Salmon. pps 49-52 in F.J. Convery and B.R. Strain (eds). U.S. dependency on Canadian natural resources: extent and significance. Center for Resource and Environmental Policy Research, Canadian Studies Center, Duke University.

## Popular Articles

- Halmay, P. and R. Hilborn. 2005. Community co-ops: the solution to small-scale U.S. fisheries? National Fisherman. March 2005. p 8.
- Hilborn, R. 2001. Comments on marine reserves. Western Outdoor News, June 29, 2001.
- Hilborn, R. 2000. Why fishermen oppose stock rebuilding plans. National Fisherman May 2000 p 7.
- Hilborn, R. 1999. Statistical issues in ecological risk assessment. Newsletter of the Section on Statistics & the Environment of American Statistical Association. 3 (1): 1/5
- Hilborn, R. 1995. Taking precautions: the implications of the precautionary approach for commercial fisheries. Seafood New Zealand Vol 3 No 11 pps 12-13.
- Hilborn, R. 1995. Fish stock collapses: lessons for New Zealand. Seafood New Zealand:9.
- Hilborn, R. 1995. How many spawners is enough? Seafood New Zealand:16.
- Hilborn, R. 1995. Is it dangerous to harvest spawning fish? Seafood New Zealand:21.
- Hilborn, R. 1993. Controlling Johnny Salmonseed. The Osprey 17: 2/18.
- Hilborn, R. Key to saving B.C. fishery is to reduce the costs of fishing. Vancouver Sun. March 9, 1984.

Hilborn, R. and C.J. Walters. Truth about wolves is lost in the howl. Vancouver Province Sunday Supplement. Jan. 29, 1984.

Hilborn, R. 1973. Climbing in the Adamants. Canadian Alpine Journal 57: 75-77.

## Research Funding

2005-2006	NOAA funding for development of SHIRAZ model to evaluate habitat impacts on salmon \$100k
2005-2007	Funding from Pew Institute for Ocean Sciences for research on dynamics of small populations. \$250k over 2 years.
2005-2008	Funding from Moore Foundation for salmon research. \$2.3 million over 3 years.
2002-2006	NOAA funding for graduate student support in marine fish population dynamics \$255,000
2004-2009	NSF funding for “Biocomplexity and fisheries sustainability” \$2.0 Million. I am the lead P.I.
2004-2006	SeaGrant funding for spatial dynamics of geoducks in Puget Sound. With David Armstrong. \$150k over 3 years.
2003-2007	NSF Biocomplexity funding Award 0308440 for study of spatial structure in fish recruitment. Dave Siegel U.C. Santa Barbara lead P.I. my portion \$315,607
1996-present	New Zealand Seafood Industry Council funding of stock assessment in New Zealand Fisheries \$67,000-\$125,000 per year.
2003-2006	NOAA/SeaGrant funding for graduate fellowship for Eric Ward in fisheries stock assessment. \$37k per year for 3 years.
2002	NMFS funding for post-doc on salmon habitat modelling. \$50k
2002-2003	Alaska Department of Fish and Game funding for grad student support on prediction of salmon run timing. \$30k
2002-2004	NMFS Stock Assessment Improvement Program funding for grad student support. \$70k per year
2002-2005	NSF LTREB funding for Alaska Salmon studies. \$35k per year. Jointly with Tom Quinn and Daniel Schindler.
2001-2003	NSF funding for field station infrastructure, \$200k for new laboratory and classroom at Porcupine Island Alaska field station. Tom Quinn lead P.I.
2002-2005	NOAA/SeaGrant funding for graduate fellowship for Melissa Haltuch in fisheries stock assessment. \$37k per year for 3 years.
2001-2003	Institute of Marine Research, Iceland funding for research on Icelandic cod and age structured models \$16k per year.
2001-2004	NOAA/SeaGrant funding for graduate fellowship for Ian Stewart in fisheries stock assessment. \$37k per year for 3 years.

2000-2001	NOAA funding for study of salmon run timing. \$70k.
2000	NMFS funding for Research Faculty position in groundfish assessment. \$120k
1999-present	Funding from Bristol Bay Salmon Processors for salmon research in Bristol Bay, Alaska. Average \$200k per year.
1998-present	NOAA funding for salmon research at Chignik Lakes, Alaska \$30k per year.
1998-2002	Funding of PNCRS research on salmon survival (Sea Grant and NOAA joint funding) Multi PI program, my portion \$35,000 per year.
1998-present	Chignik Regional Aquaculture Association funding for salmon research at Chignik Lakes, Alaska. \$45k-\$10k per year.
1998-2003	Alaska Department of Fish and Game funding for operation of Pt. Moller test fishery. \$30k per year.
1996-1997	National Marine Fisheries Service funding for analysis of interaction between habitat, ocean conditions and harvest in chinook salmon. \$49,000
1997-1998	Washington Sea Grant: modeling the interaction between habitat, harvest, ocean conditions and hatcheries. \$32,000
1995	Gift of \$100,000 as part of Consent Decree between Reynolds Aluminum and Washington Public Interest Research Group for research on Columbia River Chinook Salmon.
1990-1996	New Zealand Fishing Industry Board. with Prof. Ellen Pikitch "Analysis of New Zealand TAC setting policies." \$100,000-\$150,000 per year.
1993-1995	Washington Sea Grant. "Hatcheries: what works and what doesn't." \$100,800
1993-1994	National Marine Fisheries Service funding for Bayesian risk analysis of Snake River Fall Chinook. \$35,000
1989-1993	Bonneville Power Administration. "Analysis of historical patterns of survival among Columbia River salmonids". \$450,000.
1991-1993	Washington Sea Grant. "Salmon management using coded-wire-tags." \$96,000
1990	International Pacific Halibut Commission. "Analysis of IPHC transboundary tagging experiments, part II." \$54,105. With J.R. Skalski.
1990	Provosts fund for Interdisciplinary research. "In search of sustainable development." \$15,000. With Kai Lee and Gardner Brown.
1988	International Pacific Halibut Commission. "Analysis of IPHC transboundary tagging experiments". \$40,315. With J.R. Skalski.
1988	Bonneville Power Administration. "Flow requirements for the Hanford reach, relative to the number of chinook salmon spawners". \$23,357. With D. E. Rogers.

- 1988 Northwest Indian Fisheries Commission. Statistical procedures for comparing results of coded wire tag releases. \$10,000.
- 1989-1991 Washington Sea Grant. Managing Adaptively: early experience in Western North America. \$144,000. With Kai N. Lee and Janice E. Carpenter.
- 1987-1990 Vice Provost for Computing University of Washington. \$177,731 for microcomputer teaching lab for Colleges of Forest Resources and College of Fisheries and Ocean Sciences. Proposal written by Dr. Gordon Swartzman and myself.
- 1975-1985 National Sciences and Engineering Research Council of Canada operating grants in Population Biology (\$6000-\$12,000 per year).
- 1980-1985 Department of Fisheries and Oceans. Contract support for Cooperative Fisheries Research Unit (\$60,000-\$110,000 per year). With C.J. Walters.
- 1985-1987 3 year Strategic Grant from National Sciences and Engineering Research Council (\$90,000 per year) for "Adaptive management of fisheries resources." With C.J. Walters and D. Ludwig.
- 1978 B.C. Science Council. (\$24,000). Behavior of B.C. purse seine fleet.
- 1978 Canadian National Sportsman's Fund (\$12,000). A study of B.C. salmon purse seine vessels.