ICES TRAINING COURSES 2019

Genetics in support of fisheries and aquaculture management, 17-19 September 2019, CCMAR and University of Algarve, Faro, Portugal

Suggested Reading List: Gary Carvalho (* those papers uploaded as pdfs)

Below are some suggested books and papers that you may find helpful. It is not intended that you read the suggested primary papers, but the resource is intended as an aid for navigating through some of the most pertinent, accessible and informative overviews and applications. A small selection, are available as PDFs, and these are identified, with an*, below.

GENERAL INTRODUCTORY PRINCIPLES – For background

Please find below some general publications that you may find useful, depending on background and interests. The special issue of *Journal of Fish Biology* (Carvalho *et al* 2016) is a comprehensive compilation of recent reviews and applications in the field.

Avise, JC (2004) *Molecular Markers, Natural History and Evolution*. 2nd ed. Chapman & Hall. An excellent all round text by one of the pioneers in the field. Useful introductory information as well as more advanced case studies.

Allendorf, FW & Luikart, G (2007) *Conservation and the Genetics of Populations*. Blackwell Publishing. A more advanced text, but with some useful introductory material on genetic variation in natural populations and mechanisms of evolutionary change. A particularly useful text for those interested in conservation biology, with some excellent recent applications of molecular genetic tools that can provide a useful introduction to the primary literature (journal papers).

Carvalho, GR, Hauser, L and Naish, K (2016) Fish, Genes and Genomes: Contributions to Ecology, Evolution and Management. *Special Issue of Journal of Fish Biology,* **89**, 2471-2767.

Hauser, J, Waples, RS & Carvalho, GR (eds.) (2008) Advances in Marine Fish and Fisheries Genetics. *Special Issue of Fish and Fisheries*, **9**, 331-486.

Rowe, G., Sweet, M & Beebee, T (2017) *An Introduction to Molecular Ecology.* 3rd edition. Oxford. This is an up to date and comprehensive textbook that underpins many of the key principles, methods and applications relevant to fisheries and aquaculture.

Van Straalen & Roelofs, D. (2012) *An Introduction to Ecological Genomics*. 2nd ed. Oxford University Press. An excellent introduction into how genomic technologies can be used in ecology and evolution, including a consideration of community ecology, life histories, and stress responses.

For background information on the fundamental principles of genetics and evolutionary biology, the following are especially recommended, though there are many excellent student texts on these topics available:

Hall, BK & Hallgrimsson, B (2014) *Strickberger's Evolution* (5th ed) – excellent coverage with valuable on line student resources.

Hartl, DL (2012*) Essential Genetics. A Genomics Perspective.* Principles of Population Genetics. 6th ed. A very good text for population genetics and excellent on-line resources.

Herron, JC & Freeman (2014*) Evolutionary Analysis*. 5th ed. Pearson. Excellent background information, and was strongly recommended in the 2nd year Evolution and Genetics Module (BNS2001/2).

SPECIALIST READING

Adams, CIM, et al., (2019) Beyond Biodiversity: Can Environmental DNA (eDNA) Cut It as a Population Genetics Tool?. *Genes* 2019, 10, 192; doi:10.3390/genes10030192

Bekkevold D., Helyar S.J., Limborg M.T., Nielsen E.E., Hemmer-Hansen J., Clausen L.A.W., Carvalho G.R., FishPopTrace Consortium (2015) Gene-associated markers can assign origin in a weakly structured fish, Atlantic herring. *ICES Journal of Marine Science*, available online, doi:10.1093/icesjms/fsu247

*Bohmann K**,** Evans A, Gilbert MTP**,** Carvalho GR, Creer S, Knapp M, Yu DW**,** de Bruyn M (2014) Environmental DNA for wildlife biology and biomonitoring. *Trends in Ecology and Evolution**. 29: 358-367. (* joint first authors)* *http://www.sciencedirect.com/science/article/pii/S016953471400086X*

Brumfield, R T et al,. (2003) The utility of single nucleotide polymorphisms in inferences of population history. *Trends in Ecology & Evolution*, 18: 249-256

*Costa, FO & Carvalho, GR (2007) The Barcode of Life Initiative: synopsis and prospective societal impacts of DNA barcoding of Fish. *Genomics, Society and Policy* 3, 29-40 (available on line at www.gspjournal.com./)

Creer, S, Deiner, K et al., (2016) The ecologists field guide to sequence-based identification of biodiversity. Methods in Ecology & Evolution, doi: 10.1111/2041-210X.12574. Open Access.

Evans, NT, and Lamberti, GA (2017) Freshwater fisheries assessment using environmental DNA: a primer on the method its potential, and shortcomings as a conservation tool. *Fisheries Research*. http://dx.doi.org/10.1016/j.fishres.2017.09.013

*FAO Technical Paper- The Ecosystem Approach to Fisheries. Technical paper 443.

*FishPopTrace: Traceability of fish populations and fish products: advances and contribution to sustainable fisheries. FishPopTrace stakeholder pamphlet.

*Goodwin KD, Thompson LR, Duarte B, Kahlke T, Thompson AR, Marques JC and Caçador I (2017) DNA Sequencing as a Tool to Monitor Marine Ecological Status. *Front. Mar. Sci*. 4:107. doi: 10.3389/fmars.2017.00107

*Hauser, L & Carvalho, GR (2008) Paradigm shifts in marine fisheries genetics: ugly hypotheses slain by beautiful facts. *Fish and Fisheries*, **9** (4), 333-362.

*Heath, M. R., Culling, M. A., Crozier,W.W., Fox, C. J., Gurney,W. S. C., Hutchinson,W. F., Nielsen, E. E., O'Sullivan, M., Preedy, K. F., Righton, D. A., Speirs,, D. C., Taylor, M. I., Wright, P. J., and Carvalho, G. R. Combination of genetics and spatial modelling highlights the sensitivity of cod (*Gadus morhua*) population diversity in the North Sea to distributions of fishing. – *ICES Journal of Marine Science*, doi:10.1093/icesjms/fst185.

Hemmer-Hansen J., Therkildsen N.O., Pujolar J.M. (2014) Population genomics of marine fishes: next generation prospects and challenges. *Biological Bulletin*, 227, 117-132

Hilborn, R., Quinn, T.P., Schindler, D.E. and Rogers, D.E.(2003) Biocomplexity and fisheries sustainability. *Proceedings of the National Academy of Sciences of the United States of America* 100, 6564–6568.

Luikart, G et al., (2003) The power and promise of population genomics: from genotyping to genome typing. *Nature Reviews, Genetics*, 4, 981-994.

Morin PA etal., (2004) SNPs in ecology, evolution and conservation. *Trends in Ecology & Evolution*, 19, 208-216.

*Nielsen E, Hemmer-Hansen J, Poulsen N, Loeschcke V, Moen T, Johansen T, Mittelholzer C, Taranger G, Ogden R and Carvalho G (2009) Genomic signatures of local directional selection in a high gene flow marine organism; the Atlantic cod (Gadus morhua). *BMC Evolutionary Biology* **9**:276

*Nielsen, E., Cariani, A, Mac Aoidh, E, Maes, G, Milano, I, Ogden, R, Taylor, M, Hemmer-Hansen, J, Babbucci, M, Bargelloni, L., Bekkevold, D, Diopere, E, Grenfell, L, Helyar, S, Limborg, MT, Martinsohn, JT, McEwing, R, Panitz, F, Partarnello, T, Tinti, F, Van Houdt, J, Volckaert, F, Waples, R, FishPopTrace Consortium & Carvalho, GR (2012). Gene-associated markers provide tools for tackling illegal fishing and false eco-certification. *Nature Communications*, | 3:851 | DOI: 10.1038/ncomms1845.

Pochon X, Zaiko A, Fletcher LM, Laroche, O, Wood SA (2017) Wanted dead or alive? Using metabarcoding of environmental DNA and RNA to distinguish living assemblages for biosecurity applications. *PLoS ONE* 12(11): e0187636. https://doi.org/10.1371/journal.pone.0187636

Schindler DE, Hilborn R, Chasco B, et al . 2010. Population diversity and the portfolio effect in an exploited species. *Nature* 465:609–12.

*Trochta JT, Pons M, Rudd MB, Krigbaum; M, Tanz A, Hilborn R (2018) Ecosystem-based fisheries management: Perception on definitions, implementations, and aspirations. *PLoS ONE* 13, (1): e0190467. https://doi.org/10.1371/journal.

*Zelenina, DA, MNartinsohn, J, Ogden, R, Volkov, AA, Zelenina, IA & Carvalho, GR (2011) Advanced approaches to studying the population diversity of marine fishes: new opportunities for fisheries control and management. *Russian J Genetics*, **47**, 1444-1455.