Title of Lecture: Integrative Fisheries Management
Master Study Fishery Science and Aquaculture
WS 20/21

Schedule and Location: If not otherwise arranged, Wednesdays 9 am to 1 pm (c.t.) over Zoom, fully digital.

Instructor: Prof. Dr. Robert Arlinghaus (arlinghaus@igb-berlin.de)

October, 28 – February, 24, 2011, winter break December, 19, 2020 to January, 02, 2021.

Note that no lecture will be possible November, 4. For that reason, we will start October, 28 and have no lecture November, 4.

Moodle https://moodle.hu-berlin.de/course/view.php?id=96863
Subscription Key **IFishMan2020**

FM 14: Integrative Fisheries Management			Credits: 6
Learning objectives: Students - have learned the principles of the global overfishing crisis and know the status of world fisheries, - understand the multiple social, economic and ecological factors within capture fisheries, - are empowered to perceive fisheries as coupled social-ecological system and to analyse it accordingly from an interdisciplinary perspective, - know the specifics of the management of commercial and recreational fisheries, - know the methods to calculate maximum sustainable yield and other production metrics of fish stocks, - know the major social and institutional approaches to derive sustainable solutions and - are able to derive solutions to management problems in fisheries and to think critically.			
Preconditions: none, recommended modules taken: FM 2 Ecology of Fishes, FM 12 Commercial Inland Fisheries			
Teaching format	Hours per week, workload in hours	Credits and conditions	Content
L	3 SWS 60 hours 35 hours presence in class, 25 hours preparation and learning	2 credits, participation	- Status of world fisheries - Maximum sustainable yield and other management objectives - Principles of fisheries biology - Fisheries evolution - Socio-economic drivers - Integrative analysis of fisheries - Institutions for the sustainable management of the commons - Fisheries management and its limitations
SE	1 SWS 90 hours 15 hours presence in class, 75 hours preparation and learning	3 credits, Giving a seminar (45 minutes) on a topic provided by the lecturer	- Reading scientific literature - Presenting scientific information - Moderating the discussion - Providing a hand-out of the seminar
Final exam	30 hours Oral exam, 30 minutes, and preparation	1 credit, pass	
Duration of the module	☒ 1 semester	☐ 2 semesters	
Start of the module	☒ winter semester	☐ summer semester (four semester rotation)	

IMPORTANT NOTICES

Lecture will only be giving when at least **5 students** have zoomed in.

Literature

Students are recommended to read the literature listed below in the Table (right column) as well as the papers supplied or mentioned during the lecture. The main textbook is Welcomme (2001) for inland fisheries (accessible http://www.agrifs.ir/sites/default/files/Inland%20Fisheries.pdf). Another more recent book that is highly relevant is Cochrane & Garcia (2009) (accessible here: http://www.fao.org/docrep/015/i0053e/i0053e.pdf), which covers many relevant aspects of the

lecture for the marine environment. Furthermore, the review papers Arlinghaus et al. (2002, Fish and Fisheries), Arlinghaus et al. (2017, Reviews in Fisheries Science & Aquaculture) and Arlinghaus et al. 2016 (book chapter in Craig book, all accessible through the websites of Robert Arlinghaus, i.e., Research Gate or www.ifishman.de) set the larger frameworks of the lecture. Figures during the lecture without reference are from the Charles (2000) (available from the instructor) and Welcome (2001) books, and the review papers by Arlinghaus et al. Note all the landmark publications of the field of fisheries science are reprinted in the book Sass & Allen (2014) (available from the instructor for copy) and FAO (2012) for managing recreational fisheries as a special form of fisheries (available through the personal websites of Robert Arlinghaus or directly as PDF from FAO). A new book on inland fisheries by Craig (2016) also just appeared that is worth having a look at.

Other literature below the table is provided to present what is available in terms of text books; this literature is not a "must-read" except when otherwise indicated in the Table. Oral examinations will draw on contents of the lecture and the literature supplied. Therefore, self-education is part of the course and the final oral examination, and in fact work load is split between lecture and student self-education (mainly through reading and preparing a seminar during the lecture).

Seminar

To aid in understanding of the crucial literature on fisheries management, each student is expected to hold one seminar, either alone or in a team. The seminar consists of presenting a topic supplied by the instructor that has to be supplemented by additional literature researched by each student as seminar holder. Other students than the presenting student will receive material and papers from the student holding the seminar, not the instructor, which will become key readings too, i.e., as part of the seminar you should prepare a hand-out. Each presenting student will also have to answer questions on the subject after the oral presentation. Therefore, students will have to read additional papers to be ready for discussion. Locating[1] such papers and judgment whether additional reading is necessary remains the personal duty of the presenting student. Each presentation is scheduled for a 30 minute oral presentation using Power Point or ADOBE PDF plus discussion (in total 45 minutes). **Students will have to supply a 4 page hand out summary of the seminar to the instructor (Calibri, 12 font, single-spaced, Hand out) and the final presentation in Power Point (or PDF) to arlinghaus@igb-berlin.de as well as supporting literature so this can be made available on the course moodle site.**

Excursion

Usually we have an excursion to a commercial lake and river fishery, but due to the Corona pandemic we have to skip this.

[1] To find accompanying papers and texts, students can first use the reference list of the papers supplied. Furthermore, students are expected to use standard search engines for scientific literature accessible through the library of the Humboldt-University (get access to it from home) or the IGB. Good starting points are the Web of Science or Google Scholar, but more dedicated search engines exist for fisheries literature (e.g., ASFA). Papers can be copied at personal costs at the IGB library (ask personnel in library for copy code and costs), if accessible. Otherwise, a loan service www.subito-doc.de can be used (at own charge). A possible private site to locate PDFs is www.sci-hub.se. See also Research Gate and simply type titles of papers in google.

Grading
Grading of the whole course is based on the final oral exam and the presentation giving in the course. The final oral exam will partly build on the seminar content. That means that questions are expected to be answered at a higher quality by a particular student, if the topic under investigation was the topic of the seminar of the respective student.

Date	Topic[2]	Text reading or other duties
Oct 28	Come together, discussion about expectations of students, overview of lecture *Introduction to fisheries from a systems perspective*	1. Suggested reading after class is Arlinghaus et al. (2017)
Nov 4	No lecture	2.
Nov 11	*History of Fisheries Science and Management*	1. Suggested reading before class Arlinghaus et al. (2002), Ch. 1 and 16 in Welcomme (2001), for interested people Ch. 1 in Hubert & Quist (2010) for inland fisheries and the excellent book by Smith (1994) for marine fisheries up until 1954.
Nov 18	*Contemporary status of global fisheries*	**1. Fisheries Management in Lake Constance** 2. SOFIA report by FAO (find on the web)
Nov 25	*The role of values and the emerging sustainability norm in fisheries science and management*	**1. Limitations and potentials of catch-based overfishing assessments** 2. Chapters 4 and 5 Hubert & Quist (2010), Ch. 10 – 15 in Charles for interested students

[2] If not otherwise stated, Dr. Arlinghaus is the lecturer

Dec 2	*Population dynamics of exploited fish stocks*	**1. Incentives and labelling** 2. Selected chapters in Hilborn & Walters (1992); Walters & Martell (2004), and particularly Ch. 2 by Allen & Hightower in Hubert & Quist (2010)
Dec 9	*The ecological impacts of fishing*	**1. Seminar on stock and recruitment** 2. Papers of Myers & Worm 2003, Worm et al. 2009; several papers by Ray Hilborn and Daniel Pauly, for habitat effects work by Michael Kaiser
Dec 16	*The evolutionary impacts of fishing*	**1. Seminar on the cod collapse in Newfoundland (*Gadus morhua*)** 2. Readings evolution in papers such as Jørgensen et al. (2007), Allendorf et al. (2009), Heino et al. (2013), Laugen et al. (2014)
Jan 6	*Data rich biomass-based and structured population models to estimate MSY*	**1. Seminar on managing recreational fisheries** 2. Ch. 4 and 8 in Welcome (2001) 3. Much better covered in King (1995), very useful with many examples to calculate MSY

Jan, 13	*Data poor yield estimation methods and rules of thumb*	**1. Seminar ecosystem-based management** **2.** Ch. 4 in Welcomme (2001), paper Lester et al. (2014)
Jan, 20	*Human dimensions and bioeconomics*	**1. Seminar assessing yield potential in lakes** 2. Chapter 2 in Saas & Allen, papers Hunt et al. (2013), Johnston et al. (2010, 2013), Parkkila et al. (2010)
Jan, 27	*Managing fisheries using regulations, habitat enhancement and stocking*	**1. Seminar on human dimensions of harvest regulations** 2. FAO (2012), Arlinghaus et al. (2016b), Ch. 11-14 in Welcome (2001), Ch. 5-9 in Charles, see also chapters in Saas & Allen and Hubert & Quist 3. Papers Lorenzen (2005), Lorenzen et al. (2010, 2012), Arlinghaus et al. (2015, 2016a), Johnston et al. (2018)
Feb 3	*Planning fisheries management and the choice of regulations and habitat management using software packages (FAST, Besatzfisch Hegeplanungssoftware)*	**1. Seminar on sustainable fish stocking** 2. Handouts for the FAST and Besatzfisch Software

Feb, 10	*Institutions for sustainable management and governance*	**1. Seminar on adaptive management** 2. Not well covered in Welcome and Charles, something is in Chapter 13 and 15 in Charles and Ch. 11 in Welcome, basis are Hardin and Ostrom's papers and the books by Elinor Ostrom
Feb, 17	*A general framework for management of inland fisheries*	**1. Seminar on avoiding the tragedy of the commons using lobsters** 2. Review Welcomme (2001) – guideline in the book before Ch. 1

Main textbooks and review papers to follow the lecture and prepare oral exam (prerequisite):

[1] Arlinghaus R., Mehner T. & Cowx I.G. (2002). Reconciling traditional inland fisheries management and sustainability in industrialized countries, with emphasis on Europe. Fish and Fisheries, 3, 261-316.

This review paper tackles most aspects in a general way (not in detail, but see reference list for in-depth information) and is the red line of the lecture. Download from personal homepage.

[2] Arlinghaus, R. et al. (2017). Understanding and managing freshwater recreational fisheries as complex adaptive social-ecological systems. Reviews in Fisheries Science and Aquaculture, online early

This review conceptualizes a systems view on recreational fisheries. Most arguments also apply to any form of small-scale capture fisheries (*will be made available on moodle*)

[3] Arlinghaus, R., Lorenzen, K., Johnson, B.M., Cooke, S.J., Cowx, I.G. (2016). Management of freshwater fisheries: addressing habitat, people and fishes. In J.F. Craig (ed.), Freshwater Fisheries Ecology. Wiley Blackwell. Oxford. 557-579. Paper is available at www.ifishman.de.

This review summarizes all available knowledge to manage online fisheries (*will be made*

available on moodle or on personal websites of the lecturer)

[4] Welcomme, R.L. (2001). Inland fisheries: ecology and management. Blackwell Science, Oxford, 358 pp.

This book provides a very good coverage of management issues in commercial inland fisheries, with emphasis on developing countries where commercial inland fishing is still very important. Some redundancies in the book, not very detailed. The most important aspects have also been separately published as journal articles in Fisheries Management and Ecology. Content is a must for the oral exam, with few exceptions (e.g., Ch. 9 and 10). Available in print form from the library of IGB, or as e book at the Thaer-Institute. Arlinghaus owns a private copy as well. Note there is a version online as PDF, see link above.

[5] Craig, J.F. (2016). Freshwater fisheries ecology. Blackwell Science, Oxford.

This book covers all details of inland fisheries in various case studies and gives excellent overviews of all relevant topics (e.g., managing using stocking, stock-recruitment, fisheries induced evolution in freshwater, climate change). Copy owned by Arlinghaus, but also a copy at IGB library.

[6] Charles, A. (2000). Sustainable fisheries systems. Blackwell Science, Oxford, 370 pp.

This book provides a systems perspective on fisheries management. A very good book on the dynamics and complexities of fisheries, but similar to Welcomme (2001) scratches the surface in some instances without providing too much detail. The focus is on marine fisheries, limited coverage of inland fisheries, no coverage of recreational fisheries! Chapters indicated above are an easy ead (it is an easy read without formulas!). Available in print form from the library of IGB, the copy is however in the office of Arlinghaus. Arlinghaus owns a PDF copy as well.

[7] Cochrane, K.L., S.G. Garcia (2009) A fishery manager’s guidebook. Wiley Blackwell, Oxford & FAO.

This book covers many of the essential of the lecture and provides a refreshing balance of social and natural science aspects. See above link to get access to the book

[8] Sass, G.G., Allen, M.C. (2014). Foundations of Fisheries Science. Am. Fish. Soc., Bethesda

This book reprints and discusses the key papers in fisheries science. The summary chapters are a must read for all students.

[9] FAO (2012). Technical Guidelines for Responsible Fisheries: Recreational Fisheries. No 13, FAO, Rome. Available online through FAO

All details on the specific of recreational fisheries management are given here.

[10] Hubert, W.A. & Quist, M. editors (2010). Inland fisheries management in North America (3rd edition). American Fisheries Society, Bethesda, 780 pp. – and follow up editions

This book provides perhaps the best coverage of fisheries management in freshwater fisheries. Focus is on recreational fisheries and on North America. Therefore, not always useful to translate to German conditions. Again, some aspects can only be understood by consulting the references cited. However, the references are far from extensive and are biased towards North American literature. Chapters indicated above should be read. Available in print form from the library of IGB, the copy is however in the office of Arlinghaus. Ask for copying of selected chapters or buy a copy on your own (moderately expensive).

Additional textbooks for interested people that cover some aspects better (optional)

King (1995). Fisheries Biology, Assessment & Management. (and updated texts from more recent years)

This book is a very good student reference for marine fisheries. Covers population dynamics and surplus yield production methods very good. Has nice examples to calculate, do some own calculations etc. I can highly recommend this book for those interested in understanding the population dynamics. Arlinghaus owns the second edition of this book, which is even better..

Pitcher T.J. & Hart, P.B. (1982). Fisheries ecology. Chapman & Hall, London, 414 pp.

This book is a very good information source for those interested in marine fisheries and the details of fisheries ecology. Is partly filled with equations and mathematics, but understandable. The book has many examples from freshwater fisheries, but mostly fisheries biology. Not necessarily nice graphics. A new version has been recently published (check internet where and for the prize). I do not know whether the content has been updated. At IGB, Thomas Mehner owns the 1982 copy. However, this copy is in the office of Arlinghaus.

Hart P.J.B. & Reynolds J.D. (2002). Handbook of Fish Biology and Fisheries, Vol. 2 Fisheries. Blackwell, Oxford, 410 pp.

This book is a very good information source on marine fisheries. Also recreational fisheries is tackled in one chapter. The human dimensions introduction is rather weak. Some model explanation, but not in a very good didactical for beginners. Therefore, advanced skills are necessary to understand the model chapters. In general, the book is a very, very good general overview and very timely in contrast to Pitcher & Hart (1982). There is a copy at IGB, located in the office of Arlinghaus.

Knudsen, E.E., MacDonald, D.D. & Muirhead, Y.K., editors (2004). Sustainable management of North American fisheries. American Fisheries Society, Bethesda, 281 pp.

A nice collection of case studies and essays, heavy focus on North American, but multiple fisheries covered. Arlinghaus has personal copy.

For interested people in quantitative approaches (not focus of this lecture, but may be relevant for future career)

Ricker, W.E. (1975). Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research of Canada, 382pp. (the bible!!, at IGB, office Arlinghaus)

Beverton, R. J. H. & Holt, S.H. (1957, reprint 1993). On the dynamics of exploited fish populations. Chapman and Hall, London. (available at IGB, another bible!)

Walters, C.J. & Martell, S.J.D. (2004). Fisheries ecology and management. Princeton University Press, Princeton, 399 pp. (Arlinghaus has personal copy, very nice read)

Hilborn, R. & Walters, C.J. (1992). Quantitative fisheries stock assessment: choice, dynamics & uncertainty. Chapman & Hall, New York, 570 pp. + CD Rom. (at IGB, office Arlinghaus, stock assessment focus, advanced skill)

German literature on commercial inland fisheries (partially outdated, but for many in the fisheries management "scene" guiding until today)

Arlinghaus, R. (2006). Der unterschätzte Angler. Kosmos, Stuttgart.

Arlinghaus, R. (2017): Nachhaltiges Management von Angelgewässern: Ein Praxisleitfaden. Berichte des IGB.

Arlinghaus, R., Cyrus, E.-M., Eschbach, E., Fujitani, M., Hühn, D., Johnston, F., Pagel, T., Riepe, C. 2015. Hand in Hand für eine nachhaltige Angelfischerei: Ergebnisse und Empfehlungen aus fünf Jahren praxisorientierter Forschung zu Fischbesatz und seinen Alternativen. Berichte des IGB, Heft 28.

Barthelmes, D. (1981). Hydrobiologische Grundlagen der Binnenfischerei. VEB Gustav Fischer Verlag, Jena, 253 pp. (at IGB)

Most important national and international journals (scientific progress is here!)

Fisheries Management and Ecology

North American Journal of Fisheries Management

Fish and Fisheries

Canadian Journal of Fisheries and Aquatic Sciences

Fisheries

Transactions of the American Fisheries Society

Fisheries Research

The key marine journals of interest are ICES Journal of Marine Science and Marine Ecology Progress Series.