Module Handbook

Marine Ecosystem and Fisheries Science

Content

Title:	**Introduction to Biological Oceanography and Fishery Sciences**				
Symbol:	BMARSYS-01				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Christian Möllmann, Phone: 42838 6621, christian.moellmann(at)uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Inga Hense Dr. Rolf Koppelmann Prof. Dr. Christian Möllmann Prof. Dr. Myron Peck Prof. Dr. Elisa Schaum Prof. Dr. Axel Temming				
language	German				
Educational concept	The students have basic knowledge of the production processes and their controlling factors in the ecosystems and food webs of the different regions of the world ocean. You will also have knowledge of important stocks of marine resources, fishing techniques and trends, and the tasks and methods of the fishery sciences. The students understand the relationship between biotic and abiotic factors influencing marine ecosystems, trophic interactions in food webs and the potential for human use. They thus know and understand basic questions, methods and the current state of knowledge in the fields of Biological Oceanography and Fishery Sciences.				
Contents	Regional Oceanography; taxonomic composition, life cycles, distribution and impact on key groups in phytoplankton, zooplankton, benthos and necton; Key habitats in shelf seas, the open oceans and the deep sea; Production processes and control structures in marine food webs; latitudinal gradients and biogeography; Life cycles of plankton species; taxonomic groups of commercial importance and their life cycles; fishing techniques and catch trends of main fish stocks using the example of e.g. cod and herring; introduction to the stock assessment, introduction to recruitment research, introduction to fisheries management.				
Courses:	• L: Basics in Biological Oceanography and Fishery Sciences • S: Current Literature in Biological Oceanography and Fishery Sciences				5 SEM./HRS 2 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Basics in Biological Oceanography and Fishery Sciences		*70*	*80*	*30*
	• S: Current Literature in Biological Oceanography and Fishery Sciences		*28*	*52*	*20*
	Total workload	*9*	*98*	*132*	*50*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation. *examinations:* Presentation (graded, 100%) and written or oral examination (pass /fail)				
Duration	one semester				
Frequency of occurrence	annual				
Literature:	H Charles B. Miller „Biological Oceanography“; Simon Jennings, Michael J. Kaiser and John D. Reynolds "Marine Fisheries Ecology				

Title:	**Organisms of Marine Systems**				
Symbol:	BMARSYS-02				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	PD Dr. Dörthe Müller-Navarra; doerthe.mueller-navarra (at) uni-hamburg.de				
lecturer	PD Dr. Dörthe Müller-Navarra				
language	German				
Educational concept	Students have knowledge of marine organisms from major marine systematic groups. They recognize the dependencies of abiotic and biotic factors on the occurrence and lifecycle strategies of marine organisms. They understand adaptations to a changing environment and its limits.				
Contents	Biological basics of marine organisms and their ecological context.				
Courses:	• L: Organisms of Marine Systems • S: Organisms of Marine Systems				1 SEM./HRS 1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Organisms of Marine Systems		*14*	*31*	*10*
	• S: Organisms of Marine Systems		*14*	*11*	*10*
	Total workload	3	28	42	20
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, presentation. *examinations:* Written or oral examination (pass /fail)				
Duration	one semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Experimental physics for biology students**				
Symbol:	PHY-BBIO-02				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Erika Garutti				
lecturer	N.N.				
language	German				
Educational concept	Students have knowledge of the physical fundamentals that enable them to understand measuring instruments and biological mechanisms and processes; They have a basic understanding of scientific methods and first experiences in the experimental setup, the recording of observations and the evaluation of measurement results.				
Contents	Mathematical basics, error calculation. Physical basics in the fields of mechanics, thermodynamics, mechanical vibrations and waves, electricity and magnetism, optics as well as atomic and nuclear physics. In the practical course simple experiments for a deeper understanding of the lecture material, acquaintance of measuring instruments, protocol management.				
Courses:	• L: Experimental physics • P: Practical course in physics				4 SEM./HRS 1,5 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Experimental physics		*56*	*49*	*30*
	• P: Practical course in physics		*21*	*24*	-
	Total workload	*6*	*77*	*73*	*30*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* None for the first partial examination, for the second partial examination successful completion of the practical course (colloquia, course protocols). *examinations:* The module examination consists of two partial examinations: The first partial examination (written interim exam, graded, 20 points, 40% of the module final grade) in the first half of the semester. The second part examination (written, graded, 30 points, 60% of the module grade) takes place at the end of the semester or during the semester break.				
Duration	one semester				
Frequency of occurrence	annual				
Literature:	Hüttermann et al.: Physik für Mediziner, Biologen, Pharmazeuten. de Gruyter, Berlin. In der jeweils aktuellen Auflage				

Title:	**Marine Biodiversity**				
Symbol:	BMARSYS-03				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Myron Peck, Tel.: 42838 6642, myron.peck(at)uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Inga Hense Dr. Rolf Koppelmann Prof. Dr. Christian Möllmann Prof. Dr. Myron Peck Prof. Dr. Elisa Schaum Prof. Dr. Axel Temming				
language	German				
Educational concept	Students have knowledge of marine biodiversity with a focus on phyto-, and zooplankton species, commercial fish as well as seabirds and mammals. They know how to assess biodiversity, exemplified in regional case studies (North-, Baltic Sea). Life cycles of key species and spatial distribution pattern are understood.				
Contents	Basics of marine biodiversity within its ecological context; life cycles of key species and state of the art biodiversity research topics				
Courses:	• L: Introduction in marine biodiversity I • S: Seminar to the field trip • P: Field trip • L: Introduction in marine biodiversity II • S: Current topics in marine biodiversity • P: Identification and description of marine species				2 SEM./HRS 1 SEM./HRS 3 SEM./HRS 1 SEM./HRS 1 SEM./HRS 2 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Introduction in marine biodiversity I		*28*	*50*	*10*
	• S: Seminar to the field trip		*14*	*20*	*10*
	• P: Field trip		*42*	*30*	
	• L: Introduction in marine biodiversity II		*14*	*30*	*10*
	• S: Current topics in marine biodiversity		*14*	*20*	*10*
	• P: Identification and description of marine species		*28*	*30*	-
	Total workload	*12*	*140*	*180*	*40*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, two presentations. *examinations:* Protocol (pass / fail), Written or oral examination (graded, 100%)				
Duration	two semesters				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Theoretical Ecology**				
Symbol:	BMARSYS-04				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Axel Temming, Tel.: 42838 6620, atemming(at)uni-hamburg.de				
lecturer	Prof. Dr. Axel Temming Prof. Dr. Christian Möllmann				
language	German				
Educational concept	The students know and understand theoretical aspects and backgrounds in ecology with a focus on biological oceanography and fishery sciences. They can mathematically describe relevant ecological processes and have the ability to quantitatively simulate these processes on a computer.				
Contents	Theoretical aspects and backgrounds in ecology with a focus on biological oceanography and fisheries; Processes at the individual level (e.g., mortality, growth, exponential function, energy budgets, metabolic theory, consumption); Processes at the population level (e.g., production, logistic population growth, cohort analysis); Species interaction processes (e.g., "allee effect", intra- and interspecific competition, mutalism, "numerical and functional response", food choice, eco-stochiometry, Lotka Volterra model); Ecosystem processes (size spectra, spatial structures, metapopulations, stability and energy fluxes in food webs.				
Courses:	• L: Introduction to theoretical ecology • E: Exercise to theoretical ecology				1 SEM./HRS 1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Introduction to theoretical ecology		*14*	*28*	
	• E: Exercise to theoretical ecology		*14*	*28*	*20*
	Total workload	*3*	*28*	*42*	*20*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation *examinations:* Exercise completion (pass / fail)				
Duration	one semester				
Frequency of occurrence	annual				
Literature:	M. Begon, C.R. Townsend and J.L. Harper “Ecology: From Individuals to Ecosystems“				

Title:	**Physical Oceanography and Marine Biogeochemistry**				
Symbol:	BMARSYS-05				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Inga Hense, Tel.: 42838 6641, inga.hense(at)uni-hamburg.de				
lecturer	Prof. Dr. Inga Hense				
language	German				
Educational concept	Students have basic knowledge in physical oceanography and biogeochemical cycles in the ocean. They understand the climatic relevance of the main marine biological processes and the key organisms involved.				
Contents	This course provides the basics of physical oceanography and introduces the most important marine biological processes that play an important role in matter cycling and in the energy budget; so-called functional organism groups are presented.				
Courses:	• L: Basics in Physical Oceanography and Marine Biogeochemistry • S: Seminar on Physical Oceanography and Marine Biogeochemistry				3 SEM./HRS 1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Basics in Physical Oceanography and Marine Biogeochemistry • S: Seminar on Physical Oceanography and Marine Biogeochemistry		*42* *14*	*61* *33*	*30*
	Total Workload	*6*	*56*	*94*	*30*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, Presentation *examinations:* Written or oral examination (pass / fail)				
Duration	one semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the course				

Title:	**Statistics and Programming with R**				
Symbol:	BMARSYS-06				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Christian Möllmann, Tel.: 42838 6621, christian.moellmann@uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Christian Möllmann Prof. Dr. Axel Temming				
language	German				
Educational concept	The students have acquired further knowledge in the statistical analysis and graphical representation of data in the programming language / environment R. They are familiar with basic statistical techniques as well as variance analysis methods, linear and non-linear regression techniques, and can translate them into R.				
Contents	Introduction to the programming language / environment R; statistical methods for the evaluation of scientific data; presentation of scientific results; parametric and nonparametric significance trends; analysis of variance; univariate and multivariate linear regression.				
Courses:	• L: Introduction to Statistics and Programming with R • E: Exercise in Statistics with R • L: Analysis of Variance and Regression with R • E: Exercise in Analysis of Variance and Regression with R				1 SEM./HRS 1 SEM./HRS 1 SEM./HRS 1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Introduction to Statistics and Programming with R		14	*46*	
	• E: Exercise in Statistics with R		14	*36*	*35*
	• L: Analysis of Variance and Regression with R		14	*46*	
	• E: Exercise in Analysis of Variance and Regression with R		14	*36*	*35*
	Total workload	*9*	*56*	*164*	*70*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, Presentation *examinations:* Exercise completion (pass / fail)				
Duration	Two semester				
Frequency of occurrence	annual				
Literature:	Alain F. zuur, Elena N. Ieno, Erik H.W.G Meesters „A Beginner´s Guide to R“; Michael J. Crawley "Statistics – An Introduction using R“ MJ Crawley "Statistics – An Introduction using R“; AF Zuur, JM Hilbe, EN Ieno „Beginner's Guide to GLM and GLMM with R“				

Title:	**Marine Ecosystem Modeling**				
Symbol:	BMARSYS-07				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Inga Hense, Tel.: 42838 6641, inga.hense (at) uni-hamburg.de				
lecturer	Prof. Inga Hense				
language	German				
Educational concept	Students are able to use the “modelling language”, to select the most appropriate methods and approaches for a number of specific applications, to formulate simple ecosystem models, to analyze and present the results. They have learned to identify and evaluate model strengths and weaknesses.				
Contents	The basics of model structures are explained, including factors and processes which are generally considered in aquatic ecosystem models. Focus will be on plankton dynamics: growth and mortality processes of phyto- and zooplankton. Examples of bio-geochemical models based on carbon and nitrogen are presented.				
Courses:	• L: Introduction to Marine Ecosystem Modeling • S: Presentation of the results from practicals • E: Practicals in Marine Ecosystem Modeling				1 SEM./HRS 1 SEM./HRS 2 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Introduction to Marine Ecosystem Modeling • S: Seminar - Presentation • E: Practicals in Marine Ecosystem Modeling		14 14 *28*	*30* *30* *34*	*20*
	Total Workload	*6*	*56*	*94*	*20*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, Presentation *examinations:* Written or oral examination (graded, 100%)				
Duration	Two semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the course				

Title:	**Laboratory Methods in Biological Oceanography and Fishery Sciences**				
Symbol:	BMARSYS-08				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Myron Peck, Tel.: 42838 6642, myron.peck@uni-hamburg.de				
lecturer	Jens-Peter Herrmann Dr. Rolf Koppelmann Prof. Dr. Myron Peck Prof. Dr. Elisa Schaum Prof. Dr. Axel Temming				
language	German				
Educational concept	The students have knowledge of important laboratory techniques in Biological Oceanography and Fisheries Sciences and thus the ability to keep marine organisms and to carry out and evaluate laboratory experiments.				
Contents	Basic laboratory techniques in Biological Oceanography and Fisheries Sciences; i.e. maintenance of phytoplankton and zooplankton cultures; keeping of fish; experiments on the effects of biotic (food quality and quantity, competition) and abiotic factors (temperature, salinity, oxygen content) on the reproduction and growth of different life stages of plankton organisms and fish.				
Courses:	• L: Laboratory Methods in Biological Oceanography and Fishery Sciences				3 SEM./HRS
	• S: Laboratory Methods in Biological Oceanography and Fishery Sciences				1 SEM./HRS
	• P: Laboratory Methods in Biological Oceanography and Fishery Sciences				6 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Laboratory Methods in Biological Oceanography and Fishery Sciences		*42*	*84*	
	• S: Laboratory Methods in Biological Oceanography and Fishery Sciences		*14*	*30*	
	• P: Laboratory Methods in Biological Oceanography and Fishery Sciences		*84*	*76*	*30*
	Total workload	*12*	*140*	*190*	*30*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, Presentation *examinations:* Protocol (graded, 100%)				
Duration	One semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Population Dynamics of Marine Resources**				
Symbol:	BMARSYS-09				
Semester:	Winter				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Axel Temming, Tel.: 42838 6620, atemming@uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Christian Möllmann Prof. Dr. Axel Temming				
language	German				
Educational concept	Students will have an overview of modern, theoretical methods for analysing population dynamics of marine resources in the context of ecosystem and fisheries management. They are also capable of understanding and calculating the basic models applied in fisheries assessment to derive quota advice.				
Contents	Quantitative recording of important parameters of a population and their variability; introduction to the models and concepts applied in fisheries management; methods for estimating biomass and abundance and their change by mortality, growth and reproduction; fishing mortality and natural mortality, modeling of stomach evacuation and consumption rates, fishing effort and catch per unit of effort, Shepherd model and logistic biomass growth; Beverton and Holt Model and growth overfishing, virtual population analysis and catch quota calculation; management concepts and the principle of multi-species models; food web modeling				
Courses:	• L: Population Dynamic Models • S: Assessment of Marine Resources • E: Modeling Marine Resources				2 SEM./HRS 1 SEM./HRS 3 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Population Dynamic Models		*28*	*23*	
	• S: Assessment of Marine Resources		*14*	*13*	
	• E: Models for Modeling Marine Resources		*42*	*30*	*30*
	Total workload	*6*	*84*	*66*	*30*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, presentation *examinations:* Written or oral examination (graded, 100%)				
Duration	One semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Ecosystem Management and Environmental Policy**				
Symbol:	BMARSYS-10				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Christian Möllmann, Tel.: 42838 6621, christian.moellmann@uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Christian Möllmann				
language	German				
Educational concept	The students are aware of the political and legal background of environmental protection and resource management with a focus on Germany and the EU. They know various "assessment" methods in environmental protection and resource management, as well as the concepts and principles of ecosystem-based management. Students are also able to discuss and evaluate problems and conflicts within ecosystem management.				
Contents	Basic principles of the management of marine ecosystems; development of a sector-specific focus (eg fishing, pollution, etc.) on an Ecosystem Approach to Management (EAM) approach, legal and political background of EAM; international agreements and current EU directives; principles, concepts and instruments of the EAM (e.g. indicator systems, marine protected areas), case studies of the EAM; approaches to the assessment of marine ecosystems; problems between ecosystem management and nature conservation; conflicts between ecological, economic and social interest groups				
Courses:	• L: Ecosystem Management and Environmental Policy • S: Current Topics in Ecosystem Management and Environmental Policy				2 SEM./HRS 2 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Ecosystem Management and Environmental Policy		*28*	*42*	*40*
	• S: Current Topics in Ecosystem Management and Environmental Policy		*28*	*42*	
	Total workload	*6*	*56*	*84*	*40*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, presentation *examinations:* Exercise completion (graded, 100%)				
Duration	One semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Field Methods in Biological Oceanography and Fishery Sciences**				
Symbol:	BMARSYS-11				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Axel Temming, Tel.: 42838 6620, atemming@uni-hamburg.de				
lecturer	Dr. Jens Floeter Jens-Peter Herrmann Dr. Rolf Koppelmann Prof. Dr. Christian Möllmann Prof. Dr. Myron Peck Prof. Dr. Elisa Schaum Prof. Dr. Axel Temming				
language	German				
Educational concept	The students are familiar with the sampling techniques of marine research. They have the ability to use sampling equipment from research vessels and in shallow water. Furthermore, they have the ability to plan, carry out, and analyse the results of the sampling of different trophic levels of marine ecosystems in small project groups. They can set the results of these analyses in the context of current research topics of Biological Oceanography and Fisheries Sciences.				
Contents	Sampling techniques of marine research, i.e. plankton nets, fishing gear, hydro-acoustic methods, video-assisted zooplankton sampling, benthos grabs and dredges; basic population and community characteristics (e.g., species composition, abundance, biomass, population structure, growth, condition, reproduction, mortality)				
Courses:	• L: Field Methods in Biological Oceanography and Fishery Sciences • S: Field Methods in Biological Oceanography and Fishery Sciences • P: Field Methods in Biological Oceanography and Fishery Sciences				3 SEM./HRS 1 SEM./HRS 6 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Field Methods in Biological Oceanography and Fishery Sciences		*42*	*80*	
	• S: Field Methods in Biological Oceanography and Fishery Sciences		*14*	*20*	
	• P: Field Methods in Biological Oceanography and Fishery Sciences		*84*	*80*	*40*
	Total workload	*12*	*140*	*180*	*40*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation, presentation *examinations:* Protocol (graded, 100%)				
Duration	One semester				
Frequency of occurrence	annual				
Literature:	Will be announced at the beginning of the module				

Title:	**Multivariate Statistics with R**				
Symbol:	BMARSYS-12				
Semester:	Summer				
Module type	• Compulsory module				
Formal requirements for participation	Successful completion of "Statistics and Programming with R" is recommended				
Executive professor	Prof. Dr. Christian Möllmann, Tel.: 42838 6621, christian.moellmann@uni-hamburg.de				
lecturer	Dr. Jens Floeter Prof. Dr. Christian Möllmann Prof. Dr. Axel Temming				
language	German				
Educational concept	Students have acquired advanced knowledge in the statistical analysis and graphical representation of data in the R programming language / environment. They know various multivariate statistical methods and can implement them in R.				
Contents	Introduction to the programming language / environment R; statistical methods for the evaluation of scientific data; cluster analysis; multidimensional scaling, principal component analysis				
Courses:	• L: Multivariate Statistics with R • E: Exercise to Multivariate Statistics with R				3 SEM./HRS 1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Multivariate Statistics with R		*14*	*26*	
	• E: Exercise to Multivariate Statistics with R		*14*	*26*	*20*
	Total workload	*3*	*28*	*52*	*20*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* Active participation *examinations:* Exercise completion (graded, 100%)				
Duration	One semester				
Frequency of occurrence	annual				
Literature:	AF Zuur, IE Ieno, GM Smith “Analysing Ecological Data”; D Borcard, F Gillet, P Legendre “ Numerical Ecology with R”				

Title:	**External Internship**				
Symbol:	BMARSYS-13				
Semester:	Winter or Sommer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Christian Möllmann, Tel.: 42838 6621, christian.moellmann@uni-hamburg.de				
lecturer	N.N.				
language	German				
Educational concept	The students acquire knowledge about their own abilities, talents, interests, possibilities in the practical application in the professional field and recognize own deficits.				
Contents	Applying acquired knowledge to practice; working areas, industry structure, operational procedures, biological areas in economy, administration and authorities				
Courses:	• L: Job descriptions of biologists • P: External internship (at least 4 weeks)				2 SEM./HRS 6 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• L: Job descriptions of biologists		*28*		
	• P: External internship		*142*		*10*
	Total workload	*6*	*180*	-	*10*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* none *examinations:* Project completion (confirmation of activities by the company)				
Duration	one semester				
Frequency of occurrence	Each semester				
Literature:					

Title:	**Examining Module**				
Symbol:	BMARSYS-14				
Semester:	Winter or Sommer				
Module type	• Compulsory module				
Formal requirements for participation	The compulsory modules scheduled for the first three semesters must be completed successfully. Successful participation in compulsory modules scheduled for the fourth semester is strongly recommended				
Executive professor	N.N.				
lecturer	N.N.				
language	German				
Educational concept	Students acquire in-depth knowledge of selected basic and / or current research topics. They can put a research question in the context of marine biological and fishery science topics and have understood the complexity of ecological processes.				
Contents					
Courses:	• S: Preparation Seminar				1 SEM./HRS
Workload	• S: Preparation Seminar	*credits*	P (hrs) *14*	S(hrs)	EP (hrs) *166*
	Total workload	*6*	*14*	-	*166*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* none *examinations:* Oral examination (100%)				
Duration	one semester				
Frequency of occurrence	Each semester				
Literature:					

Title:	**Introduction to Scientific Work**				
Symbol:	BMARSYS-15				
Semester:	Sommer				
Module type	• Compulsory module				
Formal requirements for participation	none				
Executive professor	Prof. Dr. Christian Möllmann, Tel.: 42838 6621, christian.moellmann@uni-hamburg.de				
lecturer	N.N.				
language	German				
Educational concept	Students have the ability to write or critically review and evaluate scientific applications and articles, conduct literature research, and have experience with databases; professional presentation through knowledge of different presentation techniques.				
Contents	Introduction to scientific work: development of a research question; preparing an overview article on a current topic or creating a research proposal; scientific presentation in the form of a lecture.				
Courses:	• E: Introduction to Scientific Work				1 SEM./HRS
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	• E: Introduction to Scientific Work		*14*		*166*
	Total workload	*6*	*14*	-	*166*
Grading framework (possibly including examinations)	*Formal requirements for examinations:* none *examinations:* Oral examination (100%)				
Duration	one semester				
Frequency of occurrence	Each semester				
Literature:					

Title:	**Project**				
Symbol:	BMARSYS-16				
Semester:	Winter or Sommer				
Module type	• Compulsory module				
Formal requirements for participation	Advanced knowledge of biology is recommended. Occasionally individual elective and / or compulsory elective modules are recommended.				
Executive professor	N.N.				
lecturer	N.N.				
language	German				
Educational concept	Students acquire in-depth knowledge of selected basic and / or advanced research topics. In marine biological and fishery science project studies, the students' ability to actively develop and reflect on detailed insights will be reinforced, scientific research and the presentation of scientific findings will be intensified. Through advanced marine-biological case studies, students are introduced to ways of working and developing own ideas in research.				
Contents	Project specific				
Courses:	• Project Study				1 SEM./HRS
Workload	• Project Study	*credits*	P (hrs)	S(hrs)	EP (hrs)
	Total workload	*6*	*180*		
Grading framework (possibly including examinations)	*Formal requirements for examinations:* none *examinations:* Examination (pass or fail)				
Duration	one semester				
Frequency of occurrence	Each semester				
Literature:					

Title:	**Final Module**				
Symbol:	BMARSYS-AB				
Semester:	Winter or Sommer				
Module type	• Compulsory module				
Formal requirements for participation	Advanced knowledge of biology, usually proven by the successful completion of modules amounting to 120 credit points. Sometimes specific modules are recommended.				
Executive professor	N.N.				
lecturer	N.N.				
language	German				
Educational concept	Students acquire in-depth knowledge of selected basic and / or current research topics.				
Contents	In-depth study of a current or fundamental biological topic in the working group of a university teacher with experimental design, preparation of a work plan and if necessary revision of it within the progress of the project, literature research (in the library and with data bases), learning the subject-specific methodology, documentation and (statistical) evaluation of the data, evaluation of results, critical discussion compared to scientific publications and lectures.				
Courses:					
Workload		*credits*	P (hrs)	S(hrs)	EP (hrs)
	Total workload	*12*	*360*		
Grading framework (possibly including examinations)	*Formal requirements for examinations:* none *examinations:* Exam components of the final module are the written preparation of the Bachelor thesis (graded 100%) and an oral exam (pass or fail). The Bachelor thesis can be written in German or English. The Bachelor thesis is to be preceded by a summary in English and German. (pass or fail)				
Duration	one semester				
Frequency of occurrence	Each semester				
Literature:					