Appendix 1
DEFINITIONS OF MARINE BIOTECHNOLOGY

In 1991, the World Bank commissioned a study on marine biotechnology for the developing countries (Zilinskas and Lundin, 1993). As part of that study, scientists in many countries were asked how they defined the term "marine biotechnology." The following list of definitions, reproduced with permission from the World Bank, contains their replies.

"Given the fact that biotechnology is any aspect of biological system that makes money, I would say that marine biotechnology is any aspect of biotechnology that either directly concerns aquatic (marine and freshwater) systems or had as its origin an aquatic biological system."
(Dr. Joseph Bonaventura, Director Marine Biomedical Center, Duke University Marine Laboratory, North Carolina)

"Marine biotechnology as the application of molecular biological techniques/methods to the production or modification of potential commercial products. This might include the use of marine species for the application, or the use of molecular bio-techniques in the marine environment."
(Dr. David L. Nebert, Assistant Director for Research and Administration, Institute of Marine Science, University of Alaska-Fairbanks, Alaska)

"Our definition of marine biotechnology is the use of biotechnology for studies of marine organisms or the use of marine organisms for applications in the field of biotechnology."
(Dr. Bert Ely, Director Institute for Biological Research and Technology, University of South Carolina, S.C.)
"I would say that marine biotechnology is the use of all the tools and knowledge in the life sciences to produce a desired effect on or for mankind."
(Dr. Robert S. Jones, Director Marine Science Institute, University of Texas at Austin, Texas)

"Marine biotechnology is the manipulation of marine organisms to produce a beneficial product for humankind."
(Dr. Ken S. Price, Associate Dean, College of Marine Studies, Lewes, Delaware)

"The manipulation and/or use of all or part of a specific marine biological system to generate a desired product or products."
(Dr. Donald W. Remi, Senior Research Fellow, FMC Corporation, Maine)

"I would define marine biotechnology simply as the application of the techniques of modern molecular biology to marine biology. It covers the use of these techniques to study the biology of marine organisms as well as exploit practical applications of molecules derived from marine organisms."
(Dr. Norman R. Withington, Director of Research, Associates of Cape Cod, Inc., Massachusetts)

"Marine biotechnology can be defined as the efficient utilization of marine living resources or their components to provide desirable products and services."
(Dr. M. Chandrasekaran, Microbiology Laboratory, Department of Applied Chemistry, Cochin University of Science and Technology, Kochi 682022, India)

"Marine biotechnology, an extension of marine biology, blends science and technology to develop the methods for mass production and processing of marine organisms for a wide range of industrial and commercial uses."
(Dr. Naipo Chaikam, Department of Microbiology, Faculty of Science, King Mongkut's Institute of Technology Thonburi, Bangmod, Bangkok 10140, Thailand)

"Marine biotechnology is a branch of marine science dealing with marine organisms to enhance the production of food, feed and chemicals for the betterment of mankind."
(Dr. N.B. Bhode, National Institute of Oceanography, Dona Paula, Goa 403 004, India)
"I consider that any proven technology, which is aided by the biological systems, can be called biotechnology, so one can apply this definition to marine biotechnology."

(Dr. M.S. Anitha, Department of Microbiology, Government Institute of Science, Nagercoil, Trichy Caves Road, Auranagabid 431 704, India)

"I would like to define marine biotechnology from my understanding that any marine biological knowledge which could be applied to increase yield or marine products is marine biotechnology. Marine biotechnology is very wide in the sense, there are a lot of things to be done in the field of marine biotechnology. For example, only marine bacteria and marine plankton can play very important role in marine biotechnology."

(Prof. Pee Wee Homchong, Director Institute of Marine Science, Burapha University, Bangsaen, Chonburi 20131, Thailand)

"The term biotechnology generally implies the application of technology to organisms. In other words, we try to mould the organisms or its function to achieve our target. Nonetheless, to say better exploration and exploitation of the ocean and the organisms therein for the transmogrification of mankind. We would like to define marine biotechnology as the application of genetic engineering to marine sciences i.e. to utilize the untapped gene pool in:

1. The transport of minerals (nutrient cycle)
2. Novel photosynthetic system (primary production)
3. Utilization of H2S, NH3, H2 etc (chemosynthesis)
4. Production of fish, mollusks, crustaceans in natural and hatchery system (secondary and tertiary production)
5. Marine pheromones, toxins and pharmacological compounds."

(Prof. Shanta Achuthankuty, National Institute of Oceanography, Dona Paula, Goa 403 004, India)

"Marine biotechnology is the application of marine organisms including their systems or processes for the manufacture of industrial products and for the practical solution of problems created by human activity.

(Milagrosa R. Martinez, Associate professor and Director, Learning Resource Center, University of Philippines at Los Banos, College, Laguna 3720, Philippines).
"The application of biological sciences which utilizes living marine organisms, their cells or parts of cells to produce goods and services."
(Prof. S.T. Chang, Department of Biology, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong)

"I shall define marine biotechnology as the commercial exploitation of living marine organisms or their components. The organisms will include microbes, and also plants as well as animals; the later will encompass the application of molecular biology and cell culture techniques."
(P.M. Sabhath Sehriya, Post Graduate Lecturer in Microbiology, Post Graduate Department of Microbiology, Sri Panamakary College, 29 West Car Street, Kalabakkuchchi 627 416, Tamilnadu, India)

"The definition about marine biotechnology managed by the Institute is the same used in other Latin America countries and in Europe, any technology used to increase production where the final product has commercial importance. In this sense, in USA and Canada this concept is much more restricted and its use has been applied to technology where only DNA is manipulated."
(Prof. Patricio Bernal Ponce, Executive Director, Instituto de Fomento Pesquero, Jose Domingo Caras 2277, Casilla 1287, Santiago, Chile)

"I define marine biotechnology as: The use of marine organisms or their genetic information, for applications on aquaculture, pharmacology, and pollution control."
(Prof. M.L. Lizarraga-Pazza, Centro de Investigacion Cientifica y de Educacion Superior de Ensenada, Av. Espinoza No. 843, Apartado Postal 2732, Ensenada, Baja California, Mexico)

"Marine biotechnology is the science dealing with the study of marine organisms (preferentially microorganisms and plants) at a molecular level, specially on their genetic structure and on the techniques that could be used to modify or improve their genomes in order to produce substances (food, medicines, etc.) at a high quality and quantity level or to degrade debris and undesirable substances in by-products useful to mankind."
(Prof. Enrique C. Mateo, Fondo de Reactivacion del Sector Pesquero, German Schreiber 198, Fraccia 720, Miraflores, Lima, Peru)
"Marine biotechnology is the integration of advances in marine microbiology, marine biochemistry (including cell biology, molecular biology, and molecular genetics), marine biology and process engineering, for application in such areas as food and feed industry, pharmaceutical industry, environmental pollution and energy, medical diagnostics, fermentation industry, and chemical industry."
(Dr. Gideon Abu, Department of Microbiology, Box 274, University of Port Harcourt, Port Harcourt, Nigeria)

"I would want to define marine biotechnology as studies and development of marine (aquatic) resources for human welfare using the available biomolecular tools as well as developing newer and better research tools for application and improvement– enhancement of our understanding of marine (aquatic) life in general."
(Dr. S.O. Emeghae, Iboro State University, P.M.B. 2000, Okpala, Iboro State, Nigeria)

"In my opinion, the task of biotechnology is to synthesize the modern theory and methods of engineering and biology to research the variations of biological structure and function on different levels and artificially to control these variations by using engineering and technique, in order to develop some new types of industry or new biological products on a large scale, such as genetic engineering, cell engineering, enzyme engineering, microbial engineering, biochemical engineering and the technique of comprehensive utilization for biological resources."
(Dr. Chen Dayi, Institute of Oceanology, Academia Sinica, 7 Nan-Hai Road, Qingdao, Shandong, People's Republic of China)

More recently, the U.S. House of Representatives has represented marine biotechnology to mean "the application of molecular and cellular biology to marine and fresh water organisms for the purpose of identifying, developing, and enhancing products derived from these organisms."
Appendix 2

Marine Biotechnology Questionnaire for Research Units

For this questionnaire, we define marine biotechnology as any scientific investigation that focuses on marine organisms and that utilizes new cell, protein and nucleic acid technologies such as recombinant DNA, hybridoma/monoclonal production, protein engineering, polymerase chain reaction, DNA hybridization, and other related technologies.

Areas related to marine biotechnology include aquaculture/ mariculture research, fisheries research, marine biology, biochemistry/physiology of marine organisms, phycology, fermentation processes that utilize marine organisms, and marine natural products chemistry.

I. Respondent Criteria

Are you a researcher engaged in full-time research in marine biotechnology or a marine biotechnology-related area?

[ ] Marine biotechnology

[ ] Marine biotechnology-related area

[ ] Neither (If this is checked, please complete only the next section; i.e., Section II: Respondent Information.)
II. Respondent Information

(Please answer all questions. Type or print clearly. Do not use home address or telephone number.)

Last name: ________________________________________________

First name: ________________________ Middle initial: ______

Your position: ___________________________________________

Department: ______________________________________________

Institution: ______________________________________________

Address: ________________________________________________

________________________________________________________

Telephone: ____________________________

Facsimile (FAX): ________________________

Time for Interview: ________________________

III. Information about Research, Personnel and Facilities

A. Please circle the type of institution that your laboratory or unit is affiliated with.

1. University or similar institution of higher learning.
2. Research unit or center associated with a university.
4. State research center (please specify state).
5. Industry-connected basic research laboratory.
6. Industry-connected applied or developmental laboratory.

B. Please consider the following research areas

1. Aquaculture
16. Immunology
2. Biochemistry  
3. Biomolecules/Toxins  
4. Bioremediation  
5. Cell Biology  
6. Chemistry, Natural Products  
7. Chemistry, Polymer  
8. Developmental Biology  
9. Ecology  
10. Engineering, Bioprocess  
11. Engineering, Chemical  
12. Enzymology  
13. Fisheries  
14. Food Science  
15. Genetics  
17. Macroalgae  
18. Marine biology  
19. Microalgae  
20. Microbiology  
21. Molecular Biology  
22. Neurobiology  
23. Oceanography  
24. Oncology  
25. Pharmacology  
26. Physiology  
27. Toxicology  
28. Transgenic Fish  
29. Other (specify)

Please enter by number the two areas listed above that best describe your research focus:

C. Please consider the following applications areas:
1. Agrochemicals  
2. Aquaculture/mariculture  
3. Basic research  
4. Biodegradation/Biofouling  
5. Bulk chemicals  
6. Diseases of marine organisms  
7. Energy/Biomass  
8. Environment/Bioremediation  
9. Fermentation Processes  
10. Food products  
11. Human health care/Public health  
12. Naval Defense/Warfare  
13. Pharmaceuticals/Fine chemicals  
14. Other (specify)

From the above list, please indicate by number the one or two marine biotechnology application(s) that fits your research most closely:

D. Has any of the research done at your laboratory in the last three years been applied commercially?
   Yes  
   No

If YES, please list the commercial product(s) or process(es):
E. Has any discoveries made by your laboratory led to patents or patent applications?
   Yes No

If YES, please indicate:
   1. Number of patent(s) received:
   2. Patent number(s) (registry of patents):

   3. Application number(s) of patents applied for:

F. Please indicate by circling the organisms that you use most often in
   your research or that your research is focussed on (up to three
   organisms).

1. Finfish
2. Shellfish
3. Molluscs
4. Macrololge
5. Microalgae
6. Virus
7. Bacteria
8. Fungi
9. Zooplankton
10. Phytoplankton
11. Marine macro-organisms
12. Marine microorganisms
13. Protozoa
14. Nematodes (worms, etc.)
15. Insects
16. Other (please specify)

G. Please consider the following list of advanced biotechnology
   techniques:

1. Cell Culture
2. DNA Library
3. DNA Probe Construction
4. Hybridoma/Monoclonal Construction
5. In Situ hybridization
6. Polymerase Chain Reaction
7. Protein Engineering
8. Transcription Amplification System
9. Gene cloning
10. Restriction enzyme analysis
11. Restriction fragment analysis
12. Cell fusion
13. Microinjection
14. Hybrid analysis
15. Classical genetics (breeding)—animals
8. Protein Sequencing  
9. Recombinant DNA  
18. Classical genetics (breeding)—plants  
19. Other (please specify):

Please list by number, and in decreasing order of priority, up to three of the advanced biotechnology techniques in which your laboratory has strong expertise:

H. Please provide the number of full-time personnel in your laboratory:
   1. Scientists:
   2. Post-docs:
   3. Graduate students:
   4. Technicians:
   5. Other faculty (including visiting):
   6. Undergraduate students:

I. Please indicate by circling the range which best represents that total annual budget for marine biotechnology for your laboratory:
   1. $1-10,000  
   2. $10,001-50,000  
   3. $50,001-100,000  
   4. $100,001-250,000  
   5. $250,001-500,000  
   6. $500,001-1 million  
   7. $1-5 million  
   8. Over $5 million

J. Has this budget increased or decreased over the previous three year period?
   
   Increased  
   Decreased
   
   By approximately what %?

K. Would you estimate that this budget will increase or decrease in the next three years?
   
   Increase  
   Decrease
   
   By approximately what %?

L. What are the sources of research funding for your laboratory?  
   (Total should equal 100%.)
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1. Sea Grant ....................................................%  
1a. NOAA but not Sea Grant .................................%  
2. ONR/U.S. Navy ................................................%  
3. NIH/NCI ........................................................%  
4. NSF ............................................................%  
5. USDA ............................................................%  
6. FDA ..............................................................%  
7. DARPA ..........................................................%  
8. US Army/USAMRID ..........................................%  
9. Other federal (please list) ...............................%  
10. State source(s) (please name program) ...............%  
11. University ....................................................%  
12. Private foundation(s) (please name) .................%  
13. Industry (please name company) .......................%  
14. International source(s) (such as FAO, UNDP, WHO, UNESCO, etc.—please specify agency)] ...........%  
15. Other (specify) ...............................................%  

M. Does your laboratory have:  
1. MacArthur fellow(s)? Yes No  
2. NSF predoctoral fellow(s)? Yes No  
3. NSF postdoctoral fellow(s)? Yes No  
4. NIH Career Awardee(s)? Yes No  

[If YES], please indicate which category and how many?
N. Briefly describe your marine biotechnology or marine biotechnology-related research focus:

O. Does your laboratory have collaboration(s) with industry?
   Yes ___  No ___
   [If YES], briefly describe this collaboration and name the industry.

P. Does your laboratory have collaboration(s) with a laboratory or laboratories on other countries?
   Yes ___  No ___
   [If YES], briefly describe this collaboration and name the collaborating laboratories:

In order to get a better idea of the scope of marine biotechnology research and development in the U.S., an additional question has been added to this survey. We apologize for the additional time.

Q. Are there additional laboratories doing research in marine biotechnology or marine biotechnology-related area in your institution?
   Yes ___  No ___
   [If YES]: Of the total amount of funds spent on marine biotechnology research in your institution, please estimate the percentage which your laboratory receives.

Approximately what %? ___________
Appendix 3

Marine Biotechnology Questionnaire for Industry

For this questionnaire, we define marine biotechnology as any scientific investigation that focuses on marine organisms and that utilizes new cell, protein and nucleic acid technologies such as recombinant DNA, hybridoma monoclonal production, protein engineering, polymerase chain reaction, DNA hybridization, and other related technologies.

Areas related to marine biotechnology include aquaculture/mariculture research, fisheries research, marine biology, biochemistry/physiology of marine organisms, phycology, fermentation processes that utilize marine organisms, and marine natural products chemistry.

1. Respondent Criteria

Is your firm engaged in research in marine biotechnology or a marine biotechnology-related area?

[ ] Marine biotechnology

[ ] Marine biotechnology-related area

[ ] Neither (If this is checked, please complete only the next section; i.e., Section II: Respondent Information.)
II. Respondent Information

(Please answer all questions. Type or print clearly. Do not use home address or telephone number.)

Last name: ____________________________

First name: ____________________________ Middle initial: _______

Your position: __________________________

Department: ____________________________

Institution: ____________________________

Address: ____________________________

________________________________________________________________

________________________________________________________________

Telephone: ____________________________

Facsimile (FAX): ______________________

III. Information about Research, Personnel and Facilities

A. Please circle the type of business (**Choices like public sector/private, etc.).
   2. U.S. Corporation.
   3. Partnership.
   5. Family Owned.
   7. Other (please specify).

B. Year Firm Established: ____________

The following questions refer only to marine biotechnology or marine biotechnology-related area:
C. Please consider the following research areas:

1. Aquaculture
2. Biochemistry
3. Biometabolites/Toxins
4. Bioremediation
5. Cell Biology
6. Chemistry, Natural Products
7. Chemistry, Polymer
8. Developmental Biology
9. Ecology
10. Engineering, Bioprocess
11. Engineering, Chemical
12. Enzymology
13. Fisheries
14. Food Science
15. Genetics
16. Immunology
17. Macroalgae
18. Marine biology
19. Microalgae
20. Microbiology
21. Molecular Biology
22. Neurobiology
23. Oceanography
24. Oncology
25. Pharmacology
26. Physiology
27. Toxicology
28. Transgenic Fish
29. Other (specify)

Please enter by number the two areas listed above that best describe your firm's research focus: ______________________

D. Please consider the following applications areas:

1. Agrochemicals
2. Aquaculture/aquaculture
3. Basic research
4. Biodegradation/Biofueling
5. Bulk chemicals
6. Diseases of marine organisms
7. Energy/Biomass
8. Environment/Bioremediation
9. Fermentation Processes
10. Food products
11. Human health care/Public health
12. Naval Defense/Warfare
13. Pharmaceuticals/Fine chemicals
14. Other (specify)

From the above list, please indicate by number the one or two marine biotechnology application(s) that fits your firm's research program most closely: ______________________

E. Has any of the research done at your firm in the last three years led to marketable products?
   Yes    No
If YES, please list the commercial product(s) or process(es):

Product

Annual Sales Volume (if available)

F. Has any discoveries made by your firm led to patents or patent applications?

Yes

No

If YES, please indicate:

1. Number of patent(s) received: __________

2. Patent number(s) (registry of patents):

3. Application number(s) of patents applied for:

G. Please indicate by circling the organisms that your firm uses most often in its research program or that its research program is focussed on (up to three organisms).

1. Fish
2. Shellfish
3. Molluscs
4. Macroalgae
5. Microalgae
6. Virus
7. Bacteria
8. Fungi
9. Zooplankton
10. Phytoplankton
11. Marine macroinvertebrates
12. Marine microinvertebrates
13. Protozoa
14. Nematodes (worms, etc.)
15. Insects
16. Other (please specify)

H. Please consider the following list of advanced biotechnology techniques:

1. Cell Culture
2. DNA Library
3. Transcription Amplification System
4. Gene cloning
3. DNA Probe Construction
4. Hybridoma/Monoclonal Construction
5. In Situ hybridization
6. Polymerase Chain Reaction
7. Protein Engineering
8. Protein Sequencing
9. Recombinant DNA
12. Restriction enzyme analysis
13. Restriction fragment analysis
14. Cell fusion
15. Microinjection
16. Hybrid analysis
17. Classical genetics (breeding)—animals
18. Classical genetics (breeding)—plants
19. Other (please specify)

Please list by number, and in decreasing order of priority, up to three of the advanced biotechnology techniques in which your firm's research laboratory or laboratories have strong expertise:

_______  _______  _______

1. Please provide the number of personnel in your firm's research laboratory or laboratories:
   1. Senior Scientists/Researchers: __________
   2. Junior Scientists: __________  3. Post-docs: __________
   4. Technicians: __________
   5. Other Scientists (including visiting): __________

2. Please indicate by circling the range which best represents the total annual budget for marine biotechnology or marine biotechnology-related research at your firm:
   1. $1-10,000
   2. $10,000-50,000
   3. $50,001-100,000
   4. $100,001-250,000
   5. $250,001-500,000
   6. $500,001-1 million
   7. $1-5 million
   8. Over $5 million

K. Has this budget increased or decreased over the previous three year period?
   Increased  Decreased

By approximately what %?
1. Would you estimate that this budget will increase or decrease in the next three years?
   Increased  Decreased

By approximately what %?

M. What are the sources of funding for your firm’s research program?
   (Total should equal 100%.)
   1. Sea Grant .............................................. %
   1a. NOAA but not Sea Grant ......................... %
   2. ONR/U.S. Navy ....................................... %
   3. NIH/NCI ............................................. %
   4. NSF ................................................ %
   5. USDA ............................................... %
   6. FDA ................................................. %
   7. DARPA ................................................ %
   8. US Army/USAMRIID ................................. %
   9. Other federal (please list) ....................... %
   10. State source(s) (please name program) ........ %
   11. University ....................................... %
   12. Private foundation(s) (please name) .......... %
   13. Industry (please name company) .............. %
   14. International source(s) (such as FAO, UNDP, WHO, UNESCO, etc.—please specify agency) ...... %
   15. Other (specify) .................................... %

N. Briefly describe your firm’s marine biotechnology or marine biotechnology-related research focus:
O. Does your firm have collaboration(s) with a university or universities?
   Yes
   No

If YES, briefly describe this collaboration and name the university or universities:

P. Does your firm's researchers have collaboration(s) with a laboratory or laboratories in other countries?
   Yes
   No

If YES, briefly describe this collaboration and name the collaborating laboratories:

Q. Are there other firms doing research in marine biotechnology or marine biotechnology-related area that you are aware of?

If YES, please name.

R. Of the total amount of funds spent on research and development in your firm, please estimate the percentage which marine biotechnology or marine biotechnology-related research receives.

Approximately what %
Appendix 4

FOREIGN MARINE BIOTECHNOLOGY-RELATED RESEARCH INSTITUTES

The following list of foreign marine biotechnology or marine biotechnology-related research institutes is not comprehensive; the list merely reflects the names of institutes and laboratories that we have come across while undertaking the present study. Obviously, many countries, and many institutes in listed countries, are missing from the list. The list is placed in this report to give the reader an idea of the number and variety of scientific institutes that there are in the world dedicated to performing marine biology and marine biotechnology-related research.

ARGENTINA
University of Buenos Aires
Faculty of Sciences
Department of Biological Sciences

AUSTRALIA
Brackish Water Fishery Culture Research Station (Salamander Bay)
Commonwealth Scientific and Industrial Research Organization
Division of Chemistry and Wood Technology
Division of Entomology
Division of Fisheries
Division of Water Resources Research
James Cook University, North Queensland
Department of Chemistry and Biochemistry
Murdoch University
Algal Biotechnology Laboratory
School of Environment and Life Sciences
Queensland Institute of Medical Research (Brisbane)
University of Adelaide
Department of Organic Chemistry
University of Melbourne

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Department of Organic Chemistry
University of New South Wales (Kensington)
  School of Microbiology
  School of Biochemistry
University of Queensland
  Departments of Chemistry and Biochemistry
  Department of Zoology
University of Tasmania
  Department of Agricultural Sciences
University of Wollongong
  Department of Chemistry

AUSTRIA
University of Vienna
  Institute of Physical Chemistry

BELGIUM
Belgium Nuclear Center
  Department of Biology
II.F.-I.M.C.-C.E.R.I.A
  Unite de Biochimie et Biotechnologie (Bruxelles)
State University of Ghent (Ghent)
  Laboratory of Marine Ecology
  Laboratory of Pharmacological Microbiology and Hygiene
University of Liege
  Laboratory Centre Genetique

BRAZIL
Fishery Institute (Sao Paulo)
  Division of Freshwater Fish
University of Sao Paulo
  Bioscience Institute and Marine Biology Center

CANADA
Atlantic Salmon Federation (St. Andrews)
  Salmon Genetic Research Program
Atlantic Veterinary College
  Department of Pathology and Microbiology
Biological Sciences Branch (West Vancouver, B.C.)
  Department of Fisheries and Oceans
Canadian Institute of Fishery Technology (Halifax)
  Department of Fishery and Oceans
  Development Division (Newfoundland)
Freshwater Institute (Manitoba)
Dalhousie University (Halifax)
Department of Biochemistry
Department of Biology
McMaster University
Health Sciences Center
Department of Biochemistry
Huntsman Marine Sciences Center (St. Andrews, New Brunswick)
Macdonald College, McGill University (St. Anne de Bellevue, Quebec)
Department of Food Sciences and Agricultural Chemistry
Maurice Lamontagne Institute (Mont-Joli, Quebec)
Department of Fisheries and Oceans
Biology Oceanography Division
Memorial University of Newfoundland
Ocean Sciences Center
Marine Laboratory
Department of Biochemistry
Montreal Neurology Institute
National Research Council of Canada
Institute of Marine Biosciences
New Brunswick Department of Agriculture (Fredericton)
Pacific Biological Station (Nanaimo, British Columbia)
Biological Sciences Branch
Department of Fisheries and Oceans
Queen’s University (Kingston)
Department of Biochemistry
Research Branch (Ottawa)
Plant Research Center
St. Francis Xavier University
Department of Nutrition and Consumption Studies
Technical University of Nova Scotia
Canadian Institute of Fisheries Technology
Universite Laval (Quebec)
Pavillon Paul Comtois
Centre de Recherches Nutrition
University of Alberta (Edmonton)
Department of Pharmacology
University of British Columbia (Vancouver)
Department of Botany
Department of Chemistry
Department of Food Sciences
Department of Oceanography
University of Calgary (Alberta)
   Department of Microbiology
   Department of Biological Sciences
University of Guelph
   Department of Zoology
University of Manitoba
   Department of Zoology
University of New Brunswick
   Department of Biology
   Department of Chemistry
University of Ottawa
   Department of Chemistry
   Ottawa-Carleton Chemistry Institute
University of Toronto (Ontario)
   Department of Microbiology
University of Victoria
   Department of Biology
West Vancouver Laboratory

CHILE
Pontificia University Catolica of Chile
   Faculty of Biological Science
   Department of Ecology
Universidad Catolica de Valparaiso
   Escuela de Ingenieria Bioquimica
University of Austral Chile (Valdivia)
   Centro Investigaciones Marinas
University of Santiago of Chile
   Faculty of Sciences
   Department of Chemistry

CHINA
Academica Sinica
   Guangzhou Institute of Chemistry
   Institute of Genetics
   Institute of Hydrobiology (Wuhan)
   Institute of Oceanology
   Shanghai Institute of Organic Chemistry
   South China Sea Institute of Oceanology
Beijing Norm. University
   Department of Chemistry
Chinese Academy of Fishery Sciences
   Freshwater Fishery Research Center (Jiangsu)
   Heilongjiang Fish Research Institute (Harbin)
   Pearl River Fishery Institute (Guangzhou)
South China Sea Fishery Institute (Guangzhou)
Yellow Sea Fishery Research Institute (Qingdao)
Dalian Fishery College
Aquaculture Department
Fishery Research Institute Hebei Province (Qinhuangdao)
Fujian Institute of Oceanology (Xiamen)
Hainan University (Haikou)
Fishery Department
Liaoning Normal University (Dalian)
Department of Biology
Nanjing University
Department of Biology
Office of Yantai (Shandong Province)
Water Conservation
Qingdao Medical College
Department of Neurology
Shandong Institute of Marine Mat. Medicine (Qingdao)
Shandong Marine Cultivation Institute (Qingdao)
Shantou University
Department of Biology
Shenyang Pharmacy College
Animal Chemistry Department
South China Normal University (Guangzhou)
Department of Biology
Ichthyology Laboratory
Xiamen University
Department of Oceanography
Zhongshan University (Guangzhou)
Department of Biology
Laboratory of Pharmacology
Department of Chemistry

CZECHOSLOVAKIA
Akad. Vlastimil Batur
Ustav Syst. Ekol. Biol. CSAV (Brno)
Czechoslovakia Academy of Sciences (Brno)
Institute of Biophysics
Pracoviste Dol (Vltavou)

DENMARK
University of Aarhus
Institute of Ecology and Genetics
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Kemisk Institute
University of Copenhagen
H.C. Ørsted Institute
Department of Genetic and Organic Chemistry
Marine Chemistry Section

ETHIOPIA
Assasa University
Marine Biology Unit

FINLAND
Abo Akademi
Department of Biochemistry and Pharmacology
Department of Biology
University of Helsinki
Department of Microbiology
Water and Environment Research Institute (Helsinki)

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