International Council for the Exploration of the Sea

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Mariculture Committee

FINAL PROGRESS REPORT OF THE STUDY GROUP ON THE POTENTIAL FOR CULTURE OF SPECIES

by

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ABSTRACT

Aquaculture information acquired through use of the questionnaire contained in ICES Document C.M. 1990/F:9 has been assembled for the ten ICES countries responding, collated, and given a preliminary analysis. The data show that 23 finfish species and 13 invertebrate species are considered as realistic candidates for culture with seven of the finfish and seven of the invertebrate species in commercial culture now. In addition, the data show which programs are being mounted and where, the opinions of informed investigators as to the adequacy of the knowledge and the research being conducted and the programs and problems to which the different countries attach the greatest priorities.

It is proposed on behalf of the Study Group that following further analysis by the Study Group, taking into account directions given by the Mariculture Committee at the Statutory Meeting, that the report be fleshed out minimally as appropriate and upon completion published in the Cooperative Report Series.

RÉSUMÉ

Les renseignements obtenus de la part des dix pays qui ont répondu par le biais du questionnaire inclus dans le document du CIEM, c.m. 1990/F:9, ont été colligés et ont fait l'objet d'une analyse préliminaire. Les résultats démontrent que 23 espèces de poissons et 13 espèces d'invertébrés peuvent, de façon réaliste, être considérés comme candidats à l'élevage. De ce groupe sept sortes de poissons et sept sortes d'invertébrés font présentement l'objet d'élevage commercial. De plus, les renseignements indiquent les programmes en voie d'élaboration, le lieu de ces activités, et l'opinion des chercheurs avisés quant à la valeur de la recherche. Ils donnent également l'ordre et l'importance des priorités accordées par les différents pays aux programmes et aux problèmes.

Au nom du groupe d'étude, suite à une analyse plus poussée faite par ce dernier et en tenant compte des orientations données par le comité de mariculture, il est proposé qu'un rapport plus complet soit élaboré. Ce rapport devrait alors être publié dans la série: Rapport Coopératif.

INTRODUCTION

During its 78th Statutory Meeting (1990), the Council adopted Resolution 2:41: "A Study Group on the Potential for Culture of Species will be established under the chairmanship of Dr. J.E. Stewart (Canada) and will work by correspondence to: a) conduct a survey to evaluate the potential of species culture or considered for culture in order to assess future research requirements; b) prepare a matrix-profile of species of interest for mariculture, current technical knowledge, and research needs of ICES. The Group, which will include Dr. R.H. Cook (Canada), Prof. H. Rosenthal (Germany), Dr. A.L.S. Munro (United Kingdom), Dr. M. Heral (France), and Dr. H. Tilseth (Norway), will collate information supplied by each Mariculture Committee member, who will ensure that the survey questionnaire (cf Doc. C.M. 1990/F:9) is distributed to appropriate research institutions. A progress report of the survey will be presented to the Mariculture Committee in 1991 with a view to its publication by ICES."

In addition to those listed above, Dr. H. Ackefors (Sweden) and Dr. R. Dijkema (The Netherlands) joined the group and participated in the work. Early in 1991, each member of the Study Group was requested to contact appropriate representatives in assigned countries to obtain for each species a comprehensive completion of the questionnaire presented in Doc. C.M. 1990/F:9 and to send it and the completed summary tables to the chairman for compilation and incorporation into a report covering all ICES countries reporting.

The data need to be checked further than was possible for this progress report by the Study Group for completeness and accuracy, fleshed out for certain species, e.g. rainbow trout for Canada, possibly Arctic charr for Norway, and others in different countries, and analysed further as arranged by the Study Group, taking into account directions from the Mariculture Committee. Upon completion of these steps in the fall of 1992, it is proposed that the resulting report be forwarded for publication by ICES as a Cooperative Research Report.

Reports were received from 10 countries:

Belgium	The Netherlands
Canada	Norway
Denmark	Sweden

Finland United Kingdom
Iceland United States of America

All of the data received have been compiled and collated as indicated in two columns of five countries each in preparation for examination by the Study Group and discussion at the Mariculture Committee at the Statutory Meeting. The completed Analytical Forms A, B, C, and D for each country are included in the Appendix in alphabetical order. A preliminary examination and somewhat cursory analysis of the assembled data revealed some interesting facts about new species under consideration, the kinds of programs being mounted, the general views of the adequacy of the knowledge and the research being conducted, and the programs on which the different countries place priorities.

Although coverage for certain countries is more comprehensive than for others, the picture includes an extensive list of species either under cultivation or for which culture is being contemplated. There are 23 finfish species, including two Pacific salmon species now being cultivated on Canada's west coast, and somewhat fewer invertebrates, 13 species. These are listed in Table I together with information on whether the interest extends to research and development or possibly commercial production. Of the 23 finfish species, 7 are in commercial production with 7 of the 13 invertebrate species also being produced commercially. The four finfish species in general production are all salmonids (Atlantic salmon, rainbow trout, coho, and chinook [these last two, as noted above, are being cultured in Canada only on the Pacific coast]). Of the three in the early stages of commercial production, one is also a salmonid (Arctic charr) and the other two are flatfish (halibut and turbot). This picture is consistent with the development of mariculture of finfish in ICES countries where the greatest success has been with salmonids, especially Atlantic salmon and rainbow trout, species which, not surprisingly, have the longest history of manipulation of the early life history stages by man. Long term interests in flatfish culture have been abetted by the high market value for selected flatfish, increasing success in overcoming the obstacle of larval metamorphosis and more recently by market resistance to the burgeoning supplies of salmonids, notably Atlantic salmon. Beyond these, a wide variety of finfish are being

examined as possible candidates for commercial culture; the Atlantic cod, sea bass, whitefish, and bream seem to be the next group of finfish species likely to produce candidates for culture. It is interesting to note that the wrasse is listed as a species of interest and the subject of research; its anticipated use is not as food species, but rather as a predator to keep in check the sea lice growing on cultured Atlantic salmon.

Of the seven invertebrate species in commercial culture, 4 are historically important and proven: Blue mussels (*Mytilus edulis*) and the oysters (*Ostrea edulis*, *Crassostrea virginica* and *Crassostrea gigas*); the other three, the queen and bay scallops (*Chlamys opercularis* and *Argopecten irradians*) along with the bay quahaug (*Mercenaria mercenaria*) are in the early stages of commercial development. With the exception of the sea scallop (*Placopecten magellanicus*), studies on the remainder of the invertebrates have not reached the stage where development trials are taking place. Thus, there seems to be more interest in exploring and acquiring new species of finfish for culture, a fact consistent with the less suitable shellfish conditions in the more northerly location of the countries reporting or perhaps a reflection of incomplete reporting. It would be useful for the work of the Study Group to have the opinions and advice of the Mariculture Committee on the specific question and relative interest in finfish versus invertebrates.

The individual scores for knowledge and research recorded in Section 4 of the questionnaire "Topics of technical concern in relation to culture of this species" as listed below have been prepared as mean percentages for each species for each country (data source in Appendix) and then averaged to give an overall mean for that species:

1. Candidate selection
2. Life cycles
3. Spawning
4. Juv. stages
5. Environ. req.
6. Genetic st.
7. Nutrit. req.
8. Disease diag.
9. Disease measures
10. Physiol.
11. M'algae food
12. Culture site selection
13. Feeding
14. Growth units
15. Deployment of 14
16. Integration of 14
17. Strategies
18. Predation
19. Record keeping
20. Geog. class'n
21. Ocean., hydro.
22. M'algae tox.
23. M'algae threat
24. Fisheries conflicts
25. Environ. impact
26. Interaction
27. Technol. transf.
28. Other

The results are presented in Table II.

The overall ratings vary considerably for the individual species from one country to another. Generally, however, there is some correspondence with experience, the more a species is grown either over time or in volume the more satisfied the practitioners are with the adequacy of the knowledge or the research work being done. In most instances, the reports show a higher score for knowledge than for the adequacy of the research being done. This is reflected also in the various statements made concerning problems and obstacles.

As an extension of this examination, it was decided that it would be of interest to compare the knowledge:research ratings given by various countries for selected species. This is presented in Table II for those species in commercial culture and where several different countries are dealing with the same species. The species covered were Atlantic salmon, rainbow trout, halibut, cod, mussels, and flat oysters.

Although there is rough agreement on most elements, it is clear that there are, in certain instances, marked divergences concerning the importance of the topic or adequacy of the coverage of it in research. An analysis in detail to show the nature of the divergences has not yet been carried out, but it is interesting to note that some countries with the greatest experience with the species in question give the lowest scores.

In continuing this preliminary analysis of the data, we derived Table IV to draw together those topics which were stated to represent the greatest obstacles and, hence, the greatest priorities for research. An examination of these data, based upon frequency of mention, revealed again variations depending upon the species and the state-of-the-art relating to its culture. In overall terms, the list for finfish showed that, in descending order of priority, the following had the highest priorities:

1. Nutrition
2. Disease
3. Genetics
4. Feeding
5. Spawning
6. Physiology
7. Environmental impact
8. Juvenile stages

This list was drawn from those species for which reports were provided by more than one country; for an item to be included it had to be listed by two or more

countries as a priority for that species:

1. Atlantic salmon - Disease, genetics, nutrition, environmental impact, feeding, physiology, interactions
2. Atlantic cod - Feeding, nutrition, disease, strategies, spawning
3. Halibut - Juvenile stages, nutrition, genetics, spawning, growth units
4. Rainbow trout - Disease, genetics, nutrition, environmental impact
5. Turbot - Nutrition, feeding, spawning, physiology
6. Arctic charr - Nutrition, disease
7. Sea bass - Disease, environmental requirements
8. Plaice - Juvenile stages.

The invertebrate picture was even more diverse. There were no overlaps among the species for the priorities given. A summary of the country listings for the species where two or more countries provided a priority follows:

1. Lobsters - Nutrition, juvenile stages, physiology, environmental requirements
2. Mussels - Microalgal toxins, spawning, juvenile stages, geographical areas (for growth)
3. Flat oyster - Disease, growth units
4. Scallop (*Pecten maximus*) - Strategies

The remainder of the report consists of the Appendix containing the compilations prepared from the data submitted for each of the 10 countries. These have been assembled on a separate set of Analytical Forms A, B, C, and D of the questionnaire for each country reporting.

Table Ia: Species in culture or those for which interest is high and/or research is underway.
FINFISH

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Anguilla anguilla Eel - American and European		IR	IR						I	
Morone saxatilus Striped bass		IR								
Salvelinus alpinus Arctic charr		IR		IRD				IRC	I	
Salmo salar Atlantic salmon		IRC	I	IRC	IRC		IRC	IRC	IRC	
Oncorhynchus kisutch Coho salmon		IRC								
Oncorhynchus mykiss Rainbow trout			IRC	IRC			IRC	IRC	IRC	IC
Oncorhynchus tsawytscha Chinook salmon		IRC								
Hippoglossus hippoglossus Atlantic halibut		IR			IRD		IRC		IR	
Pleuronectes platessa Plaice			IR					IR		
Scophthalmus maximus Turbot			IRC			I	IRD	IR	IRD	
Solea solea Sole			I							
Gadus morhua Atlantic cod		IR	I				IRD	IR	I	
Melanogrammus aeglefinus Haddock		I								

Key: I = Interest in culture; R = Research underway; D = Development stage (value <$100,000 US); C = Commercial Production (value >$100,000 US)

Table Ia: Continued
FINFISH

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Anarchichas lupus Grey wolffish							IR			
Anarchichas minor Spotted wolffish							IR			
Anoplopoma fimbria Sable fish		IR								
Coregonus lavaratus Whitefish				IRD						
Cyclopterus lumpus Lumpfish		IR								
Dicentrachus labrax Sea bass	IRD		IRD			IR			I	
Macrozoarces americanus Eelpout		IR								
Sparus aurata Bream			IRD							
Ctenolabrus rubestris Goldsinny wrasse									IR	

Key: I = Interest in culture; R = Research underway; D = Development stage (value <$100,000 US); C = Commercial Production (value >$100,000 US)

Table Ib: Species in culture or those for which interest is high and/or research is underway.
INVERTEBRATES

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Homarus americanus Lobster		IR								
Homarus gammarus Lobster							IR		IR	
Cancer pagurus Crab							I			
Chionocetes opilio Snow crab		IR								
Mytilus edulis Blue mussel		IRC				IRC			IRC	IRC
Crassostrea gigas Pacific or Japanese oyster						IC				
Crassostrea virginica American oyster		IRC								IRC
Ostrea edulis Flat oyster		IR				IRC		IRD	IRC	
Mercenaria mercenaria Bay quahaug		IR							IR	IC
Argopecten irradians Bay scallop		IRC								
Chlamys opercularis Queen scallop									IC	
Pecten maximus Great scallop							IR			
Placopecten magellanicus Sea scallop		IRD								

Key: I = Interest in culture; R = Research underway; D = Development stage (value <$100,000 US); C = Commercial Production (value >$100,000 US)

TABLE IIa: ADEQUACY OF CURRENT KNOWLEDGE (%K) AND RESEARCH (%R) IN SUPPORT OF FINFISH MARICULTURE AMONG ICES COUNTRIES

		BELGIUM		CANADA		DENMARK		FINLAND		ICELAND		NETHERLANDS		NORWAY		SWEDEN		UNITED KINGDOM		UNITED STATES OF AMERICA		MEAN RATING (all countries)		
	SPECIES	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	n	(%K)	(%R)
ANADROMOUS/ CATADROMOUS	Anguilla anguilla Eel - American and European			24.2	49.6	-	-											97.2	80.0			2	60.7	64.8
	Morone saxatilis Striped bass			29.0	37.1															-	-	1	29.0	37.1
	Salvelinus alpinus Arctic charr			66.0	64.6			37.1	33.0							52.2	47.8	66.0	47.5			4	52.5	45.7
	Salmo salar Atlantic salmon	-		89.2	82.6	-	-	67.6	60.0	62.0	62.0			49.6	32.3	60.0	49.6	89.2	80.3	-	-	8	61.4	52.4
	Oncorhynchus kisutch Coho salmon			63.2	51.2																	1	63.2	51.2
	Oncorhynchus mykiss Rainbow trout			-	-	66.0	67.0	70.4	74.0					52.0	39.2	71.7	59.6	73.2	56.2	63.0	49.5	6	65.0	52.6
	Oncorhynchus tshawytscha Chinook salmon			65.0	62.2																	1	63.2	51.2
FLATFISH	Hippoglossus hippoglossus Atlantic halibut			29.2	41.7					36.0	36.0			30.5	31.3			36.4	26.2			4	35.0	33.0
	Pleuronectes platessa Plaice					51.0	29.0									51.4	40.0					2	51.2	34.5
	Scophthalmus maximus Turbot					72.0	39.0					51.0	44.0	46.3	33.9	65.0	52.4	46.0	36.7			5	56.2	43.2
	Solea solea Sole					49.0	35.0															1	49.0	35.0
DEMERSAL	Gadus morhua Atlantic cod			58.4	44.2	63.0	29.0							53.0	70.0	72.0	51.7	51.6	22.9			5	54.2	43.7
	Melanogrammus aeglefinus Haddock			16.7	44.6																	1	16.7	44.6
	Anarchichas lupus Grey wolffish													27.5	22.2							1	27.5	22.2
	Anarchichas minor Spotted wolffish													27.5	22.2							1	27.5	22.2
	Anoplopoma fimbria Sable fish			23.9	23.2																	1	23.9	23.2
	Coregonus lavaretus Whitefish							43.3	33.0													1	43.3	33.0
	Cyclopterus lumpus Lumpfish			17.2	22.9																	1	17.2	22.9
	Dicentrachus labrax Sea bass	60.0	36.0			60.0	38.0					36.0	42.0			-		48.0	39.6			4	48.0	36.7
	Macrozoarces americanus Eelpout			19.6	19.4																	1	19.6	19.4
	Sparus aurata Bream					63.0	44.0															1	63.0	44.0
PREDATOR	Ctenolabrus rupestris Goldsinny wrasse																46.7	43.3				1	46.7	43.3

- Further information to be obtained.

TABLE IIb: ADEQUACY OF CURRENT KNOWLEDGE (%K) AND RESEARCH (%R) IN SUPPORT OF INVERTEBRATE MARICULTURE AMONG ICES COUNTRIES

		BELGIUM		CANADA		DENMARK		FINLAND		ICELAND		NETHERLAND		NORWAY		SWEDEN		UNITED KINGDOM		UNITED STATES OF AMERICA		MEAN RATING (all countries)		
	SPECIES	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	(%K)	(%R)	n	(%K)	(%R)
LOBSTER	Homarus americanus Lobster			49.1	29.1																	1	49.1	29.1
	Homarus gammarus Lobster													63.6	51.5							1	63.6	51.5
CRAB	Cancer pagurus Crab													40.0	37.4							1	40.0	37.4
	Chionoecetes opilio Snow crab			11.7	10.0																	1	11.7	10.0
MUSSEL	Mytilus edulis Blue mussel			66.2	36.0							46.0	43.0					71.2	61.2	59.0	33.3	4	59.6	43.3
OYSTER	Crassostrea gigasea Pacific or Japanese oyster											57.0	46.0					79.4	66.4			2	66.2	55.2
	Crassostrea virginica American oyster			79.6	60.0															59.6	47.6	2	69.6	53.8
	Ostrea edulis Flat oyster			68.4	53.3							61.0	48.0			63.8	79.0	63.1	59.2			4	61.9	59.9
QUAHAUG	Mercenaria mercenaria Bay quahaug			62.7	46.8															46.7	33.8	2	54.7	40.3
SCALLOP	Argopecten irradians Bay scallop			46.7	41.7																	1	46.7	41.7
	Chlamys opercularis Queen scallop																	38.8	33.2			1	38.8	33.2
	Pecten maximus Great scallop													51.6	22.5			49.6	41.2			2	50.6	31.9
	Placopecten magellanicus Sea scallop			45.4	32.8																	1	45.4	32.8

TABLE IIIa

<u>Salmo salar</u>
Atlantic salmon

Knowledge:Research
(K:R)
In Relevant Countries

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

	1. Cand. select.		2. Life cycles		3. Spawning		4. Juv. stages		5. Environ. req.		6. Genetic st.		7. Nutrit. req.		8. Dis. diag.		9. Dis. measures		10. Physiol.		11. M'algae food		12. Cult. site		13. Feeding		14. Growth units	
	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R
BELGIUM																												
CANADA	8	8	9	8	7	6	8	7	7	7	5	6	8	7	6	6	6	4	6	5			7	6	7	5	7	8
DENMARK																												
FINLAND			9	7	9	7	10	7	10	7	6	6	9	7	7	6	7	5	9	8			9	9	9	9	6	5
ICELAND	6	6	7	7	8	8	6	6	5	5	7	7	7	7	7	7	7	7	7	7			6	6	7	7	7	7
THE NETHERLANDS																												
NORWAY	9	5	3	2	5	3	4	3	6	5	9	8	4	3	2	2	4	3	5	3			7	4	5	3	3	2
SWEDEN	7	7	6	7	7	7	7	8	6	5	6	4	5	4	7	5	4	2	5	8			8	8	5	4	5	3
UNITED KINGDOM	10	8	6	8	8	6	8	4	8	8	4		8	7	8	8	8	8	8	7			8	4	8	7	8	8
UNITED STATES																												
MEAN																												

	15. Deploy. of 14		16. Integration		17. Strategies		18. Predation		19. Record keep.		20. Geog. areas		21. Ocean., hydro.		22. M'algae tox.		23. M'algae threat		24. Fish confl.		25. Envir. impact		26. Interaction		27. Tech. transf.		28. Other		%K / %R
	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K:R
BELGIUM																													
CANADA	6	6	7	6	5	4	5	2	4	4	4	3	4	3			4	4	4	4	4	5	3	2	7				59.2 / 52.5
DENMARK																													
FINLAND	6	5	7	7	6	4	8	5	4	4	2	1	3	1			6	5	4	3	3	3	4	4	9				67.5 / 60.0
ICELAND	7	7	7	7	6	6			3	3	4	4	6	6			4	4											62.0 / 60.0
THE NETHERLANDS																													
NORWAY	3	3	3	1	5	3	7		6	4	6	4	9	6					3	2	4	1	3	1	4				49.6 / 32.3
SWEDEN	4	3	6	6	5	5	5	5	9	4	8	7	5	5					3	3	7	5	5	2	4		7	2	60.8 / 49.6
UNITED KINGDOM	6	5	8	8	8	4	9	6	9	6	4	3	5	7			4	3	3	5	7	5	3	5	7				69.2 / 58.3
UNITED STATES																													
MEAN																													61.4 / 52.4

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

TABLE IIIb
Oncorhyncus mykiss
Rainbow trout

Knowledge:Research (K:R) In Relevant Countries

	1. Cand. select.		2. Life cycles		3. Spawning		4. Juv. stages		5. Environ. req.		6. Genetic st.		7. Nutrit. req.		8. Dis. diag.		9. Dis. measures		10. Physiol.		11. M'algae food		12. Cult. site		13. Feeding		14. Growth units		15. Deploy. of 14		16. Integration		17. Strategies		18. Predation		19. Record keep.		20. Geog. areas		21. Ocean., hydro.		22. M'algae tox.		23. M'algae threat		24. Fish confl.		25. Envir. impact		26. Interaction		27. Tech. transf.		28. Other		%K / %R
	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	K	R	R	K	K:R
BELGIUM																																																									
CANADA																																																									
DENMARK			7	7	7	7	7	7	7	7	2	7	7	7	7	7	7	7	7	7					8	8	9	6	8	6	8	5	5	4	10		5		7	7	7	7			1		7		5	8	3		6				64.0 / 67.0
FINLAND			8	7	8	7	8	7	9	7	6	6	9	7	7	6	7	5	8	8			9	7	8	9	8	8	8	8	5	5	5	5	8	8	4	4	7	7	9	5			6	5	5	5	8	8	4	4	7				70.4 / 74.4
ICELAND																																																									
THE NETHERLANDS																																																									
NORWAY	8	5	6	4	6	4	6	4	6	5	8	7	7	6	6	4	6	4	7	5			5	4	6	5	4	3	4	3	4	2	4	3	6	6	5	4	4	3	6	5			3	2	3	2	3	2	3	2	4				52.0 / 39.2
SWEDEN	7	8	7	8	8	6	1	1	9	9	8	7	8	8	5	7	5	7	7	7			9	4	7	8	7	8	6	3	8	4	6	3	9	5	5	4	8	8	9	6					6	5	8	8	6	3	6				71.7 / 59.6
UNITED KINGDOM	10	8	8	5	8	6	8	8	8	8	8	0	9	7	8	8	9	8	8	7			8	4	8	7	10	8	9	5	8	8	8	4	9	5	9	6	4	3	5	7			1	2	3	0	7	5	3	3	5				73.2 / 56.2
UNITED STATES	8	5	8	7	6	4	6	6	9	8	6	3	5	5	5	5	4	4	7	4			5	5	7	3	6	6	6	6	7	6								1			3	2	5	5	7	5	8	7	7	7	9				63.8 / 49.5
MEAN																																																									65.8 / 52.6

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

TABLE IIIc
Hippoglossus hippoglossus
Halibut

Knowledge:Research (K:R) In Relevant Countries

Country	1. Cand. select. K	1. R	2. Life cycles K	2. R	3. Spawning K	3. R	4. Juv. stages K	4. R	5. Environ. req. K	5. R	6. Genetic st. K	6. R	7. Nutrit. req. K	7. R	8. Dis. diag. K	8. R	9. Dis. measures K	9. R	10. Physiol. K	10. R	11. M'algae food K	11. R	12. Cult. site K	12. R	13. Feeding K	13. R	14. Growth units K	14. R
BELGIUM																												
CANADA	7	6	5	6	5	7	4	3	3	3	2	5	4	4	3	4	3	3	3	3			3	2	3	3	3	3
DENMARK																												
FINLAND																												
ICELAND	4	4	4	4	4	4	4	4	4	4	3	3	4	4	3	3	3	3	5	5			3	3	4	4	4	4
THE NETHERLANDS																												
NORWAY	5.5	7	6	7.5	5	5.5	6	5.5	5	5	3	3	3	3.5	4	5	3	4	1.5	1	0	0	3	3.5	4.5	5	5	3
SWEDEN																												
UNITED KINGDOM	4	4	4	7	3	4	3	5	3	1	1	1	3	3	3	3	3	3	4	4			7	4	6	4	4	4
UNITED STATES																												
MEAN																												

Country	15. Deploy. of 14 K	15. R	16. Integration K	16. R	17. Strategies K	17. R	18. Predation K	18. R	19. Record keep. K	19. R	20. Geog. areas K	20. R	21. Ocean., hydro. K	21. R	22. M'algae tox. K	22. R	23. M'algae threat K	23. R	24. Fish confl. K	24. R	25. Envir. impact K	25. R	26. Interaction K	26. R	27. Tech. transf. K	27. R	28. Other K	28. R	%K / %R K:R
BELGIUM																													
CANADA	1	5	3	3	2	5	1	4	0	5	3	2	5	3			3	7	0	5	0	5	0	4	7				29.2 / 41.7
DENMARK																													
FINLAND																													
ICELAND			3	3					2	2	2	2	4	4			4	4	4	4	3	3							36.0 / 36.0
THE NETHERLANDS																													
NORWAY	4	3.5	3	3.5	1.5	2.5	6	0	1.5	1.5	3.5	1.5	4	1.5	0	0	3.5	2	7	0	3	3.5	8	1	5.5				38.5 / 31.3
SWEDEN																													
UNITED KINGDOM	3	3	3	2	5	3	3	1	3	0	6	3	2	1			1	0	0	0	7	3	3	0	7				36.4 / 26.2
UNITED STATES																													
MEAN																													35.0 / 33.8

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

TABLE IIId
<u>Gadus morhua</u>
Cod

Knowledge:Research (K:R) In Relevant Countries

	1. Cand. select. K	1. R	2. Life cycles K	2. R	3. Spawning K	3. R	4. Juv. stages K	4. R	5. Environ. req. K	5. R	6. Genetic st. K	6. R	7. Nutrit. req. K	7. R	8. Dis. diag. K	8. R	9. Dis. measures K	9. R	10. Physiol. K	10. R	11. M'algae food K	11. R	12. Cult. site K	12. R	13. Feeding K	13. R	14. Growth units K	14. R
BELGIUM																												
CANADA	9	7	6	7	7	7	5	5	7	7	5	5	7	7	6	6	3	3	8	7			4	4	7	7	7	5
DENMARK	7	0	7	0	7	3	7	1	7	1	5	0	7	1	4	1	4	1	5	7			7	4	7	9	6	3
FINLAND																												
ICELAND																												
THE NETHERLANDS																												
NORWAY	6	8	6	8	6	8	5	8	5	9	6	9	6	9	6	9	7	9	5	8			4	5	6	8	8	8
SWEDEN	4	4			8	8	6	4	6	8	6	1	6	3	6	4	4	6	4	3	10	3	10	8	10	10	10	6
UNITED KINGDOM	4	4	3	3	5	3	4	4	4	4	1	1	3	3	3	1	3	2	1	1			3	3	3	1	2	1
UNITED STATES																												
MEAN																												

	15. Deploy. of 14 K	15. R	16. Integration K	16. R	17. Strategies K	17. R	18. Predation K	18. R	19. Record keep. K	19. R	20. Geog. areas K	20. R	21. Ocean., hydro. K	21. R	22. M'algae tox. K	22. R	23. M'algae threat K	23. R	24. Fish confl. K	24. R	25. Envir. impact K	25. R	26. Interaction K	26. R	27. Tech. transf. K	27. R	28. Other R	28. K	%K / %R (K:R)
BELGIUM																													
CANADA	5	5	5	5	6	6	3	3	3	3	2	2	5	4			2	2	3	2	2	1	5	4	4				50.4 / 44.2
DENMARK			7	3	7	2			6	1	7	4	7	4			5	1							6				63.0 / 29.0
FINLAND																													
ICELAND																													
THE NETHERLANDS																													
NORWAY	5	6	6	9	4	6	7	8	5	5	4	6	6	8					3	3	3	3	3	3	4				53.8 / 70.9
SWEDEN	10	6	8	8	8	6	6	4	8	4	6	6	8	6			4	2	8	2	8	6	8	6	8				72.0 / 51.7
UNITED KINGDOM	3	2	3	2	2	1	6	1	0	0	3	3	0	0			1	0	5	5	7	5	5	5	5				31.6 / 22.9
UNITED STATES																													
MEAN																													54.2 / 43.7

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

TABLE IIIe
Mytilus edulis
Mussels

Knowledge:Research
(K:R)
In Relevant Countries

Country	1. Cand. select. K	R	2. Life cycles K	R	3. Spawning K	R	4. Juv. stages K	R	5. Environ. req. K	R	6. Genetic st. K	R	7. Nutrit. req. K	R	8. Dis. diag. K	R	9. Dis. measures K	R	10. Physiol. K	R	11. M'algae food K	R	12. Cult. site K	R	13. Feeding K	R	14. Growth units K	R
BELGIUM																												
CANADA	9	6	7	5	7	5	8	5	9	3	5	3	6	3	6	3	1	1	5	3	5	3	9	4	7	3	9	5
DENMARK																												
FINLAND																												
ICELAND																												
THE NETHERLANDS	9	6	3	2	3	2	2	1	8	8	3	7	3	1	2	1	2	2	3	3			8	8	5	5	5	5
NORWAY																												
SWEDEN																												
UNITED KINGDOM	8	7	8	6	8	7	9	7	6	6	3	3	4	4	7	7	5	5	8	8	6	5	7	5	8	8	9	9
UNITED STATES			7	6	4	2	6	4	7	5	7	2	7	3	7	1	7	1	9	5	8	5	5	5	6	3	5	1
MEAN																												

Country	15. Deploy. of 14 K	R	16. Integration K	R	17. Strategies K	R	18. Predation K	R	19. Record keep. K	R	20. Geog. areas K	R	21. Ocean., hydro. K	R	22. M'algae tox. K	R	23. M'algae threat K	R	24. Fish confl. K	R	25. Envir. impact K	R	26. Interaction K	R	27. Tech. transf. K	R	28. Other R	K	%K / %R K:R
BELGIUM																													
CANADA	8	4	7	4	7	4	6	3	9	5	6	3	5	3	5	6			8	2	4	4	6	2	8				66.2 / 36.8
DENMARK																													
FINLAND																													
ICELAND																													
THE NETHERLANDS	2	2	5	5	2	2	8	4	0	0	8	8	7	7	8	3			8	5	9	9	3	2	4				48.0 / 43.0
NORWAY																													
SWEDEN																													
UNITED KINGDOM	9	9	8	8	9	9	9	7	5	5	8	3	2	1	9	9			8	5	8	7	5	4	9				71.2 / 61.2
UNITED STATES	3	3	5	6	4	4	6	1	9	6	1	1	2	4	2	2	3	1	6	2	6	2	6	3	1	6	4		53.0 / 32.3
MEAN																													59.6 / 43.3

COMPARISON OF KNOWLEDGE:RESEARCH RATINGS FOR SELECTED SPECIES

TABLE IIIf
Ostrea edulis
Flat oysters

Knowledge:Research (K:R) In Relevant Countries

Country	1. Cand. select. K	R	2. Life cycles K	R	3. Spawning K	R	4. Juv. stages K	R	5. Environ. req. K	R	6. Genetic st. K	R	7. Nutrit. req. K	R	8. Dis. diag. K	R	9. Dis. measures K	R	10. Physiol. K	R	11. M'algae food K	R	12. Cult. site K	R	13. Feeding K	R	14. Growth units K	R
BELGIUM																												
CANADA	4	8	8	8	9	8	9	8	4	6	9	8	9	7	8	3	0	0	8	7	8	8	4	3	9	8	7	7
DENMARK																												
FINLAND																												
ICELAND																												
THE NETHERLANDS	8	8	8	8	7	5	5	4	8	8	7	2	7	7	8	3	2	2	6	3			8	8			5	2
NORWAY																												
SWEDEN	6	8	8	8	9	9	7	8	4	6	8	8	9	9	0	9	2	9	7	8	8	9	4	5	8	9	6	8
UNITED KINGDOM	6	6	7	7	7	7	7	7	6	7	3	3	4	4	8	7	6	8	8	8	5	5	7	5	7	6	8	7
UNITED STATES																												
MEAN																												

Country	15. Deploy. of 14 K	R	16. Integration K	R	17. Strategies K	R	18. Predation K	R	19. Record keep. K	R	20. Geog. areas K	R	21. Ocean., hydro. K	R	22. M'algae tox. K	R	23. M'algae threat K	R	24. Fish confl. K	R	25. Envir. impact K	R	26. Interaction K	R	27. Tech. transf. K	R	28. Other K	R	%K / %R K:R
BELGIUM																													
CANADA	5	6	9	8	9	7			7	0	3	2	3	1	5	0			2	3	3	2	2	3	7				50.4 / 53.3
DENMARK																													
FINLAND																													
ICELAND																													
THE NETHERLANDS	7	2	2	0	2	2	7	7	1	1	7	7	8	5	8	8			8	8	7	7	7	8	2				61.0 / 48.0
NORWAY																													
SWEDEN	6	8			3	6	7	9	4	7	7	7	5	5	8	8			8	8	8	9	8	9	8				63.0 / 79.0
UNITED KINGDOM	9	9	7	7	7	7	8	8	5	3	8	3	2	1	9	9			8	4	8	7	5	4	7				63.1 / 59.2
UNITED STATES																													
MEAN																													61.9 / 59.9

Table IV: Items of greatest priority.
FINFISH

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Anguilla anguilla Eel - American and European		10,7,3,4,8								
Morone saxatilus Striped bass		5,3,7,8,17								
Salvelinus alpinus Arctic charr		2,7,13,3,18,6, 10,27		8,5,7,14,20				8,9		
Salmo salar Atlantic salmon		26,25,7,17,27, 10,9,23		6,9,13,14,21	4,5,6,9			8,9,6,13,25	8,6,10,7,25,26, 18	
Oncorhynchus kisutch Coho salmon		3,6,9,7,13								
Oncorhynchus mykiss Rainbow trout			8,9,7,13,6	9,8,6,25,16				8,9,2,25	10,6,8	3,7,23
Oncorhynchus tsawytscha Chinook salmon		6,26,9,13,7								
Hippoglossus hippoglossus Atlantic halibut		4,14,12,16,7,1			3,4,5,6		27,16,4,6,8/9		4,3,7,14,17	
Pleuronectes platessa Plaice			3,7,4,5,8					4,10,16,24		
Scophthalmus maximus Turbot			7,5,13,10,4			7,13,9,27	17,10,13,7,6,3	3,4,16,17,24	4,7,3	
Solea solea Sole			3,7,4,5,8							
Gadus morhua Atlantic cod		17,27,8,2,13, 18,3,12	5,7,10,6,16				3,28,10,13,18	4,5,9,10,17	4,7,13	
Melanogrammus aeglefinus Haddock		4,5,7,10,14								

Numerals refer to Questionnaire Section 4 Topics (see key in text).

Table IV: Continued.
FINFISH

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Anarchichas lupus Grey wolffish							3,14,15,16,17			
Anarchichas minor Spotted wolffish							3,14,15,16,17			
Anoplopoma fimbria Sable fish		4,3,7,6,9								
Coregonus lavaratus Whitefish				14,7,6,16,27						
Cyclopterus lumpus Lumpfish		2,3,7,10,13,4, 5,14								
Dicentrachus labrax Sea bass			5,7,4,2,8			5,20,8,9,12				
Macrozoarces americanus Eelpout		3,12,7,10,14								
Sparus aurata Bream			5,7,4,2,8							
Ctenolabrus rubestris Goldsinny wrasse										

Numerals refer to Questionnaire Section 4 Topics (see key in text).

Table IV: Items of greatest priority.
INVERTEBRATES

	Belgium	Canada	Denmark	Finland	Iceland	Netherlands	Norway	Sweden	United Kingdom	United States of America
Species										
Homarus americanus Lobster		2,3,4,5,6,7,9, 10								
Homarus gammarus Lobster							18,7,5,14		7,10,4,26,17	
Cancer pagurus Crab							10,7,13,18,14			
Chionocetes opilio Snow crab		1,2,3,4,5,6,7, 17								
Mytilus edulis Blue mussel		1,2,3,4,6,10, 12,22				4,20,25,26,22			5,22,14	22,21,10,20,3
Crassostrea gigas Pacific or Japanese oyster						17,4,27,10			5,22	
Crassostrea virginica American oyster		5								8,16,4,6,9,3,2
Ostrea edulis Flat oyster						9,8,15,14,4		4,8,9,12,17	5,22,9,8	
Mercenaria mercenaria Bay quahaug										12,14,15,17,7, + marketing
Argopecten irradians Bay scallop		3,4,5,6,7,8,9, 10,11,13,27								
Chlamys opercularis Queen scallop										
Pecten maximus Great scallop							7,11,13,3,17		17,4,5,22,24	
Placopecten magellanicus Sea scallop		2,3,4,7,10,13, 14,15,16,17,22, 27								

Numerals refer to Questionnaire Section 4 Topics (see key in text).

APPENDIX

Analytical Forms A, B, C, and D for each country.

Keys: 1) The Arabic numerals contained in the tables refer to the questions in Section 4 of the questionnaire; the topic/question titles appear in abbreviated and numbered form as headings for Tables A and B.

2) Letter Code, items from Section 3: Reasons for selection of this species for culture, study or consideration for culture in your country:

A) High product value
B) Anticipated continuing short supply in market place.
C) Hardy.
D) Rapidly-growing species.
E) Relatively easy to grow or anticipated to be so.
F) Large or adequate areas suitable for its growth in bulk.
G) Ready access to large supplies of seed.
H) Large supplies of adequate food available.
I) Other.

BELGIUM

ANALYTICAL FORM A

KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN					
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. Dicentrachus labrax Sea Bass	1	8	7	6	7	1	6	3	3	4	X	4	6	5	5	5	4	4	5	2	2	X	3	2	2	1	5	X	101	250	40%
2.																															
3.																															
4.																															
5.																															
6.																															
7.																															
8.																															
9.																															
10.																															
11.																															
12.																															
13.																															
14.																															
15.																															
Point Total																															
Average																															

BELGIUM

ANALYTICAL FORM B

RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	28. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
Dicentrachus labrax																													
1. Sea bass	2	4	4	4	5	1	3	2	2	3	X	4	3	5	3	3	3	3	4	3	2	X	2	2	2	1	5	74	250	30%
2.																													
3.																													
4.																													
5.																													
6.																													
7.																													
8.																													
9																													
10																													
11.																													
12.																													
13.																													
14.																													
15.																													
Point Total																													
Average																													

BELGIUM

ANALYTICAL FORM C
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		* Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Sea bass *Dicentrachus labrax*	Y	1	60	A,C,E,G,H,	40	30	600	1	12	200	2400	?	?

BELGIUM

ANALYTICAL FORM D
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments (from Section 5 - 3)
Seabass *Dicentrachus labrax*	(2) Biol. criteria (3) Repr. physiology (4) Biol. juv. stages (5) Envir. requir. (14) Culture units ind. (15) Culture units arrays (27) Techn. transfer	Not given	Not given

CANADA

ALYTICAL FORM A

NOWLEDGE SCORES

FINFISH

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN					
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. N'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. N'algae tox.	23. N'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. Salmo salar Atlantic salmon	8	9	7	8	7	5	8	6	6	6	-	7	7	7	6	7	5	5	4	4	4	-	4	4	4	3	7	-	148	250	59.2
2. Salvelinus alpinus Arctic char	8	8	5	7	6	4	7	7	7	8	-	8	7	7	7	6	7	2	3	5	5	-	2	3	2	2	7	-	140	250	56.0
3. Gadus morhua Atlantic cod	9	6	7	5	7	5	7	6	3	8	-	4	7	7	5	5	6	3	3	2	5	-	2	3	2	5	4	-	126	250	50.4
4. Hippoglossus hippoglossus Atl. Halibut	7	5	5	4	3	2	4	3	3	3	-	3	3	3	1	3	2	1	0	3	5	-	3	0	0	0	7	-	73	250	29.2
5. Morone saxatilus Striped bass	5	4	6	5	5	0	4	3	3	4	-	5	5	2	1	0	1	0	0	4	1	-	0	0	2	0	-	-	60	240	25.0
6. Anguilla anguilla American eel	5	4	1	1	6	0	4	3	3	4	-	7	6	5	5	3	0	0	0	0	1	-	0	0	0	0	-	-	58	240	24.2
7. Cyclopterus lumpus Lumpfish	6	4	3	2	2	0	2	1	1	2	-	2	2	1	1	2	1	0	3	1	3	-	1	1	1	1	0	-	43	250	17.2
8. Melanogammus aeglefinus Haddock	3	4	5	4	4	2	3	1	1	4	-	1	3	1	0	2	0	0	0	0	1	-	1	0	0	0	-	-	40	240	16.7
9. Macrozoarces americanus Eel pont	3	2	0	3	3	0	2	0	0	1	-	0	3	2	0	2	2	3	1	6	6	-	0	0	0	0	0	-	39	250	15.6
0. Oncorhynchus kisutch Coho salmon	7	7	5	7	7	6	6	6	7	7	-	7	6	6	7	6	7	6	6	6	6	-	6	6	6	6	6	-	158	250	63.2
1. Oncorhynchus tsawytscha Chinook salmon	6	8	7	8	8	4	6	7	7	8	-	7	6	7	7	6	7	7	-	7	7	-	6	4	6	4	8	-	158	240	65.8
2. Anoplopoma fimbria Sable fish	3	3	2	2	5	0	1	-	4	4	-	2	3	1	1	1	-	2	1	3	6	-	6	1	1	1	2	-	55	230	23.9
3.																															
4.																															
5.																															
oint Total																															

CANADA

ANALYTICAL FORM B

RESEARCH SCORES

FINFISH

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS							
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1 Salmo salar Atlantic salmon	8	8	6	7	7	6	7	6	4	5	-	6	5	8	6	6	4	2	4	3	3	-	4	4	5	2	-	126	240	52.5
2 Salvelinus alpinus Arctic char	8	8	5	7	7	4	7	7	6	8	-	8	8	7	8	6	7	2	3	5	4	-	2	2	1	1	-	131	240	54.6
3 Gadus morhua Atlantic cod	7	7	7	5	7	5	7	6	3	7	-	4	7	5	5	5	6	3	3	2	4	-	2	2	1	4	-	106	240	44.2
4 Hippoglossus hippoglossus Atl. Halibut	6	6	7	3	3	5	4	4	3	3	-	2	3	3	5	3	5	4	5	2	3	-	7	5	5	4	-	100	240	41.7
5 Morone saxatilus Striped bass	4	2	5	4	4	9	2	2	2	3	-	2	4	0	0	0	0	9	8	2	0	-	10	0	8	9	-	89	240	37.1
6 Anguilla anguilla American eel	0	6	2	1	4	10	4	1	1	3	-	3	4	4	4	2	6	8	10	5	5	-	10	8	9	9	-	119	240	49.6
7 Cyclopterus lumpus Lumpfish	5	4	2	2	2	5	1	1	1	1	-	1	1	1	1	2	1	0	0	1	4	-	5	5	4	5	-	55	240	22.9
8 Melanogammus aeglefinus Haddock	4	3	2	2	3	9	2	0	0	3	-	0	2	1	9	2	7	9	9	0	2	-	10	9	9	9	-	107	240	44.6
9 Macrozoarces americanus Eel Pont	2	2	0	2	2	0	2	0	0	1	-	0	3	2	0	2	2	3	1	6	7	-	0	0	0	0	-	37	240	15.4
10 Oncorhynchus kisutch Coho salmon	6	7	4	7	7	6	5	6	7	7	-	7	5	5	6	5	6	5	5	6	6	-	6	4	5	5	-	123	240	51.2
11 Oncorhynchus tsawytscha Chinook salmon	5	8	8	8	7	3	7	8	8	7	-	6	6	6	6	6	6	6	-	6	7	-	6	5	5	3	-	143	230	62.2
12 Anoplopoma fimbria Sable fish	4	3	2	3	6	0	2	-	3	3	-	1	3	1	1	3	-	1	-	1	6	-	6	0	1	1	-	51	220	23.2
13.																														
14.																														
15.																														
Point Total																														
Average																														

CANADA

ALYTICAL FORM A

OWLEDGE SCORES

INVERTEBRATES

	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN				
AME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
Crassostrea virginica American oyster	9	8	8	8	10	10	10	7	4	9	9	9	9	8	8	9	8	9	8	8	6	5	-	8	4	7	9	-	207	260	79.6
Mytilus edulis Mussel	9	7	7	8	9	5	6	6	1	5	5	9	7	9	8	7	7	6	9	6	5	5	-	8	4	6	8	-	172	260	66.2
Mercenaria mercenaria Bay quahaug	9	9	9	9	9	9	7	4	0	7	8	8	6	6	8	5	5	7	4	4	3	5	-	8	3	5	6	-	163	260	62.7
Ostrea edulis Flat oyster	4	8	9	9	4	9	9	8	0	9	9	4	9	7	5	9	9	-	7	3	3	5	-	2	3	2	7	-	151	250	60.4
Argopecten irradians Bay scallop	7	9	7	6	5	1	5	6	3	6	5	4	5	6	6	5	4	1	-	3	2	4	-	3	2	2	5	-	112	240	46.7
Placopecten magellanicus Sea scallop	7	8	5	4	5	5	4	4	2	4	5	4	4	6	5	5	4	5	2	4	3	4	-	6	3	4	6	-	118	260	45.5
Homarus americanus Lobster	10	10	8	8	9	1	4	2	2	6	-	4	5	6	5	6	5	-	0	4	4	-	-	4	1	4	-	-	108	220	49.1
Chionocetes opilio Snow crab	3	4	4	4	2	2	2	2	0	2	-	0	1	1	0	0	0	0	0	0	0	-	-	0	0	0	-	-	27	230	11.7
nt Total																															

CANADA

ANALYTICAL FORM B

RESEARCH SCORES

INVERTEBRATES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. Crassostrea virginica American oyster	7	7	6	4	7	8	8	5	7	7	9	6	6	7	7	7	6	8	0	7	4	7	-	4	1	5	-	150	250	60.0
2. Mytilus edulis Mussel	6	5	5	5	3	3	3	3	1	3	3	4	3	5	4	4	4	3	5	3	3	6	-	2	4	2	-	92	250	36.8
3. Mercenaria mercenaria Bay quahaug	9	9	9	5	8	7	7	2	0	6	7	5	3	5	5	3	3	7	0	2	0	7	-	5	0	3	-	117	250	46.8
4. Ostrea edulis Flat oyster	8	8	8	8	6	8	7	3	0	7	8	3	8	7	6	8	7	-	0	2	1	7	-	3	2	3	-	128	240	53.3
5. Argopecten irradians Bay scallop	3	7	6	6	4	1	7	3	2	4	5	2	7	6	5	5	5	0	-	2	1	6	-	3	2	4	-	96	230	41.7
6. Placopecten magellanicus Sea scallop	4	6	3	4	2	4	3	3	3	1	3	4	3	5	6	4	4	2	1	2	2	4	-	4	1	2	-	80	250	32.0
7. Homarus americanus Lobster	10	10	8	5	5	1	1	1	1	2	-	1	2	1	1	4	4	-	0	1	1	-	-	4	0	1	-	64	220	29.1
8. Chionocetes opilio Snow crabs	2	5	5	3	3	2	0	0	0	0	-	0	1	0	0	0	2	0	0	0	0	-	-	0	0	0	-	23	230	10.1
9.																														
10.																														
11.																														
12.																														
13.																														
14.																														
15.																														
Point Total																														
Average																														

CANADA

ANALYTICAL FORM C – RESULTS FOR FINFISH
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person Years (PY)	Total Expenditures $X1000				Numbers	Tonnes	$X1000	Tonnes	$X1000	Tonnes	$X100
Salmo salar Atlantic salmon	Y	34.0	1,880	A,B,C,D,E,F, G,H	59.2	52.5		8,500	71,000	12,500	96,000	15,500	124,000
Gadus morhua Atlantic cod	Y	3.0	185	B,C,D,E,H,	50.4	44.2		0	0	200	250		
Salvelinus alpinus Arctic char	Y	0.3	15	A,B,C,D,E,F, H	56.0	54.6		210	460	100	1,000	1,000	12,000
Oncorhynchus kisutch Coho salmon	Y	5.0	360	A,B,C,D,E,F, G,H	63.2	51.2		1,000	5,500	3,000	18,000	5,000	30,000
Hippoglossus hippoglassus Atl.Halibut	Y	8.0	330	A,B,C,D,H	29.2	41.7		0	0				
Morone saxatilus Striped bass	Y	1.0	65	A,C,D,E,H	25.0	37.1		0	0				
Anguilla anguilla American eel	Y	0.3	20	A,C,E,G,H	24.2	49.6		0	0				
Cyclopeterus lumpus Lumpfish	Y	0.7	46	A,B,C,D,E,F, G,H	17.2	22.9		0	0				
Macrozoarces americanus Eel pont	Y	3.0	180	B,C,D,E,H	15.6	15.4		0	0				
Oncorhynchus tsawytscha Chinook salmon	Y			A,B,C,D,E,F, G,H	65.8	62.2				9,000	55,000	10,000	61,000
Melanogrammus aeglefinus Haddock	Y			A,B,F,H	16.7	44.6		0	0				
Anoplopoma fimbria Sablefish	Y			A,B,C,D,E,F, H	23.9	23.2		0	0				

CANADA

ANALYTICAL FORM C - RESULTS FOR INVERTEBRATES
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (X) from Analytical Form A	Overall "Research" Rating No. (X) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person Years (PY)	Total Expenditures $X1000				Numbers	Tonnes	$X1000	Tonnes	$X1000	Tonnes	$X100
Mytilus edulis Blue mussel	Y	5.75	250	A-H	66.2	36.8		3,900	6,900	5,000	8,000	8,000	14,000
Crassostrea virginica American oyster	Y	1.0	50	A-H	79.6	60.0		3,300	6,500	4,000	8,000	5,000	10,000
Placopecien magellanicus Sea scallop	Y	6.8	350	A-H	45.4	32.0		0.5	4.4	35	250	150	1,200
Argopecien irradians Bay scallop	N	3.5	175	A,D,E,F,G,H	46.7	41.7		25	170	30			
Mercenaria mercenaria Bay quahaug	Y	0.5	30	A,C,E,G,H	62.7	46.8		0	0	1	2		
Ostrea edulis European oyster	N	0.1	10	A,C,E,G,H	60.4	53.3		0	0				
Chionocetes opilio Snow crab	Y	1.0	55	A,C,G	11.7	10.0		0	0				
Homarus americanus American lobster	Y			A,B,C,D,E,G	49.1	29.1		0	0				

CANADA

ANALYTICAL FORM D RESULTS FOR FINFISH

RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Trust of General Comments (from Section 5 - 3)
1 Oncorhynchus kisutch Coho salmon	1,2,3,4,5,6,8,9,10,14,15,16,19, 20,21,23,25,26,27	3,6,9,7,13	
2 Salmo salar Atlantic salmon	Almost all	26,25,7,17,27,10,9,23,20,24	
3 Gadus morhua Atlantic cod	1,2,3,4,5,7,8,9,10,13,14,17,19, 21,27	17,27,8,2,13,18,3,12	
4 Salvelinus alpinus Arctic char	1,2,3,4,5,6,10,12,13,14,16 17,23,27	2,7,13,3,18,6,10,27	
5 Oncorhynchus tsawytscha Chinook salmon	1,2,3,4,5,6,7,8,9,10,12,13,16, 17,18,20,21,23,25,27	6,26,9,13,7	
6 Hippoglossus hippoglossus Atlantic halibut	1,2,3,5,7,10,14,16,20,21,27	4,14,12,16,7,1	
7 Morone saxatilus Striped bass	3,4,5,7	5,3,7,8,17	
8 Anguilla anguilla American eel	4,5,10	10,7,3,4,8	
9 Cyclopterus lumpus Lumpfish	1,2,3,4,5,7,10,16,20	2,3,7,10,13,4,5,14	
10 Macrozoarces americanus Eel pout	1,2,3,4,7,13,14,16,18,20,21	3,12,7,10,14	
11 Anoplopoma fimbria Sablefish	1,2,3,4,5,7,9,10,13,23	4,3,7,6,9	
12 Melanogrammus aeglefinus Haddock		4,5,7,10,14	
13 Oncorhynchus mykiss Steelhead Trout			
14.			
15.			
16.			

CANADA

ANALYTICAL FORM D RESULTS FOR INVERTEBRATES

RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Trust of General Comments (from Section 5 - 3)
1 Mytilus edulis Blue mussel	1,2,3,4,6,10,12,22	22,10,12,6,3	
2 Crassostrea virginica American oyster	5	4,21,19	
3 Placopecten magellanicus Sea scallop	2,3,4,7,10,13,14,15,16,17,22,27	4,5,12,7,10,17,22,6,16,18	
4 Argopecten irradians Bay scallop	3,4,5,6,7,8,9,10,11,13,27	10,7,8,24	
5 Mercenaria mercenaria Bay quahaug		4,12,14	
6 Ostrea edulis European oyster		24,26,4,8,9	
7 Chinocetes opilio Snow crab	1,2,3,4,5,6,7,17	5,4,7,13,14	
8 Homarus americanus American lobster	2,3,4,5,6,7,9,10	13,14,3,6,9	
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			

DENMARK

ANALYTICAL FORM A
KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. maximus Turbot	8	8	8	8	7	3	7	5	5	8		8	8	8		8	8		8								8		123	170	72.0%
S. solea Sole	7	7	5	7	7	1	4	3	1	7			4	6	6	6	6		6								1		84	170	49.0%
G. morhua Cod	7	7	7	7	7	5	7	4	4	8		7	7	6		7	7		6	7	7		5				6		125	200	63.0%
P. platessa Plaice	7	8	7	7	7	1	4	3	1	7			4	6	6	6	6		6								1		87	170	51.0%
S. aurata Bream	6	7	6	6	7	1	4	7	4	1		8	8	8	9	8	8		5	9							7		119	190	63.0%
D. labrax Sea bass	6	7	6	6	7	1	4	7	3	2		8	8	8		6	8		7	7							7		108	180	60.0%
O. mykiss Rainbow trout		7	7	7	7	2	7	7	7	7			8	9	8	8	5	10	5	7	7		1	7	5	3	6		147	230	64.0%

DENMARK

ANALYTICAL FORM B
RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. maximus Turbot	1	1	1	1	0	0	0	6	5	1		8	1	6		2	8		5										46	160	29.0%
S. solea Sole	7	8	5	6	5	1	3	3	1	5			2	2	2	3	2		1										56	160	35.0%
G. morhua Cod	0	0	3	1	1	0	1	1	1	7		4	9	3		3	2		1	4	4		1						46	160	29.0%
P. platessa Plaice	7	3	3	4	5	1	3	3	1	5			2	2	2	3	2		1										47	160	29.0%
S. aurata Bream	1	1	6	1	1	0	1	5	5	2		8	8	6	9	6	8		5	6									79	180	44.0%
D. labrax Sea bass	1	1	5	1	1	0	5	2	2	2		8	6	7		8	6		3	1									59	170	35.0%
O. mykiss Rainbow trout		7	7	7	7	7	7	7	7	7			8	6	6	5	4			7	7				8				114	170	67.0%

DENMARK

ANALYTICAL FORM C. RESULTS
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Rainbow trout *Oncorhyncus mykiss*	N	3	170	A,C-E	64	67		7,000	27,000				
Turbot *Scophthalmus maximus*	Y	2	110	A-E,G,H	72	29	Juveniles 160,000	6	546	150	1,200		
Sole *Solea solea*	Y	0	0	A-C,E,I	49	35	0	0	0				
Cod *Gadus morhua*	Y	0	0	C,E-H,I	63	29	0	0	0				
Plaice *Pleuronectes platessa*	Y	0.1		C-E,G,I	51	29	0	0	0				
Bream *Sparus aurata*	N	1	64	A-E,G,H	63	44		0.2	3.8	50	650		
Seabass *Dicentrachus labrax*	N	1	64	A-E,G,H	60	35		0.3		150	1,900		
European eel *Anguilla anguilla*	Y	0.5	30				0	0	0				
Atlantic salmon *Salmo salar*	Y	0	0				0	0	0				

DENMARK

ANALYTICAL FORM D. RESULTS FOR INVERTEBRATES
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section and Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments
Rainbow trout *Oncorhyncus mykiss*	2-10,13-17,20,21,25	8,9,7,13,6	
Turbot *Scophthalmus maximus*	12,14,16,17,19,24	7,5,13,10,4	
Sole *Solea solea*		3,7,4,5,8	
Cod *Gadus morhua*	13,27,28	5,7,10,6,16	
Plaice *Pleuronectes platessa*		3,7,4,5,8	
Bream *Sparus aurata*	2,3,12-17,19,20,27	5,7,4,2,8	
Seabass *Dicentrachus labrax*	2,3,7,12,13,14,16,17,18,20, 27	5,7,4,2,8	

FINLAND

ANALYTICAL FORM A

KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN					
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. O. mykiss Rainbow trout	8	8	8	9	6	9	7	7	8	X	9	8	8	8	5	5	8	4	7	9	X	6	5	8	4	7	X	169	240	70.4%
2. S. salar Atlantic salmon	9	9	10	10	6	9	7	7	9	X	9	9	6	6	7	6	8	4	2	3	X	6	4	3	4	9	X	162	240	67.5%
3. S. alpinus Arctic charr	7	6	6	6	3	3	7	7	5	X	5	6	3	3	3	2	2	1	1	1	X	6	1	1	1	3	X	89	240	37.1%
4. C. lavaratus Whitefish	7	6	6	6	4	3	7	6	3	X	6	5	3	1	3	1	8	1	3	3	X	6	5	1	5	4	X	104	240	43.3%
5.																														
6.																														
7.																														
8.																														
9.																														
10.																														
11.																														
12.																														
13.																														
14.																														
15.																														
Point Total																														
Average																														

FINLAND

ANALYTICAL FORM B

RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic at.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	28. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. O. mykiss Rainbow trout	7	7	7	7	6	7	6	5	8	X	7	9	8	8	5	5	8	4	7	5	X	5	5	8	4	X	148	230	74.0%
2. S. salar Atlantic salmon	9	9	9	9	8	9	7	5	8	X	9	9	5	5	7	4	5	4	1	1	X	5	3	3	4	X	138	230	60.0%
3. S. alpinus Arctic charr	6	5	6	4	4	3	6	5	4	X	4	5	3	3	3	2	2	1	1	1	X	5	1	1	1	X	76	230	33.0%
4. C. lavaratus Whitefish	6	6	6	4	4	2	6	4	3	X	3	3	1	1	3	0	2	1	3	3	X	5	1	5	4	X	76	230	33.0%
5.																													
6.																													
7.																													
8.																													
9																													
10																													
11.																													
12.																													
13.																													
14.																													
15.																													
Point Total																													
Average																													

FINLAND

ANALYTICAL FORM C
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Rainbow trout *O. mykiss*	N	9	300	A,C,D,E,F,G, H	70.4	74		18,600	83,000	21,000	85,000	23,000	115,000
Atlantic salmon *S. salar*	Y	4	120	A,B,D,E,F,G, H,I	67.5	60		157	1200	150	1125	200	1500
Arctic charr *S. alpinus*	Y	3	100	A,B,D,G,H,I	37.1	33		7	35	40	200	80	400
Whitefish *C. lava-ratus*	Y	2	50	A,B,F,G,H,I	43.3	33		5	20	10	50	150	750

FINLAND

ANALYTICAL FORM D
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments (from Section 5 - 3)
O. mykiss Rainbow trout	3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 16, 17, 19, 20, 21, 25, 26, 27	(9) Diseases - vaccine for furunculosis (8) More rapid diagnosis BKD (6) Selective breeding program (25) Impacts on the environment (16) Integration of fish culture practices	
S. salar Atlantic salmon	2, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 19, 20, 21, 24, 25, 26	(6) Genetic studies (9) Diseases - countermeasures (13) Feeding (14) Individual culture units (21) Technical information	The major concerns are the low price of the produced fish and the long rearing cycle
S. alpinus Arctic charr	3, 5, 7, 9, 10	(8) Diseases - why are Arctic charr so sensitive (5) Environmental requirements during time of high temperatures (7) Nutritional requirements, amino acids especially (14) Individual culture units (20) Classification of coastal areas	
C. lavaratus Whitefish	4, 5, 7, 9, 10, 26	(14) Individual culture units (7) Nutritional requirements (6) Genetic studies - start of selective breeding program (16) Integration of growth units (27) Technology transfer	

ICELAND

ANALYTICAL FORM A
KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. salar Atlantic salmon	6	7	8	6	5	7	7	7	7	7		6	7	7	7	7	6		3	4	6		4						124	200	62.0%
H. hippoglossus Halibut	4	4	4	4	4	3	4	3	3	5		3	4	4		3			2	2	4		4	4	3				71	200	36.0%

ICELAND

ANALYTICAL FORM B
RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. salar Atlantic salmon	6	7	8	6	5	7	7	7	7	7		6	7	7	7	7	6		3	4	6		4						124	200	62.0%
H. hippoglossus Halibut	4	4	4	4	4	3	4	3	3	5		3	4	4		3			2	2	4		4	4	3				71	200	36.0%

ICELAND

ANALYTICAL FORM C. RESULTS
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Salmon *Salmo salar*	Y	10	500	A,B,C,D,E,F,G, H	62	62		2,886	16,000	4,000	24,000	6,000	36,000
Halibut *Hippoglossus hippoglossus*	Y	8	300	A,B,C,E,F,H	36	36		6	66	30	300	300	3,000

ICELAND

ANALYTICAL FORM D. RESULTS FOR INVERTEBRATES
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section and Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments
Salmon *Salmo salar*	3,4,6,7,8,9	4,5,6,9	Increase productivity, growth role, survival, etc.
Halibut *Hippoglossus hippoglossus*	1,2,3,4,5,7,10,13,16,21	3,4,5,6	Improve survival of larvae, increase growth

THE NETHERLANDS

ANALYTICAL FORM A

KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN				
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deplor. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish coefl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. D. labrax Sea Bass	8	7	3	8	4	8	8	5	4	4	X	5	5	7	3	2	2	7	1	1	8	X	7	8	8	2	2	X	127	250	51%
2. S. maximus Turbot	3	5	5	5	7	2	3	5	5	2	x	3	1	1	2	2	2	6	2	2	8	X	7	5	3	1	1	X	88	150	35%
3.																															
4.																															
5. M. edulis Blue mussels	9	3	3	2	8	3	3	2	2	3	X	8	5	5	2	5	2	8	0	8	7	8	X	8	9	3	4	X	120	250	48%
6. O. edulis Flat oyster	8	8	7	5	8	7	7	8	2	6	X	8	X	5	7	2	2	7	1	7	8	8	X	8	7	7	2	X	146	240	61%
7. C. gigas Pacific oyster	8	5	5	3	8	7	4	3	3	7	X	8	X	7	7	5	5	6	2	3	8	7	X	8	8	7	2	X	136	240	57%
8.																															
9.																															
10.																															
11.																															
12.																															
13.																															
14.																															
15.																															
Point Total																															
Average																															

THE NETHERLANDS

ANALYTICAL FORM B

RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic at.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. D. labrax Sea bass	8	8	1	8	1	8	8	7	2	2	X	2	5	7	2	2	3	7	1	1	5	X	8	8	2	2	2	110	750	49%
2. S. maximus Turbot	6	6	5	7	6	3	5	5	5	4	X	1	4	3	2	2	2	6	2	4	5	X	8	5	7	1	1	105	250	42%
3.																														
4.																														
5.																														
6. M. edulis Blue mussel	6	2	2	1	8	7	1	1	2	3	X	8	5	5	2	5	2	4	0	8	7	3	X	5	9	2	X	102	240	43%
7. O. edulis Flat oyster	8	8	5	4	8	2	7	3	2	3	X	8	X	2	2	0	2	7	1	7	5	8	X	8	7	8	X	114	240	48%
8. C. gigas Pacific oyster	6	6	5	2	8	4	2	2	2	6	X	8	X	7	7	2	2	6	1	0	8	9	X	1	5	7	X	106	240	44%
9																														
10																														
11.																														
12.																														
13.																														
14.																														
15.																														
Point Total																														
Average																														

THE NETHERLANDS

ANALYTICAL FORM C.
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Sea bass *Dicentrachus labrax*	Y	1.5	100	A,D,E	35	42	1000			50	350	?	?
Turbot *S. maximus*	Y	-	-	A,G,H	51	44				1	15	?	?
Blue mussel *M. edulis*	Y	8	200	F,G,H,E	48	43		100,000	55	100,000	70,000	100,000	80,000
Flat oyster *O. edulis*	Y	2	55	F,H,G,A	61	48		800	4.5	300	1666	?	?
Pacific oyster *C. gigas*	Y	-	-	I,F,E,C	57	44		800	4.5	600	1,500	800	3,000

. THE NETHERLANDS

ANALYTICAL FORM D
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments (from Section 5 - 3)
Seabass *Dicentrachus labrax*	(5) Env. require. (13) Feeding (23) Microalgae	(5) Temp. of coastal water i.r.t. growth/survival (20) Site selection for cages (8/9) Diseases/paras.-treatment (12) Criteria for site-sel.	Market prospects good Cold resistance still uncertain Limited numbers of suitable sites will probably limit expansion
Turbot *S. maxims*	(1) Biol. criteria (7) Nutritional req. (10) Physiology (13) Feeding (14) Culture units (21) Tech. data (23) Microalgae	(7) Nutr. req. (13) Feeding i.r.t. recirc. sys.-terms aimed at effluent quality (9) Diseases, medication and prevention in salt recirc. sys. (27) Technology transfer	Prospects for limited production are good: big investment costs and small market volume will limit big expansion. Zootechnical aspects seem to be no major problem.
Blue mussel *M. edulis*	4, 12, 20, 22, 25, 26	4, 20, 25, 26, 22	Production will stay the same
Flat oyster *O. edulis*	8, 9, 14, 15, 22	9, 8, 15, 14, 4	Future uncertain due to Bonamia epizooty
Pacific oyster *C. gigas*		17, 4, 27, 10	Small, slowly expanding culture due to Bonamia problems in *O. edulis*

NORWAY

ANALYTICAL FORM A
KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tax.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. salar Atlantic salmon	9	3	5	4	6	9	4	2	4	5		7	5	3	3	3	5	7	6	6	9			3	4	3	4		119	240	49.6%
O. mykiss Rainbow trout	8	6	6	6	6	8	7	6	6	7		5	6	4	4	4	4	6	5	4	6		3	3	3	3	4		130	250	52.0%
H. gammarus Lobster	6	3	8	2	9	0	7	6	8	7			7	7	7		9	9	3	4	3			10	8	10	7		140	220	63.6%
C. pagurus Edible crab	4	6	5	7	4	0	3	3	3	3		4	4	3	3	1	4	6	3	6	7			5	5	5	4		98	240	40.8%
P. maximus Great scallop	8	6	5	3	6	3	3	5	3	4	6	5	5	7	4	4	3	3	6	6	7	6			9	8	4		129	250	51.6%
G. morhua Cod	6	6	6	5	5	6	6	6	7	5		4	6	8	5	6	4	7	5	4	6			3	3	3	4		129	240	53.8%
A. lupus Grey wolffish	4	4	3	5	3	0	2	2	2	2		3	4	2	4	3	4	0	0	4	5			2	2	3	3		66	240	27.5%
A. minor Spotted wolffish	4	4	3	5	3	0	2	2	2	2		3	4	2	4	3	4	0	0	4	5			2	2	3	3		66	240	27.5%
S. maximus Turbot	4	6	6	6	4	4	4	5	5	5		4	5	4	6	5	5	5	4	4	4			4	4	4	4		111	240	46.3%
H. hippoglossus Halibut	5.5	6	5	5	5	3	3	4	3	1.5	0	3	4.5	5	4	3	1.5	6	1.5	3.5	4	0	3.5	7	3	8	5.5		104	270	38.5%

NORWAY

ANALYTICAL FORM B
RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro.	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total - Max x 100
S. salar Atlantic salmon	5	2	3	3	5	8	3	2	3	3		4	3	2	3	1	3		4	4	6			2	1	1			71	220	32.3%
O. mykiss Rainbow trout	5	4	4	4	5	7	6	4	4	5		4	5	3	3	2	3	6	4	3	5		2	2	2	2			94	240	39.2%
H. gammarus Lobster	8	5	7	5	8	6	5	6	6	7			6	7	7			8	8	2	1			0	1	0			103	200	51.5%
C. pagurus Edible crab	7	3	5	1	7	0	6	1	1	6		7	7	6	7	1	5	6	5	2	3			0	0	0			86	230	37.4%
P. maximus Great scallop	3	1	1	1	3	0	5	4	5	2	6	3	5	2	1	2	1	1	0	3	3	2			0	0			54	240	22.5%
G. morhua Cod	8	8	8	8	9	9	9	9	9	8		5	8	8	6	9	6	8	5	6	8			3	3	3			163	230	70.9%
A. lupus Grey wolffish	3	3	3	3	3	0	2	2	2	2		3	2	2	2	3	2	0	0	2	5			2	2	3			51	230	22.2%
A. minor Spotted wolffish	3	3	3	3	3	0	2	2	2	2		3	2	2	2	3	2	0	0	2	5			2	2	3			51	230	22.2%
S. maximus Turbot	7	6	6	6	7	4	7	7	7	5		4	7	4	6	7	5	5	4	4	4			4	4	4			124	230	53.9%
H. hippoglossus Halibut	7	7.5	5.5	6.5	5	3	3.5	5	4	1	0	3.5	5	5	3	3.5	2.5	0	1.5	1.5	1.5	0	2	0	3.5	1			81.5	260	31.3%

NORWAY

ANALYTICAL FORM C. RESULTS
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Salmon *Salmo salar*	Y			A,B,D-H	49.6	32.3		157,944	760,000				
Rainbow trout *Oncorhyncus mykiss*	N			A,C-H	52	39.2		3,523	12,000				
Cod *Gadus morhua*	Y		600	B-F,H	53.8	70.9		18	80	1,200	50,000	4,000	200,000
Turbot *Scophthalmus maximus*	Y		200	A-I	46.3	53.9		1	9	10	1,000	100	10,000
Halibut *Hippoglossus hippoglossus*	Y	40	2,000	A-F,H	38.5	31.3		130	1,000	150	1,000	1,000	8,000
Grey Wolffish *Anarchichas lupus*	Y	1	80	A-F,H	27.5	22.2		0	0	10	40	50	200
Spotted wolffish *Anarchichas minor*	Y	1	80	A-F,H	27.5	22.2		0	0	10	40	100	400
Great scallop *Pecten maximus*	Y	5	400	A,B,E-F,H	51.6	22.5		0	0	-	-	1	4,000
Lobster *Homarus gammarus*	Y	3.5	416	A-C,E-F,I	63.6	51.5		0	0	10	250	100	2,500
Edible crab *Cancer pagurus*	Y	0	0	B,C,E-I	40.8	37.4		0	0	100	600	1,000	6,000

NORWAY

ANALYTICAL FORM D. RESULTS FOR INVERTEBRATES
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section and Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)
Salmon *Salmo salar*	3,4,6,7,8,9,13,14,24,25,26	
Rainbow trout *Oncorhyncus mykill*	3,6,	
Cod *Gadus morhua*	1-10,13,16-18,20,21,27	Seed, product price, early maturation, weaning from live plankton to artificial diets, cannibalism
Turbot *Scophthalmus maximus*	1,5,7-9,13,16	Heating water, low temperature adaptation, feeding/weaning, nutritional requirements, brood stock management, egg quality
Halibut *Hippoglossus hippoglossus*	1-9,13,17	Technology transfer, integration of fish culture practices, biology of juvenile stages, genetics, diseases
Grey Wolffish *Anarchichas lupus*		Reproduction physiology, individual culture units, deployment and arrays of culture units, integration of practices, strategies for optimal production
Spotted wolffish *Anarchichas minor*		Reproduction physiology, individual culture units, deployment and arrays of culture units, integration of practices, strategies for optimal production
Great scallop *Pecten maximus*		Nutritional requirements, microalgae as food, feeding, reproduction, choices of strategies
Lobster *Homarus gammarus*	1-7,10,13-16,18,19	Predation, feeding/nutritional requirements, environmental requirements, individual culture units
Edible crab *Cancer pagarus*	1,5,7,10,12-15,17-19,27	Physiology, nutritional requirements, feeding, predation/aggressiveness in culture situations, individual culture units

SWEDEN

ANALYTICAL FORM A

KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN				
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. S. salar Atlantic salmon	7	6	7	7	6	6	5	7	4	5	X	8	5	5	4	6	5	5	9	8	5	X	X	3	7	5	4	7	146	240	60.8%
2. S. alpinus Arctic charr	5	6	4	8	6	5	4	4	6	4	X	8	3	3	5	3	3	4	5	6	7	X	X	3	8	4	6	X	120	230	52.2%
3. O. mykiss Rainbow trout	7	7	8	1	9	8	8	5	5	7	X	9	7	7	6	8	6	9	5	8	9	X	X	6	8	6	6	X	165	230	71.7%
4. O. edulis Flat oysters	6	8	9	7	4	8	9	0	2	7	8	4	8	6	6	X	3	7	4	7	5	8	X	8	8	8	8	X	158	250	63.0%
5. G. morhua Cod	4	X	8	6	6	6	6	6	4	4	10	10	10	10	10	8	8	6	8	6	8	X	4	8	8	8	8	X	180	250	72.0%
6. S. maximus Turbot	5	X	6	5	8	3	6	6	5	5	10	10	6	6	6	6	5	X	8	X	8	X	X	8	8	5	8	X	143	220	65.0%
7. P. platessa Plaice	5	X	6	5	8	4	5	4	3	3	10	6	6	3	3	3	3	X	6	X	8	X	X	8	8	4	2	X	113	220	51.4%
8.																															
9.																															
10.																															
11.																															
12.																															
13.																															
14.																															
15.																															
Point Total																															
Average																															

SWEDEN

ANALYTICAL FORM B

RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. S. salar Atlantic salmon	7	7	7	8	5	4	4	5	2	8	X	8	4	3	3	6	5	5	4	7	5	X	X	3	5	2	2	119	240	49.6%
2. S. alpinus Arctic charr	4	4	3	6	4	5	2	2	3	6	X	6	7	2	2	5	5	3	7	5	7	X	X	2	7	3	X	110	230	47.8%
3. O. mykiss Rainbow trout	8	8	6	1	9	7	8	7	7	7	X	4	8	8	3	4	3	5	4	8	6	X	X	5	8	3	X	137	230	59.6%
4. O. edulis Flat oysters	8	8	9	8	6	8	9	9	9	8	9	5	9	8	8	X	6	9	7	7	5	8	X	8	9	9	X	189	240	79.0%
5. G. morhua Cod	4	X	8	4	8	1	3	4	6	3	3	8	10	6	6	8	6	4	4	6	6	X	2	2	6	6	X	124	240	51.7%
6. S. maximus Turbot	8	X	6	8	8	3	8	4	4	7	3	8	6	4	4	4	4	X	4	X	6	X	X	2	6	3	X	110	210	52.4%
7. P. platessa Plaice	4	X	6	4	6	3	3	3	2	2	3	6	6	3	3	3	3	X	3	X	6	X	X	6	6	3	X	84	210	40.0%
8.																														
9.																														
10																														
11.																														
12.																														
13.																														
14.																														
15.																														
Point Total																														
Average																														

SWEDEN

ANALYTICAL FORM C
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person years (PY)	Total expenditures $ x 1000				Numbers	Tonnes	$ x 1000	Tonnes	$ x 1000	Tonnes	$ x 1000
Atlantic salmon *S. salar*	Y	ca. 10	700	A,C,D,E,F,G, H	60.8	49.6		500	3500	500	3600	500	3600
Arctic charr *S. alpinus*	Y	ca. 4	400	A,B,C,D,E,F, H	52.2	47.8		150	1000	1000	7000	5000	35,000
Rainbow trout *O. mykiss*	N	ca. 5	300	A,C,D,E,F,G, H	71.7	59.6		7000	45,000	8000	50,000	8000	50,000
Cod *G. morhua*	Y	1,5	150	I	72	51.7				10	250	50	1250
Turbot *S. maximus*	Y	2	250	I,A,B,C	65	52.4				?		?	
Plaice *P. platessa*	Y	0,2	10	I,E,C,F,G,H	51.4	40				?		?	
Flat oysters *O. edulis*	Y	1	58	A,B,F,H	63	79	50,000	4	28	6	50	30	250

SWEDEN

ANALYTICAL FORM D
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments (from Section 5 - 3)
Atlantic salmon *S. salar*	1,2,3,4,6,8,9,10,20,21,25	Diseases, life-history, environm. influence	Because of stiff compositions from nearby Norway, we expect little development of intensive aquaculture on this species in Sweden
Arctic charr *S. alpinus*	1,4,5,6,10,12,13,16,17, 19,21,27	Diseases	
Rainbow trout *O. mykiss*	6,8,9,13,14,20,25	Diseases, genetic studies, feeding, environm. impact	
Flat oysters *O. edulis*	(1) Biol. criteria (5) Environ. req. (6) genetic studies (9) Disease measures (12) Culture site (14) Growth units (15) Deploy. of 14 (18) predation (22) Algae tox. (27) Tech. transf.	(4) Environm. req. (8) Dis. diagn. (9) Dis. measures (12) Culture site (17) Strategies	

SWEDEN

ANALYTICAL FORM D (CONTINUED)
RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)	Main Thrust of General Comments (from Section 5 - 3)
Cod *G. morhua*	(1) Cand. select (3) Spawning (4) Juvenile stages (5) Environ. req. (9) Dis. measures (12) Culture site (13) Feeding (14) Growth units (15) Deploy of 14 (16) Integration (17) Strategies (19) Record keep. (20) Geog. areas (21) Ocean hydro. (25) Environm. impact (26) Interaction (27) Tech. transf.	(4) Start feeding (5) Environm. req. (9) Diseases (10) Physiology (17) Choices of strategies	Primarily studies on Baltic cod for ranching in the Bottnian Sea but also Skagerrak cod is studied
Turbot *S. maximus*	(7) Nutrit. req. Dis. measures (9) Physiology (10) Feeding (13) Record keep. (19) Tech. transf.	(3) Reproduction (4) Start feeding (16) Integration (17) Choices of strategies (24) Fisheries impact	Tested for enhancement stocking in the Baltic Sea
Plaice *P. platessa*	(1) Cand. select. (13) Feeding (17) Strategies (24) Fish. confl.	(4) Juv. stages, start feeding (10) Physiology (16) Integration (24) Fisheries impact on	Will be tested in enhancement stocking at the Skagerrak coast

UNITED KINGDOM

NALYTICAL FORM A

NOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN					
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
Salmo salar 1. Atlantic salmon	10	6	8	8	8	4	8	8	8	8	-	8	8	8	6	8	8	9	9	4	5	-	4	3	7	3	7	-	173	250	69.2
Oncorhyncus mykiss 2. Rainbow trout	10	8	8	8	8	8	9	8	9	8	-	8	8	10	9	8	8	9	9	4	5	-	1	3	7	3	5	-	181	250	73.2
Scophthalmus maximus 3. Turbot	4	6	3	4	7	5	6	3	3	5	-	7	6	6	4	6	4	6	4	5	3	-	2	7	5	3	3	-	117	250	46.8
Ctenolabrus rubestris 4. Wrasse	3	8	6	4	4	1	2	2	9	1	-	10	4	7	4	5	5	-	-	-	-	-	-	-	-	-	7	-	78	160	48.7
Hippoglossus hippo- 5. glossus Atl. Halibut	4	4	3	3	3	1	3	3	3	4	-	7	6	4	3	3	5	3	3	6	2	-	1	0	7	3	7	-	91	250	36.4
Dicentrachus labrax 6. Sea bass	8	5	5	5	6	3	4	4	5	5	-	7	7	6	6	4	4	3	6	8	4	-	1	0	7	3	4	-	120	250	48.0
Anguilla anguilla 7. European eel	7	5	1	4	5	1	6	6	6	5	-	8	8	9	9	6	7	6	6	7	5	-	4	5	7	3	7	-	143	250	57.2
Gadus morhua 8. Atlantic Cod	4	3	5	4	4	1	3	3	3	1	-	3	3	2	3	3	2	6	0	3	0	-	1	5	7	5	5	-	79	250	31.6
Salvelinus alpinus 9. Arctic char	4	6	6	7	8	5	6	7	8	8	-	7	8	8	8	6	7	8	9	8	6	-	0	5	7	5	5	-	162	250	64.8
Mytilus edulis 0. Blue mussel	8	8	8	9	6	3	4	7	5	8	6	7	8	9	9	8	9	9	5	8	2	9	-	8	8	5	9	-	185	260	71.2
Ostrea edulis 1. Flat oyster	6	7	7	7	6	3	4	8	6	8	5	7	7	8	9	7	7	8	5	8	2	9	-	8	8	5	7	-	172	260	63.1
Crassostrea gigas 2. Japanese oyster	8	8	8	8	7	5	5	8	8	8	6	8	8	9	9	8	8	9	5	8	4	9	-	8	8	7	9	-	196	260	75.4
Pecten maximus 3. Great scallop	6	8	6	6	6	3	3	3	3	5	4	6	5	5	5	5	5	7	3	5	2	9	-	8	6	4	4	-	132	260	49.6
Chlamys opercularis 4. Queen scallop	6	6	6	6	4	3	3	3	3	5	4	4	4	2	2	2	3	7	1	3	1	9	-	6	4	2	1	-	100	260	38.5
Homarus gammarus 5. Lobster	5	10	6	8	6	2	4	6	6	4	-	6	6	6	5	5	4	4	1	1	4	1	-	5	6	4	5	-	120	250	48.0
Point Total																															

NITED KINGDOM

ALYTICAL FORM B

ESEARCH SCORES

AME OF SPECIES Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total + Max x 100
1. Salmo salar Atlantic salmon	8	8	6	4	8	0	7	8	8	7	-	4	7	8	5	8	4	6	6	3	7	-	3	5	5	5	-	140	240	58.3
2 Oncorhyncus mykiss Rainbow trout	8	5	6	8	8	0	7	8	8	7	-	4	7	8	5	8	4	5	6	3	7	-	2	0	5	3	-	132	240	56.2
3 Scophthalmus maximus Turbot	5	5	4	4	5	3	4	3	3	5	-	4	4	4	4	3	3	6	3	2	3	-	1	3	4	3	-	88	240	36.7
4 Ctenolabrus rube-stris wrasse	5	5	5	5	5	1	1	1	4	1	-	10	6	6	5	5	-	-	-	-	-	-	-	-	-	-	-	65	150	43.3
5 Hippoglossus hippo-glossus Atl. halibut	4	7	4	5	1	1	3	3	3	4	-	4	4	4	3	2	3	1	0	3	1	-	0	0	3	0	-	63	240	26.2
6 Dicentrachus labrax Sea bass	6	5	3	6	5	1	4	4	5	5	-	7	5	6	5	4	4	1	4	5	4	-	2	0	4	0	-	95	240	39.6
7 Anguilla anguilla European eel	4	5	1	6	6	1	7	5	4	5	-	4	7	7	6	5	4	1	4	5	3	-	1	0	5	0	-	96	240	40.0
8 Gadus morhua Atlantic cod	4	3	3	4	4	1	3	1	2	1	-	3	1	1	2	2	1	1	0	3	0	-	0	5	5	5	-	55	240	22.9
9 Salvelinus alpinus Arctic char	6	5	7	7	5	1	7	5	5	5	-	7	5	5	5	5	5	3	6	5	4	-	0	4	4	3	-	114	240	47.5
10 Mytilus edulis Blue mussel	7	6	7	7	6	3	4	7	5	8	5	5	8	9	9	8	9	7	5	3	1	9	-	5	7	4	-	154	250	61.2
11. Ostrea edulis Flat oyster	6	7	7	7	7	3	4	7	8	8	5	5	6	7	9	7	7	8	3	3	1	9	-	4	7	4	-	149	250	59.2
12. Crassostrea gigas Japanese oyster	8	8	8	8	7	4	4	7	7	8	6	6	6	8	9	8	8	8	5	5	3	9	-	4	7	5	-	166	250	66.4
13. Pecten maximus Great scallop	5	6	6	5	5	3	3	3	0	5	4	4	4	5	4	4	5	6	3	3	1	9	-	4	4	2	-	103	250	41.2
14. Chlamys opercularis Queen scallop	4	6	6	6	4	2	3	3	0	5	4	4	4	2	2	2	2	5	1	3	1	9	-	3	2	0	-	83	250	33.2
15. Homarus gammarus Lobster	5	6	7	4	4	0	3	4	4	3	-	6	6	6	4	5	4	4	0	1	4	1	-	5	6	3	-	95	240	39.6
Point Total																														
Average																														

UNITED KINGDOM
ANALYTICAL FORM C – RESULTS FOR FINFISH
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person Years (PY)	Total Expenditures $X1000				Numbers	Tonnes	$X1000	Tonnes	$X1000	Tonnes	$X100
Salmo salar Atlantic salmon	Y	N/A	3,500	C,D,E,F,G,H	69.2	58.3	14x10⁶	32,000	260,000	40,000	210,000	50,000	262,000
Oncorhynchus mykiss Rainbow trout	N	0	2	C,D,E,F,G,H	73.2	56.2		1,000	3,500	1,000	3,500	1,000	3,500
Scophthalmus maximus Turbot	Y	0	0	A,B,C,F,G,H	46.8	36.7		10	100	0		0	
Ctenolabrus rupestris Wrasse	Y	2	62.5	A,B,C,E,F,G,H	48.7	43.3		0		*	2,000	*	2,000
Hippoglossus hippoglossus Atlantic Halibut	Y	5	175	A,B,C,D,F,G,H	36.4	26.2		0		0		3,000	26,000
Dicentrachus labrax Sea bass	Y	0	0	A,B,G,H	48.0	39.6		0		0		0	
Anguilla anguilla Eel	Y	0	0	A,B,C,D,G,H	57.2	40.0		0		0		0	
Gadus morhua Atlantic cod	Y	0	0	C,D,E,F,G,H	31.6	22.9		0		0		0	
Salvelinus alpinus Arctic char	Y	0	0	A,B,C,D,E,F,H	64.8	47.5		0		50		250	1,000

UNITED KINGDOM
ANALYTICAL FORM C - RESULTS FOR INVERTEBRATES
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (%) from Analytical Form A	Overall "Research" Rating No. (%) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person Years (PY)	Total Expenditures $X1000				Numbers	Tonnes	$X1000	Tonnes	$X1000	Tonnes	$X100
Mytilus edulis Mussel	Y	N/A	1,800	C,D,E,F,G,H	71.2	61.2	-	4,000	1,800	9,000	-	26,000	-
Ostrea edulis European oyster	Y	N/A	1,800	A,B,F,G,H	63.1	59.2	-	1,600	7,400	3,000	-	6,000	-
Crassostrea gigas Japanese oyster	N	N/A	1,800	A,C,D,E,F, G,H	75.4	66.4	-	-	-	-	-	-	-
Pecten maximus Scallop	Y	N/A	N/A	A,B,C,F,G,H	49.6	41.2	105,000	13	-	100	-	500	-
Chlamys opercularis Queen scallop	Y	-	N/A	C,D,E,F,G,H	38.5	33.2	$1.3X10^6$	54	-	100	-	200	-
Homarus gammarus Lobster	Y	3	200	A,B,C,F,G,H	48.0	39.6	6,800	-	15	0	-	5	27

ANALYTICAL FORM D UNITED KINDGOM

RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)
1. Salmo salar Atlantic salmon	7,8,9,10,13,15,16,17,18,19,21,24 25,26	8,6,10,7 (26118)
2. Oncorhuncus mykis Rainbow Trout	8,9,10,13,19	10,6,8
3. Scophthalmus maximus Turbot	14	4,7,3
4. Ctenolabrus rubestris Wrasse	2,8,27	Cleaner fish for sea lice control on salmon
5. Hippoglossus hippoglossus Atl. halibut	1,2,3,4,8,12,14,27	4,3,7,14,17
6. Dicentrachus labrax Sea bass		
7. Anguilla anguilla European eel	1	No activity at present
8. Gadus morhua Atlantic cod	1	4,7,13
9. Salvelinus alpinus Arctic Char	1	No activity at present; some interest
10. Mytilus edulis Blue mussel	5,14,22	5,22,14
11. Ostrea edulis Flat oyster	5,8,9,22	5,22,9,8
12. Crassostrea gigas Japanese oyster	5,22	5,22
13. Pecten maximus Great scallop	1,3,4,5,12,14,15,16,17,22	17,4,5,22,24
14. Chlamys opercularis Queen scallop	5,14,15,22	
15. Homarus gammarus Lobster	1,14,15,16,26	7,10,4,26,17
16.		

UNITED STATES
(Northeastern)

ANALYTICAL FORM A

KNOWLEDGE SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV IMPACTS			TECH TRAN				
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy. of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20. Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. Impact	26. Interaction	27. Tech. transf.	28. Other	Point Total	Maximum Points Obtainable	Pt. Total ÷ Max x 100
1. Oncorhynchus mykiss Steelhead	8	8	6	6	9	6	5	5	4	7	-	5	7	6	6	7	-	-	-	-	-	3	5	7	8	7	9		134	210	63.8
2. Crassostrea virginica American oyster	7	8	7	6	8	4	6	5	4	6	7	6	7	6	6	5	5	7	3	7	6	5	-	5	6	6	7		155	260	59.6
3. Mytilus edulis Blue mussel	-	7	4	6	7	7	7	7	7	9	8	5	6	5	3	5	4	6	9	1	2	2	3	6	6	6	1	4	143	270	53.0
4. Mercenaria mercenaria Quahaug	7	7	5	4	5	5	2	2	3	4	8	4	6	5	5	5	5	7	3	7	4	2	4	4	4	2	7		126	270	46.7
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Point Total																															

UNITED STATES
(Northeastern)

ANALYTICAL FORM B

RESEARCH SCORES

NAME OF SPECIES (Scientific and Common)	BIOLOGY											CULTURE SYSTEMS							MANAGEMENT					ENV. IMPACTS						
	1. Cand. select.	2. Life cycles	3. Spawning	4. Juv. stages	5. Environ. req.	6. Genetic st.	7. Nutrit. req.	8. Dis. diag.	9. Dis. measures	10. Physiol.	11. M'algae food	12. Cult. site	13. Feeding	14. Growth units	15. Deploy of 14	16. Integration	17. Strategies	18. Predation	19. Record keep.	20 Geog. areas	21. Ocean., hydro	22. M'algae tox.	23. M'algae threat	24. Fish confl.	25. Envir. impact	26. Interaction	27. Other	Point total	Maximum Points Obtainable	Pt. Total + Max x 100
1. Oncorhynchus mykiss Steelhead	5	7	4	6	8	3	5	5	4	4	-	5	3	6	6	6	-	-	-	1	-	2	5	5	7	7		104	210	49.5
2. Crassostrea virginica American oyster	6	7	6	5	7	3	6	5	4	5	7	5	6	4	5	2	3	5	2	4	4	4	-	5	3	6		119	250	47.6
3. Mytilus edulis Blue mussel	-	6	2	4	5	2	3	1	1	5	5	5	3	1	3	6	4	1	6	1	4	2	1	2	2	3	6	84	260	32.3
4. Mercenaria mercenaria Quahaug	6	7	5	3	5	6	1	1	2	4	7	1	5	2	2	3	4	6	1	7	2	1	2	2	2	1		88	260	33.8
5.																														
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13.																														
14.																														
15.																														
Point Total																														
Average																														

UNITES STATES (Northeastern)

ANALYTICAL FORM C -
SUMMARY OF SPECIES DATA

Name of Species (Scientific and Common)	Indigenous Yes or No	1990 Expenditures		Priority Reasons for Selection (Use Letter Codes from Section 3 of Report)	Overall "Knowledge" Rating No. (X) from Analytical Form A	Overall "Research" Rating No. (X) from Analytical Form B	Production in 1990			Projections (from Section 5 of Report)			
										1995		2000	
		Staff Person Years (PY)	Total Expenditures $X1000				Numbers	Tonnes	$X1000	Tonnes	$X1000	Tonnes	$X100
Oncorhynchus mykiss Steelhead	Y	N/A	N/A	A,C-H	63.8	49.5		1,000	7,500	2,000	12,000	5,000	30,000
Crassostrea virginica American oyster	Y	25	1,000	A-H	59.6	47.6		3,200 (meat)	25,000	-	-	-	-
Mytilus edulis Blue mussel	Y	2	100	C-H	53.0	32.3		1,200	800	3,000	3,000	6,000	6,000
Mercenaria mercenaria Quahaug	Y	N/A	N/A	A,C-G	46.7	33.8	$35X10^6$		4,200	$500X10^6$ (indiv)	50,000	$500X10^6$ (indiv)	50,000

ANALYTICAL FORM D

RESEARCH AND RESEARCH PRIORITIES

Name of Species (Scientific and Common)	Section 4 Topics under Study in Country by Name and Number	The Five Items of Greatest Priority for Each Species (from Section 5 - 1)
1. Oncorhynchus mykiss Steelhead	3	3,7,23
2. Crassostrea virica American oyster	1-4,6-15,18,22,27	8,16,4,6,9,3,2
3. Mytilus edulis Blue mussel	4,5,10,12,16,21	22,21,10,20,3
4. Mercenaria mercenaria Quahaug	6,11	12,14/15,17,7, marketing
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