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International Council for the
Exploration of the Sea

C.M.1974/E:7
Fisheries Improvement Committee

REPORT OF THE ICES WORKING GROUP ON THE INTRODUCTION OF NON-INDIGENOUS MARINE ORGANISMS

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*)
General Secretary, ICES,
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REPORT OF THE ICES WORKING GROUP ON THE INTRODUCTION OF NON-INDIGENOUS MARINE ORGANISMS

The Group met at MAFF headquarters, Great Westminster House, Horseferry Road, London, on 31 January and 1 February, 1974.

Those present were:

Dr H.A. Cole (Chairman)	U.K.
Mr A. Franklin (Secretary)	U.K.
Dr R. Meixner	Federal Republic of Germany
Prof. Dr P. Korringa	Netherlands
Dr L. Marteil	France
Dr R. Pérès	France
Dr E. Egidius	Norway
Dr F.A. Gibson	Ireland
Mr H. Quiroga	Spain
Mr Alvarez de Meneses	Spain
Mr F. Palminha	Portugal
Mr R. Lloyd	U.K.
Dr G.T. Boalch	Observer, British Phycological Society

Apologies for absence were received from:

Mr C.P. Ruggles	Canada
Dr B.I. Dybern	Sweden
Dr A.K. Sparks	U.S.A.
Mr H. Vøgg Jacobsen	Denmark
Prof. J.M. Pérès	France
Mr J. Le Noan	France

The Agenda as attached was adopted.

The Chairman introduced Dr G.T. Boalch of the Marine Biological Association, Plymouth, who was present as an observer at the request of the British Phycological Society. The Chairman referred to a suggestion that had been made by Professor C.L. Maurin, that Drs North and Neushul from California should be invited to the Meeting of the Working Group. This had been considered at the Lisbon Meeting of ICES. It was then agreed that if the U.S.A. wished to include these scientists in their delegation to the Meeting, this would certainly be acceptable. In the event, the U.S.A. had no representation at the Meeting.

The terms of reference embodied in Council Resolution 1973/2:18 were noted (see ANNEX 1).

The following papers were circulated:

(1) Note on the eventual introduction on the French continental slope of algae belonging to the genus Macrocystis by Professor J.M. Pérès (Marseille) (ANNEX 2).

(2) Report from the Committee on Foreign Seaweed Advisory Council on Scientific Policy (U.K.) 31 March 1950 (ANNEX 3).

(3) Advisory Council on Scientific Policy - Committee on Foreign Seaweed. Minutes of a Meeting held on 6 March, 1950 (ANNEX 4).

(4a) British Phycological Society - Resolution on Macrocystis passed on 4 January 1974 (ANNEX 5).

(4b) British Phycological Society - Summary of a paper given by H.T. Powell, Dunstaffnage Laboratory, Oban on 4 January 1974 (ANNEX 6).

(5) Letter to the Chairman from the Department of Trade and Industry (U.K.) dated 15 January 1974 (ANNEX 7).

(6) Letter to the Chairman from the Ministry of Defence (U.K.) Navy Department dated 21 January 1974 (ANNEX 8).

The Working Group also had before it copies of the following documents:-

(1) Etude sur l'opportunité d'introduire l'algue Macrocystis sur le littoral français by R. Pérèz et al., Rev. Trav. Inst. Pêches marit., 37(3): 307-361, 1973.

(2) Letter from the office of the Director of the Rijksherbarium, LEIDEN, Netherlands, outlining the views of the Dutch phycologists on the proposed introduction of Macrocystis.

(3) Letter to the Chairman from Dr H.T. Powell at present studying Macrocystis in the Falkland Islands.

(4) Letter to the Chairman from Alginate Industries Ltd., London, supporting the proposed introduction.

(5) Letter from the Town Clerk of Worthing (U.K.) regarding the cost of removing stranded algae from beaches.

(6) Letter from Commander Campbell (RN), describing the difficulties encountered during a hydrographic survey of Falkland Island waters, due to the presence of Macrocystis.

The Portuguese representative provided a written statement of his country's position regarding the proposed introduction of Macrocystis (ANNEX 9).

Discussion was based on a consideration of these documents and on a further explanation by the French representatives of the nature and purposes of the controlled experiment outlined on page 359 of the report by Pérèz et al. Reference was also made to the full discussion which took place at the 61st Statutory Meeting at Lisbon.

The French representatives indicated that it would be their intention to make a re-appraisal, in conjunction with ICES, of the advantages and disadvantages of introducing Macrocystis at the conclusion of the controlled experiment, before deciding whether to proceed with commercial scale introduction and acclimatisation. It was stressed that some of the principal advantages of the introduction of Macrocystis would be the substantial increase in the amount of seaweed available to the alginate industry and the wider market potential of the material manufactured from Macrocystis.

The discussion by the Working Group of the advantages and disadvantages of introducing Macrocystis on a commercial scale included an examination of the possible effects on the exploitation of existing seaweed resources, fish and shellfish farming, inshore fisheries especially those for lobster and salmon, navigation and hydrographic surveying in coastal waters, passage of small vessels into and out of port, fouling of ships' inlets, stranding of weed on beaches and other effects on amenities. The inevitable major changes in shallow-water ecosystems resulting from the establishment of Macrocystis, including possible effects on production, were also fully considered.

Particular attention was paid to the possibility that the proposed experimental introduction into the sea off Brittany might lead to the uncontrollable spread of Macrocystis. Such an occurrence might ultimately affect coastal areas as far north as Norway and as far south as Spain and Portugal.

It was agreed that the principal task of the Working Group was to reach a conclusion on the desirability and feasibility of making a controlled experimental introduction as outlined in the French proposal. In the event of this proving successful, a final decision on whether to proceed to a commercial-scale introduction would be dependant upon a careful balancing of the advantages and disadvantages to various sectional interests, with particular reference to economic considerations.

General agreement on the advisability of the proposed experiment could not be reached. Some members of the Working Group expressed their willingness to support a controlled experiment as proposed by the French representatives, if they could be given assurances that all plants would be removed before they reached the reproductive phase, that there would be no risk of uncontrollable spread of Macrocystis and that a successful experiment would be followed by a re-appraisal of the advantages and disadvantages before proceeding to a commercial-scale introduction. This re-appraisal might show that it would be possible to cultivate this species under controlled conditions on a commercial scale.

However, some members held the view that it would be impossible to have such an experiment without incurring a risk of uncontrollable spread. The proposed experiment might not provide sufficient evidence to judge the risk of the occurrence of such an uncontrollable spread.

The majority of the Working Group members were convinced that the spread of Macrocystis to their coasts would be followed by serious disadvantages.

Several other matters were discussed by the Working Group:

(a) The Portuguese representative asked for advice on a proposal to introduce Crassostrea gigas adults from Spain (near Cadiz) to Portugal. The introduction of C. gigas spat to Spain had been by direct shipment from Japan. It was suggested that the Recommended Procedure in the agreed Code of Practice be adhered to and that hatchery-reared C. gigas should be utilised if possible. The Dutch representative pointed out that C. gigas might replace C. angulata completely and this would be unfortunate, since both species had points of special merit.

(b) The Norwegian representative expressed concern at the increased risks of spreading pests and diseases with the development in aquaculture of the use of cages in the open sea. The Chairman agreed that this was a topic that warranted special consideration by the Working Group at a future

Meeting, especially since diseases could easily be spread to adjacent wild populations. The Working Group was informed that EIFAC were also very concerned with the problem of communicable diseases in fish. The French representatives commented that he was worried about the possibility of fin-fish carrying Dermocystidium-like organisms which could be transmitted to invertebrates such as oysters. This was a question on which there was little available information.

(c) The great increase in the number of exotic fish being imported into Ireland for private aquaria was discussed. The Chairman referred to recent U.K. legislation which licensed such introductions and commented that this type of action was the only answer to such problems.

The above Report was approved by the members of the Working Group for transmission by the Chairman to the General Secretary of ICES.

ANNEX 1

AGENDA

1. Introduction by the Chairman.
2. Representation of member countries and observers*).
3. Terms of reference - Council Resolution 1973/2:18.
4. Presentation of the case for the introduction of Macrocystis pyrifera.
5. Discussion.
6. Recommendation to ICES.
7. Any other business.
8. Approval of the Report of the Meeting.

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*) The British Phycological Society will be represented by Dr G.T. Boalch of the Marine Biological Association, Plymouth, who will present a recommendation from the Society opposing the Macrocystis introduction. Copies of this will be available at the Meeting.

TERMS OF REFERENCE (Council Resolution 1973/2:18)

"It was decided, that:-

(a) the Working Group on the Introduction of Non-Indigenous Marine Organisms should meet as soon as practicable to consider further the proposed introduction of Macrocystis to France in the light of the detailed assessment prepared by Pérès et al., taking into account the discussion of this question at the 61st Statutory Meeting of ICES.

(b) in view of the importance of the matter, all potentially affected member countries be requested to appoint members to the Working Group."

ANNEX 2

NOTE ON THE EVENTUAL INTRODUCTION ON THE FRENCH CONTINENTAL SLOPE OF ALGAE BELONGING TO THE GENUS MACROCYSTIS

The Report that I have been asked to prepare for the CST/CNEXO tries to give the Directorate a warning as well motivated as possible on the eventual introduction on the French continental slope of brown algae of the genus Macrocystis. A certain number of headings that should appear in the present report are enumerated in a letter dated 5 June 1973 from the Director General of CNEXO to the Director General of ISTPM.

1. Technical capabilities of harvest and transformation; influence on employment.

2. The state of the market and perspectives; alternative solutions.

3. Influence on the state of the coast (development and defence).

4. Influence on the navigation of pleasure boats.

5. Problems posed by surface ships and submarines of the Navy.

6. Responsibility towards other countries in the case of proliferation of the alga.

Headings should evidently be added devoted to the influence on the whole ecosystem and on the exploitation of the many species comprising it. In addition to the bibliographic documentation, relatively important, to which I had access I have received communications as much from CNEXO as from ISTPM of a number of documents of which the principal ones are: for CNEXO, the BIPE Report, for ISTPM, the Report of the Mission sent to California and to Chile in 1973 under the aegis of this organisation and of the Inter-Professional Committee on Marine Algae (ISTPM/CIAM Report). First it must be stressed that among the many species of giant Laminariales existing in the whole world, the only one of which introduction is planned is Macrocystis pyrifera, which is known in the following regions:

> Lower California, Peru, all the continental and island coasts of the southern hemisphere beyond 35 degrees south.

The choice of M. pyrifera is justified by the fact that this species only settles on hard substrates which avoids all risk of expansion to the softer bottoms of the continental shelf, which are eventually trawlable. The biology and ecology of the species are clearly described in the ISTPM/CIAM Report. It must be noted at this point that in three zones where populations of M. pyrifera (Lower California, Chile, Kerquelen) have been made the object of quite detailed studies, the specimens have not only morphological differences but have also physiological ones (in particular in biomass) which make us think of a subspeciation. The eventual introduction in France would be made from spores from the Californian populations which does not mean that the population which could result from them on our coast would be quite comparable at all points to those which exist in the original region.

The first point to consider is evidently economic, for it is useless to carp at the inconveniences and advantages of the introduction of M. pyrifera if it is not profitable. The market for alginates is in full expansion and the substitution by synthetic products applicable to many uses would seem unlikely in the short or medium term. The world production of alginates in 1970 was 12 800 tons, of which 4 500 for the United States (corresponding to about 13 000 tons of Macrocystis provided practically entirely by the Kelco Company), 3 000 tons for England (Alginate Industries Ltd.), 2 500 tons for Norway and for France, 1 200 following the ISTPM/CIAM Report; the BIPE Report allows it to be understood that the French production would be much higher (of the order of 2 000 tons) of which 80% is exported, the imports (corresponding to special alginates) not reaching more than 400 tons; the demand of the internal market of the order of 600 tons. The commercial balance to French industry of the alginates seems thus to be clearly beneficial.

On the economic plan the argument advanced by ISTPM proposing the acclimatization of M. pyrifera on our coasts can be summarised thus: the artisanal exploitation furnishes French industry with Laminaria digitata which is treated at a price which makes this industry less and less competitive with respect to Kelco, but puts it in peril also with respect to the Norwegian and above all British alginates since the entry of Great Britain into the Common Market. The exploitation of other Laminarians in deeper water would increase still more the price of the primary material. To this proposal, the author who is not an economist, asks himself why the exploitation of the same species (L. digitata) is profitable in Norway and in Great Britain and would not be so in France; certainly the fields of L. digitata in our country are much less extensive than those of Norway or of Great Britain but that has nothing to do with the conditions profitable or not, of the treatment. The introduction of M. pyrifera would allow with regular cuttings (every three or four months), to ensure a regular revitalization of the French industry and quantitatively more important an increase in primary materials. It is not evident that cutting the extremities of the thalli of M. pyrifera (about 1 - 2 metres) could be done with the French seaweed fleet designed for the uprooting of L. digitata; nevertheless, since the Meeting of 27 June, the representative of the Merchant Navy has agreed that the reconversion was possible and already foreseen. Indeed, if the introduction of M. pyrifera is decided upon and if it were to succeed (which is far from being proved), it would appear improbable that the fields of this alga would ever reach on our coasts those levels that allow the harvest by ships of 100 metres in length as practised off California.

The potential influence on the state of the coast (development, defence) is difficult to foresee. The ISTPM/CIAM Report estimates that the circulation on the platforms formed by the thalli is sufficiently active that there would be no need to fear, for example, an invasion of mud in certain bays. The same document underlined that the breakwaters formed by the floating thalli have shown in California an excellent barrage to prevent the arrival of oil spills on shore.

No noticeable influence on marine navigation can be sustained because of the relative fragility of the thalli. The fields of Macrocystis are numerous before the great Naval base in San Diego and it does not seem that the U.S. Navy has ever considered that they were a nuisance. The pleasure boats, very active in lower California (about 200 000 boats) do not seem to be affected to any degree; on the one hand, the banks do not form a continuous barrier; on the other, each passage through a field by a big ship tears the algae over several metres of thickness thus opening a channel. At least damage comparable to that which follows consequent on the presence of Laminaria on our coasts of the Channel and the Atlantic, would only be felt by little boats of less than 10 hp.

The international responsibility in the case of expansion of M. pyrifera outside French waters deserves to be considered seriously. The reporter considers that agreement (or simply the 'nihil obstat') of ICES from its Working Group on the Introduction of Non-Indigenous Marine Organisms should be obtained before the start of the operation. Certainly an identical demand from a British Institute was rejected in 1950. The precedent could not be invoked, because the work of W.J. North, to whom we owe practically all that is known on the biology and ecology of Macrocystis had only been started in 1955 (I have personally seen Dr North in 1958, when he was still at the Scripps Institute in La Jolla, and he was then visibly at the very beginning of his programme). The sum of knowledge accumulated by this research worker and his team is altogether remarkable and his discoveries particularly concerning the weak power of dispersal of the spores and the very low potential of sexual reproduction allow us to think that the risks of uncontrolled expansion of an alga which despite its great size is fragile and demanding (temperature, water movement, sensibility to grazers, etc.) are extremely weak. The risks of colonisation by a thallus torn out by a storm and having drifted for a fair distance are equally weak.

It remains to try to appreciate the impact on the global eco-system of the French continental shelf, of the eventual introduction of M. pyrifera, following the expansion, which may or may not be important and besides fairly improbable, before a delay of several years.

Given that Macrocystis only prospers in those zones where nutrient salts are abundant (particularly zones of upwelling) one would fear a massive mobilisation of such salts to the detriment of other algal species (planktonic or benthic). Such a hypothesis does not appear to be sustainable, partly because one knows of the high plankton production characteristic of the Californian current or the Peru current, and partly because one has known for a few years that large populations of Laminaria liberate important quantities of dissolved organic materials (amino acids, carbohydrates) which play an important and energetic role in the fertility of the continental shelf.

The reduction in irradiance at the level of the substrate between the depths of 5-6 metres and 20 metres, where one might think that M. pyrifera would settle, will automatically lead to the disappearance of a certain number of light-loving algae, living in this part of the infra-littoral zone; this disappearance would bring in its train that of certain sedentary and sessile invertebrates because the algae is very specific with regard to support and food. In so far as concerns the populations associated with M. pyrifera, despite the fact that at Kerguelen, the observations, perhaps insufficient, have led us to suspect that M. pyrifera might emit a repulsive substance for fish, all the work done in California (of which some is only experimental) leads us to admit that such fields of Macrycystis are very richly populated and that their eco-system seems to be well balanced. The high algal production of M. pyrifera favours greatly sea urchins and herbivorous gastropods living above all upon the young stages of the alga; there are also certain herbivorous fishes. M. pyrifera by the dimensions of its thallus represents for the settlement of sessile forms, or as support of small sedentary species, an available surface, which is of the order of 10 times greater than that of the bottom itself. All the species of the second level of the trophic pyramid are eaten by the carnivores: essentially crustaceans (crawfish, crab) and fish which seem to be extremely numerous. There is, moreover, a protective effect and a thigmotrophic one (contact) which recalls that of the artificial reefs.

The comparison which one might make with the fields of Laminaria on our coasts and the fields of M. pyrifera off California and Peru leads us to think that the habitat represented by Macrocystis if these were introduced would be quite rapidly adopted by numerous invertebrates and fishes which would occupy there an ecological niche analogous to that which they at present occupy on other populations of brown alga and that M. pyrifera would represent moreover a more favourable element to the prosperity of different species exploited by the artisanal fishery and by the non-professional fishery.

If finally one examines the advice given so far by a certain number of specialists consulted on the same opportunity of the introduction of M. pyrifera on the coasts of France one sees two radically opposed opinions. The one is that of Dr W.J. North who after about twenty years has studied Macrocystis deeply in all aspects including most applied ones and who is resolutely favourable to its introduction; he considers, in addition, that success is far from being assured. The other opinion, shared practically by all the algologists consulted, is that any introduction of an exotic species represents a potential danger to the existing eco-system supposed to be in balance.

This last opinion, a true position of principle, founded on certain pessimistic hypotheses, but of which all cannot be rejected a priori, has the inconvenience of not taking into account a certain number of scientifically established facts which are rather favourable to the project. So the reporter, who wishes to believe that the links which might exist between the KELCO Coy and Dr W.J. North have not altered the calmness of judgement of these specialists, is inclined to approve a trial introduction of Macrocystis pyrifera on condition that it be conducted in such a way that on the one hand, it can be stopped if a nuisance, whatever it might be, appears; on the other hand, to follow the population dynamics in the area of the sea bed where the introductions would be made.

ANNEX 3

COMMITTEE ON FOREIGN SEAWEED

Report to the Chairman of the Advisory Council on Scientific Policy

1. We were appointed in January, 1950 by the Advisory Council on Scientific Policy with the following terms of reference:-

"To consider whether it is practicable and desirable to introduce foreign seaweed of industrial value into British inshore waters".

Our membership was as follows:-

Sir Edward Salisbury, Chairman.
Professor T.A. Bennet-Clark, King's College, University of London.
Dr J.A. Carroll, Admiralty.
Professor F.E. Fritsch, Emeritus Professor of Botany, Queen Mary College, University of London.
Mr E.H.E. Havelock, Development Commission.
Mr R.R. Merton, Alginate Industries Ltd.
Sir Thomas R. Merton, Scientific Adviser, Board of Trade.
Dr F.S. Russell, Marine Biological Station, Plymouth.
Dr W.K. Slater, Agricultural Research Council.
Dr F.N. Woodward, Scottish Seaweed Research Association.
Secretary: Mr A.R.M. Murray, Office of the Lord President of the Council.

Subsequently Dr C.E. Lucas, the Director of the Marine Laboratory of the Fisheries Division of the Scottish Home Department, was co-opted to the Committee to represent the Fisheries Department of the Ministry of Agriculture and Fisheries and the Fisheries Division of the Scottish Home Department, and Commander H. Kennedy of the Hydrographic Department of the Admiralty was nominated to represent that Department whenever matters of interest to it might arise.

2. We have held two Meetings and have considered a paper by Dr F.N. Woodward, Director of the Scottish Seaweed Research Association, in which he informed us that the Board of Management of the Association wished to attempt to introduce Macrocystis into British waters, in view of the lower cost of harvesting this seaweed as compared with the existing Laminaria and the consequent economic advantage to the industry based upon the processing of seaweed. We have also considered memoranda by the Admiralty and the Fisheries Departments commenting on this proposal.

3. The proposal to introduce Macrocystis into British waters has as its objective a potential economic gain, but against this has to be set a potential loss in respect of the creel and salmon fisheries with which such a seaweed might seriously interfere. These industries have been estimated to have a turnover of more than £2 million per annum, and to emply some thousands of men. While the economic picture is too complex for us to analyse it in detail, there is a danger that any potential economic gain might be more than counterbalanced by the potential economic loss. It has been represented to us that Macrocystis would be a mechanical menace to fishing were it successfully introduced, and also, by reason of its size and possession of floats, its detached masses would be a far greater danger than those of our indigenous seaweeds, which sometimes cause trouble with fishing gear.

4. Macrocystis would also be a biological menace since it might well oust the existing Laminarias and would, we understand, bring about unpredictable changes in the marine fauna that might be extremely detrimental and provide a suitable habitat for such pests as the octopus. It has also been pointed out to us that enormous swarms of Obelia medusae might be the outcome of such introduction, with disastrous consequences to the fishing industry.

5. It has been represented to us that the successful establishment of Macrocystis would also interfere with navigation by small craft and probably cause obstruction in many shallow straits with rocky bottoms. It would be a menace to the relief services of lighthouses, the servicing of light-buoys, and possibly even the launching of lifeboats. It would interfere with navigation by small craft, both in times of peace and of war. Moreover, its presence under war conditions would be to our disadvantage in all aspects of underwater warfare and would hamper minesweeping, whilst rendering nugatory new counter-measures against mines.

6. Moreover, there is no assurance that the economic advantages of processing Macrocystis would be permanent, and if, after its successful introduction, its harvesting gradually became uneconomic, its growth would be entirely unrestricted unless the harvesting were continued at a financial loss.

7. In short, if Macrocystis were successfully introduced into our inshore waters, its control could not be assured since harvesting would not remove the parts concerned in reproduction and would therefore not in itself be a method of control, and its uncontrolled growth might, in view of the evidence which has been placed before us, have most undesirable consequences. We are, therefore, unanimously of the opinion that, whilst the introduction of Macrocystis to our coasts might perhaps be practicable, it would be a dangerous experiment which might have most undesirable consequences and should not be undertaken.

Signed on behalf of the Committee,

E.J. Salisbury

(Chairman)

31 March 1950.

ANNEX 4

ADVISORY COUNCIL ON SCIENTIFIC POLICY COMMITTEE ON FOREIGN SEAWEED

Minutes of a Meeting of the Committee held in Conference Room 'A', Cabinet Office, Great George Street, SW1, on Monday 6 March, 1950 at 2.30 p.m.

Present:

Sir Edward Salisbury (in the Chair)
Professor Bernet-Clark
Mr E.H.E. Havelock
Mr R.R. Merton
Dr F.S. Russell
Professor F.E. Fritsch
Dr C.E. Lucas
Sir Thomas Merton
Dr F.N. Woodward

The following were also present:

Commander H. Kennedy, Admiralty
Mr R.S. Wimpenny, Ministry of Agriculture and Fisheries

Secretary:

Mr A.R.M. Murray

Contents:

Item	Subject
1	New Member.
2	Matters Arising out of the Minutes of the Committee's First Meeting.
3	The Introduction of Foreign Seaweed of Industrial Importance into British Inshore Waters.

1. New Member

The Chairman welcomed Dr C.E. Lucas, Director of the Marine Laboratory of the Fisheries Division of the Scottish Home Department, who had been nominated to serve on the Committee as the representative of the Fisheries Department of the Ministry of Agriculture and Fisheries and the Fisheries Division of the Scottish Home Department, and Commander H. Kennedy, who had been nominated to represent the Admiralty. He also welcomed Mr Wimpenny of the Fisheries Department of the Ministry of Agriculture and Fisheries.

2. Matters Arising out of the Minutes of the Committee's First Meeting
(Previous Reference: S.P.(F.S.) (50) 1st Meeting)

Professor Fritsch asked that the record of his remarks on page 3 should be amended by the omission of the word "Macrocystis" and the substitution of the words "a marine alga".

3. The Introduction of Foreign Seaweed of Industrial Importance into British Inshore Waters

The Committee had before them memoranda by the Fisheries Departments and the Admiralty commenting on Dr Woodward's proposals (S.P.(F.S.)(50)3 and 4).

The Chairman reviewed the principal arguments advanced in these memoranda and said that both Departments had made out a strong case against the introduction of foreign seaweed into British waters.

Mr Wimpenny suggested that when the Committee reported they should emphasise that they were not concerned with the anticipated economic results of introducing foreign seaweed into British waters, but only with the scientific aspects of the proposal.

The Chairman thought that the Committee had a duty to draw attention to the two sides of the economic problem. He agreed that it was not their business to discuss the economic issue as a whole, but he thought they should point out that there were economic arguments both for and against the introduction of foreign seaweed.

Commander Kennedy hoped that in the Committee's Report special stress would be laid on paragraph 3 of the Admiralty's memorandum, as they considered that if the commercial exploitation of the seaweed proved to be temporary its growth would get completely out of hand.

Dr Russell thought that the Committee should also stress the possible repercussion of Macrocystis on seaside amenities.

Mr Wimpenny said that there was a serious danger of Macrocystis encouraging the growth of various undesirable types of marine fauna.

The Chairman thought that the main biological reason for not recommending the implementation of Dr Woodward's proposals was that the introduction of a new type of seaweed would create a new habitat. This might make the environment uncongenial to some organisms, such as fish, which were economically desirable and favourable to others that were deleterious.

The Chairman said that the Committee's terms of reference had been to consider whether it was practicable and desirable to introduce foreign seaweed of industrial value into British inshore waters. He thought that the evidence placed before them had shown that it might be practicable, but that it was clearly not desirable, to proceed with its introduction. If the Committee were in agreement with this view it would not be necessary to call a further Meeting and it would only remain to agree a Report and submit it to the Advisory Council on Scientific Policy.

Dr Woodward thanked the Committee for the careful consideration which they had given to his proposals and said that he had been convinced by the arguments advanced that it would not be expedient to proceed with them.

The Committee:

(1) Agreed that, in view of the considerations brought to their attention, it might be practicable, but that it would not be desirable, to introduce foreign seaweed of industrial value into British inshore waters.

(2) Invited the Chairman to circulate a draft Report for their approval, and subsequently to submit it to the Chairman of the Advisory Council on Scientific Policy.

Office of the Lord President
of the Council,
Great George Street, SW1.

16 March 1950.

ANNEX 5

BRITISH PHYCOLOGICAL SOCIETY

The following Resolution was passed (nem. con.) at the 22nd Annual General Meeting of the British Phycological Society held at University College, London, on 4 January 1974.

Resolution

"The British Phycological Society strongly opposes any proposal to introduce the giant kelp Macrocystis into European waters" [for the scientific, economic, amenity and defence reasons briefly outlined in the attached paper].

"The British Phycological Society would appreciate being officially represented on any national and international Committee or Working Group that may be set up to consider this matter in detail".

Representative of the British Phycological Society in this matter:

Mr H.T. Powell, Dunstaffnage Marine Research Laboratory, P.O.Box 3, Oban, Argyll, Scotland PA34 4AD (Telephone: Oban 2244).

Deputy-Representative:

Dr G.T. Boalch, The Laboratory, Citadel Hill, Plymouth, Devon PL1 PB2 (Telephone 0752 21761).

ANNEX 6

SUMMARY OF PAPER PRESENTED TO THE ANNUAL GENERAL MEETING OF THE BRITISH PHYCOLOGICAL SOCIETY AT UNIVERSITY COLLEGE, LONDON, ON 4 January 1974

by

H.T. Powell
Scottish Marine Biological Association,
Dunstaffnage Marine Research Laboratory,
P.O. Box 3, Oban, Argyll, Scotland.

Mr President, and members of the Society,

Some, but certainly not all of you, will have heard that for several years past some workers in France based at the Marine Fisheries Laboratory at Nantes (especially M. René Pérèz) have been conducting experiments designed to find out whether the truly giant kelp Macrocystis pyrifera could be grown successfully on the west coast of France - with a view to introducing it and cropping it for the production of alginates - culminating in this very recent paper by Pérèz et al*) indicating that they very much want to get on with it.

M. Pérèz has already grown plants of Macrocystis rather secretly in the sea off Roscoff in 1972 to a length of 13 m in 9 months and then removed them. Hopefully he removed all of them!

At the end of my remarks, the Algal Conservation Committee of the Society hope you will pass a Resolution opposing continuation of these French proposals.

[He then showed 5 slides as follows:

1. Map showing present world distribution of M. pyrifera, M. integrifolia and M. angustifolia.

   - mainly Southern Hemisphere. In Northern Hemisphere it is present only on the Pacific coast of N. America (Canada to S. California).

2. Diagrams showing the development of Macrocystis: fertile sporophyll → release spores → which give rise to male and female gametophytes → fusion of gametes → zygote → new sporophyte plant. That is, the macro-sporophyte alternates with a micro-gametophyte phase, as in our well-known genus Laminaria.

3. Diagram showing the further development of macro-sporophytes into large bushy plants, which can grow up to 150 ft (50 m) in length, much of this being at the surface (forming a dense canopy) since in various parts of the world the plants can attach from just below low water mark to about 80 or 90 feet below L.W. The meristematic (growing) areas are at the apices of the developing branches.

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*) R. Pérèz, J.C. du Mesnil, Y. Colin, L. le Fur et H. Didou. "Étude sur l'opportunité d'introduire l'algue Macrocystis sur le littoral français". Rev. Trav. Inst. Pêches Marit., 37(3):307-361. (Late 1973 - no date on reprint).

The fertile sporophylls are borne low down on the plant, and form at the end of the first year.

4. This photograph (taken at Kerguelen) shows that in many parts of the Southern Hemisphere Macrocystis pyrifera definitely grows from near low tide level downwards - although off California (which is the only place where most Europeans have seen it growing) it grows up from about -20 ft to -60 (-80) feet and so appears there as mainly offshore beds.

5. Map of World - from "France Pêche Magazine", No. 174, October 1972, p.35. - showing that in various part of the world Macrocystis grows between the sea surface temperature limits of 2°C and about 24°C. Off Brittany the sea temperature range is 6° - 20°C. The shaded part of the map indicates that all the coast of western Europe from N. Africa to northern Norway is potentially suitable for Macrocystis. /

We on the Algal Conservation Committee have considered all aspects of this matter as thoroughly as possible since we were first alerted to it in March 1973 by Dr Michael Neushul of Santa Barbara, California, and we are convinced that the potential disadvantages that would be associated with having this giant weed established in European waters greatly outweigh the advantage to the alginate industry.

I summarise below some aspects of this argument very briefly:

1. Argument for the Introduction

   1. Economic: it would be advantageous only for the alginate industry (which will always be on a relatively small scale, compared with say fisheries), and then only if it were allowed to spread widely enough to support a considerable harvest, by large and expensive mechanical harvesting boats.

      (Note: The British Alginate Industry presently have an annual turnover of about £10 000 000. The U.S.A. industry is probably larger, but not much so. The Norwegian and French seaweed industries are considerably smaller than the British).

2. Argument against the Introduction

   1. Conservation of the environment. Macrocystis forests would profoundly modify the shallow water eco-systems of western Europe which has gradually evolved over millions of years. Conservationists argue that it would be indefensible to deliberately alter a natural marine eco-system in this way. / Although it is of course the case that Man has profoundly altered the terrestrial environment /.

   2. Economic, biological and amenity interests. For alginate production large tonnages are required, and harvesting is only economically viable if carried out by quite large and expensive boats (£400 000 each in California). All this argues that very large areas would have to be allowed to become dominated by Macrocystis, by natural (and induced) spread; and on this scale the distribution obviously could not be controlled - these are large long-lived plants, becoming fertile annually.

3. Where Macrocystis occurs naturally it is 'in balance' with other marine plants and animals. In Europe it could replace a great deal of the Laminaria hyperborea forest which grows down to about 20-25 m in suitable areas, by overshading the forest.

4. There is always the risk that it could prove to be exceedingly ecologically vigorous as some other large introduced algae have proved to be:

   e.g. Sargassum muticum in Canada and U.K.
   Codium fragile in U.K. and Norway.
   Colpomenia peregrina in Europe (a 'pest' on oyster beds).

5. Hindrance to operation of all small boats that have to move through it

   - pleasure craft used for sailing, cruising, sea-angling, water-skiing, etc.

   - fishing boats could not operate within the beds for present lobster, crab and prawn fishing.

   So it cannot be said to benefit European native fisheries and shell fisheries. Some fish would obviously live and thrive in among the weed but these would be largely inaccessible to Man.

6. After storms there could be very large tonnages of damaged drift plants cast ashore on beaches of high amenity on the Channel coast. It already costs a lot of money to keep these beaches clean of cast-up algae on the south coast of England. Piles of Macrocystis would greatly add to the problem and cost of removal.

7. It was proposed to introduce Macrocystis integrifolia into Scotland in 1950 by the Scottish Seaweed Research Association (S.S.R.A.), for alginate production. After very careful consideration the experiment was forbidden by Government Order mainly because it was considered that Macrocystis would probably grow only too well and could not be controlled, with all the ensuing disadvantages listed in paragraph 2, 1-6 above.

   The British M.A.F.F. expressed particular concern that inshore fisheries could be adversely affected. Lobsters for instance do not thrive in Macrocystis areas, probably because they become too accessible in these rather open 'forests' to their main predator - Octopus.

   Additionally, and decisively, the Ministry of Defence (Admiralty) emphasized the potential nuisance and danger of such a large and robust weed in shallow water and in the approaches to harbours, especially to small naval craft and submarines. (See the M.A.F.F. and Admiralty papers of 1950).

8. Conclusion. The argument against introducing any species of Macrocystis into European waters is overwhelming for all the scientific, economic, amenity and defence reasons listed in paragraph 2, 1-7 above. It is hardly possible to put a monetary cost to Man on all the disadvantages and nuisances listed, but the cost must be many times greater than the amount by which the alginate industry would benefit.

Gerald Boalch and I attended a Meeting of the French Phycological Society at Roscoff in November at which the whole question was discussed at great length. A great majority of French phycologists are against the idea and Dr René Déléphine (University of Paris) was deputed to draw up a detailed paper in reply to the proposals of Pérèz. We reminded them of the British decision against introducing Macrocystis into Britain in 1950, and we are now alerting British Government and Ministry officials to the French Ministry of Fisheries proposals.

There is a recently formed ICES Working Group on the Introduction of Non-Indigenous Marine Organisms (Chairman: Dr Cole, Lowestoft) which has been asked to look into this French proposal urgently.

We would like to make our views known to this Working Group officially and it would strengthen our position in communicating with Dr Cole, Ministers, the Navy, etc. if the Society could agree now to pass the Resolution appended to this paper. [The Resolution was passed, nem con; see ANNEX 5].

H.T. Powell

8 January 1974

ANNEX 7

From: Department of Trade and Industry,
Sunley House,
90-93 High Holborn,
London WC1V 6LP.

15 January 1974

To: Dr H.A. Cole,
Controller of Fisheries Research and Development,
Ministry of Agriculture, Fisheries and Food,
Lowestoft,
Suffolk.

Dear Dr Cole,

Proposed Introduction of Giant Kelp to Brittany

John Archer asked me to look into the proposal referred to in your letter of 28 December to introduce the giant kelp to the coast of Brittany, which is to be discussed at your Working Group on the Introduction of Non-Indigenous Marine Organisms.

We have considered not only the objections raised in the 1949/50 Report of the Advisory Council on Scientific Policy but also a recent Report prepared by Dr Gerald Boalch of the Marine Biological Association. Dr Boalch attended the Meeting of the Société Phycologique de France at Roscoff on 8-10 November last. Both Reports, and consultation with MOD (Navy), confirm our opinion that there are strong objections to the proposal in view of the inherent dangers to the safety of navigation off our coast, particularly to smaller craft in shallow and/or narrow waters.

Yours sincerely,

Signed E.R. Hargreaves

ANNEX 8

From: Rear Admiral G.P.D. Hall, CB, DSC,
Hydrographer of the Navy,
Ministry of Defence,
Old War Office Building,
Whitehall,
London SW1A 2EU.

21 January 1974

To: Dr H.A. Cole,
Controller of Fisheries Research and Development,
Ministry of Agriculture Fisheries and Food,
Lowestoft,
Suffolk.

Dear Dr Cole,

Proposed Introduction of Giant Kelp to Brittany

Thank you for your letter FLR 866 of 28 December - which I have discussed with the Naval Staff.

In general we are opposed to the introduction of giant kelp to Breton waters both because of its adverse effects on navigation and hydrographic operations in those waters and because of the risk of its spreading to our own waters - where the Navy's interests in these and other aspects are of course much greater.

Hydrographic operations in the interests of safe navigation are of prime concern to my Department, both within and beyond our own waters, and for this reason alone I would deplore any action which could prejudice either the operations or the interests.

The Navy is not, of course, competent to assess the degree of risk of the weed spreading to our own waters, but the threat is there and we feel justified in opposing the project for that reason. We also have an interest in excluding it from the Channel Islands, which is the area most likely to be first affected by any such spread.

Yours sincerely,

Signed Rear Admiral Hall

ANNEX 9

PORTUGAL'S POSITION REGARDING THE INTRODUCTION OF NON-INDIGENOUS MARINE ORGANISMS ESPECIALLY THE MACROCYSTIS PYRIFERA

The minutes of the Meetings of the Shellfish and Benthos Committee and Fisheries Improvement Committee of ICES, and the Recommendation approved by the Consultative Committee at the 61st Statutory Meeting, show the debate of a proposal presented by France regarding the plantation of the giant kelp Macrocystis pyrifera for the purpose of increasing the production of raw material for the alginate industry, and the detection of Sargassum muticum in waters of United Kingdom coast.

These problems are extremely important because of the potential danger that the presence of those seaweeds may represent to some European countries, including Portugal.

It is evident that any country may be exposed to the appearance of a plague of any nature in its coast. If a plague appears by accident, we cannot blame the country, but we may demand that to the extent possible and within its resources, appropriate measures be taken to fight the plague, not only to protect its own interests but also those of the neighbouring countries.

But which are the most efficient methods to fight a plague?

In my opinion this is a very difficult problem as its resolution is often beyond human possibilities, even when they are served by a great technological advancement.

As an example, we may refer to the case of the United Kingdom, which has not yet found a solution to the great problem of the brown seaweed Sargassum muticum which affects the operations of its fishing boats and the indigenous seaweeds and may become harmful to the oyster culture.

But, as far as we know it was neither the scientists nor the British Industrialists that brought it to the United Kingdom.

The Sargassum muticum turned up by accident.

The same is true with Portugal where 30 years ago we could not find the red seaweed Asparagopsis armata, which appeared by unforeseen circumstances, and even today is affecting enormously the areas where Gelidium sesquipedale exists, which is the species mostly used in Portugal as a raw material in the industry of agar-agar.

The same seaweed - the Asparagopsis armata - is presently also affecting the Azores Islands, competing with the Pterocladia which we also exploit. However, 20 years ago, the Asparagopsis armata was not found in those Islands.

Have we contributed to the appearance of that seaweed?

Absolutely not!

What we must consider as a serious problem is the voluntary plantation by a country of a species that not only will change the physiognomy of its coast, but for sure will also harm the indigenous flora.

If that seaweed would affect that country, only, that would constitute a local problem.

However, the problem is that the plantation of the Macrocystis pyrifera will for sure also affect the coasts of the neighbouring countries.

While the problem of the Macrocystis pyrifera was under the control of the scientists, everything was all right. But, if in the future, the Macrocystis pyrifera is definitely planted for industrial purposes, no control will ever be possible.

In this case, we would certainly become the witnesses of an invasion of this giant kelp along the coast of a great part of Europe, and, perhaps the most affected countries would be not only France but also the United Kingdom, Spain and Portugal.

At this moment, we only see an immediate interest - France wishes to increase its alginate industry to compete with other producing countries, without taking into consideration the damages it may cause to the other European countries.

However, we have to pay our respects to some French phycologists who have been fighting against the plantation in France, namely to Mr Délephine for the clear and precise declarations he made in the "France Pêche Magasine" published in October 1972.

Mr Délephine, an expert on the subject, pointed out the dangers of the plantation of Macrocystis pyrifera, not only at local or regional level, but also at European level.

We shall also take into consideration the position assumed by the French Phycological Society at its Meeting held in December 1972, which unanimously approved a motion pointing out the dangers that the plantation of Macrocystis pyrifera might represent to France, and which was sent to the French authorities.

Being known, from available bibliographic sources, the possibilities that the Macrocystis pyrifera has to proliferate in France and also in other European countries and considering particularly the ecological conditions of the Portuguese coast, the following conclusions were reached:

1. Once the Macrocystis pyrifera is planted in France, there are great possibilities that its proliferation may extend to Portugal, causing inevitable damages to:

   - the coastal fishing and navigation;

   - the exploitation of the Gelidium sesquipedale which would reflect negatively on the activities of the agar-agar industry.

2. In view of these facts my country does not approve France's projects for the introduction of Macrocystis pyrifera in Europe.

Francisco Prudêncio Palminha

London, 31 January 1974