

## Wadden Sea Newsletter 2001 – No. 2

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## Preface

### Dear Reader,

The painting on the cover shows the winner of the poster competition launched by the Danish National Forest and Nature Agency (Skov- og Naturstyrelsen) to design the poster for the next Trilateral Governmental Wadden Sea Conference in Esbjerg, Denmark, on October 31, 2001. Young people of schools in the Danish Wadden Sea municipalities and in Nordfriesland were invited to take part in a competition in the period from March to May 2001. Over 140 posters from 25 classes of 14 schools reached the jury. All contributions will be published in a booklet by the Danish Nature and Forest Agency.

On 13 June 2001, Her Royal Highness Princess Alexandra awarded the first prize to the 4th class of the Esbjerg Bakkeskolen. The award of 10,000 DKK is meant for an educational tour to the Wadden Sea abroad. Additionally, the class is invited to visit the "Multimar Wattforum" in Tönning.

This Wadden Sea Newsletter informs about the current status of the preparation of the Ministerial Conference and a further contribution concerns the future perspective of the Wadden Sea

Cooperation. In spring 2001, the Hamburg and Lower Saxon National Park Act were amended; an overview of the major changes are given together with information about the developments in the other countries. Other articles address highlights of the breeding bird season 2000 and give recent information about the water quality in the Dutch Ems-Dollard estuary and the Danish Wadden Sea.

You will also find the recommendations of the 10<sup>th</sup> International Scientific Wadden Sea Symposium in Groningen (October 30 – November 2, 2000), which provide a valuable input in the preparation of the policy assessment report prepared for the Ministerial Conference.

Last but not least, you will find a list of forthcoming events, most notably the LANCEWAD conference on 17 – 19 September 2001 (Bad Bederkesa, Germany) and the WADSIS workshop on 11–12 November 2001 (Texel, The Netherlands).

Harald Marencic  
Common Wadden Sea Secretariat

## The 9<sup>th</sup> Wadden Sea Conference in Esbjerg in October 2001 – Esbjerg revisited

Jens Enemark, Common  
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As announced in the previous Newsletter, the next Trilateral Governmental Conference on the Protection of the Wadden Sea will be held in Esbjerg, Denmark, on October 31, 2001. The 2001 Conference will be an Esbjerg-revisit event. 10 years after the 1991 Conference – same city – same conference center.

The preparation of the Esbjerg conference is well under way. A comprehensive draft Progress Report has been made of the implementation of the decisions of the last conference in Stade including the Wadden Sea Plan. On the basis of the progress and the recommendations of the Quality Status Report 1999, including the recommendations of the Scientific Symposium held last year in Groningen and recent information, a draft Policy Assessment Report has been elaborated. The Policy Assessment Report entails an integrated analysis and evaluation of the status of the Wadden Sea and the implementation of the Stade Declaration and the Wadden Sea Plan. It therefore defines the main policy and management issues to be addressed by the Conference.

The draft Ministerial Declaration has been developed during the past months. The Declaration is the central document of the Conference. It will be discussed by the ministers, outstanding issues solved, and finally be approved. The draft version of June 2001 is currently subject to a wide consultation process in the countries. In addition to decisions on the follow-up of the Stade Declaration and the Wadden Sea Plan, there are basically three issues of wider interest.

The first of those is the potential nomination of the Wadden Sea national parks and nature reserves or parts thereof as a natural World Heritage Site. A recent feasibility study concluded that an inscription in the World Heritage List under the current conservation and management arrangements is feasible. The World Heritage List entails natural and cultural heritage monuments unique on a worldwide scale. Currently consultations are ongoing in the countries with a view to have the nomination considered at the conference.

Closely related to this issue is the intention to develop sustainable development scenarios with the stakeholders. Inhabitants of the Wadden Sea

Region expressed their wish to have greater influence on the planning of the trilateral policy and management and the trilateral projects and actions in order to secure economic development and quality of life. The future trilateral policy and management should reflect ways and means to further integrate nature protection and economic development to also ensure a greater public acceptance of the Wadden Sea Cooperation. It is intended that a stakeholder forum will be given this task and will report to the following conference, which is anticipated to be held in 2005. This issue very nicely connects to the poster theme of the Wadden Sea "Man and the Wadden Sea" (see preface and cover).

A third issue is shipping safety. A topical issue of great concern for the communities of the Wadden Sea region. One of the most interesting topics to be discussed in this context is whether the Wadden and an adjacent zone should be designated as a Particularly Sensitive Sea Area. As agreed at the Stade Conference, a feasibility study has been made by the cooperation. The report and its recommendations will be discussed in the countries in the coming period.

Finally, it is important to notice the substantial progress made by the Inter-regional Wadden Sea Cooperation. It launched the NetForum project on sustainable tourism and recreation in the Wadden Sea Region in the past period. The collaboration will table a proposal for a common policy on sustainable tourism to be discussed by the ministers.

In 1991, the 6<sup>th</sup> Wadden Sea Conference was in Esbjerg. It was at this conference that the common principles and policies for the overall protection and management of the Wadden Sea were adopted, which laid the foundation for the Wadden Sea Plan, adopted at the last Conference in Stade in 1997. Will the 2001 Conference also pave the way for new developments and guide the cooperation onto new frontiers as the 1991 Conference did? On October 31 we will know more.

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## Perspectives on the Trilateral Cooperation – A brief note

**The trilateral governmental cooperation on the protection of the Wadden Sea is likely to be reduced to technical adjustments of the trilateral Wadden Sea Plan. A Wadden Sea Convention could be an appropriate organizational instrument and a means to ensure further progress.**

Since 1982, the trilateral governmental cooperation between the Netherlands, Germany and Denmark has a formal basis in the Joint Declaration on the Protection of the Wadden Sea. Later, trilateral governmental agreements have all been made within the institutional framework of the Joint Declaration. The Joint Declaration is a political agreement on cooperation without legal obligations, according to international law. It expresses an acknowledgement of joint governmental responsibility with regard to the cooperation on the protection of the Wadden Sea and an authorization of a conservation discourse with the Wadden Sea as an object. Since the cooperation has no basis in an international legal instrument, such as a treaty or a convention, it is legitimized through already existing international agreements, among these the Ramsar, Bonn and Bern Conventions as well as the Convention on Biological Diversity. Other legitimizing references are the EC Bird and Habitat Directives.

The adoption of a common management plan, the Wadden Sea Plan, at the Stade Conference in 1997 could be seen as a fulfillment of the originally agreed upon governmental cooperation, which poses some interesting questions concerning the future: Will the trilateral governmental cooperation be reduced to technical adjustments of the Wadden Sea Plan? Will the frustrating difficulty in national implementations of the Wadden Sea Plan, especially in Denmark, cause the governments to abort the trilateral governmental cooperation and displace the protection of the Wadden Sea to EU and various national regulations? Or will the trilateral governmental cooperation develop into a legal regime according to international law?

In my interpretation, the trilateral governmental cooperation is at a point where the cooperation is likely to be reduced to technical adjustments of the Wadden Sea Plan unless some sort of organizational change takes place.

A Wadden Sea Convention would not solve all environmental problems in the Wadden Sea by mere existence, but from an organizational point of view, it could be an appropriate instrument in order to clarify who is cooperating, how it is done, and with what objective and status of the agreements made. Furthermore, a convention would be a symbol of parliamentary mandate that would strengthen the national implementation of trilateral agreements and facilitate negotiations in a broad sense. Finally, a Wadden Sea Convention could be a binding benchmark that could ensure further progress in trilateral policy-making, if negotiated among the contracting parties, keeping the Guiding Principle of the Wadden Sea policy in mind: "to achieve, as far as possible, a natural and sustainable ecosystem in which natural processes proceed in an undisturbed way" (Esbjerg Declaration 1991).

But a Wadden Sea Convention as a basis for future trilateral governmental cooperation is not on the governmental agenda at present and will probably not be in several years to come. The governments have generally been reluctant in committing to legal obligations and recent NGO attempts to address this issue have been met by ignorance. Still, NGOs, such as the World Wide Fund for Nature and the Wadden Society, have an important role to play in order to get a Wadden Sea Convention on the political agenda by exerting a persistent pressure (see WSNL 2000 No. 2).

Meanwhile, a recommendation is to make an updated governmental declaration, including all relevant trilateral decisions from the past, in one political agreement; among these the Guiding Principle and the Common Management Principles of the Esbjerg Declaration of 1991, the agreed upon Ecological Targets and the geographical delineation of the area of cooperation of the Leeuwarden Declaration of 1994, and the adoption of the Wadden Sea Plan for the Cooperation Area of the Stade Declaration of 1997. This could be considered a preparatory document and after a ripening period put in the Statute Book.

At the conference "The Wadden Sea – Our Compassion and Concern" in 1995 someone stated: "We need something more systematic, more comprehensive, and more workable than the present situation". This is still true.

# New Developments in the Wadden Sea Protection Regimes

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## Introduction

The national protection regimes in the three Wadden Sea countries have been amended or are currently in the process of amendment:

In Denmark, the revised Statutory Order for the Danish Nature and Wildlife Reserve in the Wadden Sea was enacted in March 1998 (see WSNL No. 1/1998). Currently, the trilateral Wadden Sea Plan is being implemented by the two county councils Ribe and South Jutland in the framework of regional management plans.

In Germany, the amendment of the National Park Act in Schleswig-Holstein, resulting in an extension of the National Park, a zero-use zone and a whale protection area, was finalized in October 1999 (see WSNL No. 1/2000). The Hamburg National Park Act was endorsed in April 2001, and the amendment of the Lower Saxony National Park Act was endorsed in May 2001.

In the Netherlands, an amended key planning decision document was presented by the Dutch government (see also WSNL No. 1/2000) and was subject to a public hearing in the period February – May 2001.

## Regional Plans in Denmark

The two county councils Ribe and South Jutland decided to implement the State Declaration and the Wadden Sea Plan relevant for the regional level in the framework of the regional physical planning. In 1999, the two county councils issued a document of intent with the aim of obtaining input and ideas from authorities, organizations and local citizens to the elaboration of a planning document. The document of intent entailed a number of issues and questions based on the targets of the Wadden Sea Plan regarding the development in the Wadden Sea Area and the adjacent area.

On the basis of these inputs the county councils have jointly issued a draft planning document as an amendment to the overall regional physical plan in December 2000. The planning document entails a framework for the future development of the Wadden Sea Region. This framework establishes a general zoning of the future use and protection of the area in terms of nature and agriculture, landscape and the cultural environment, tourism and recreation, and urban and industrial

developments. The planning document further entails guidelines for the management of the area in terms of the relevant themes of the Wadden Sea Plan. The guidelines entailed in the administrative part of the document are binding for the planning of the municipalities and the municipal and regional administration of area related national legislation (e.g. Nature Protection Act, Raw Material Act etc.). The planning document also entails recommendations to state government organizations and intentions of the regional government for the future management.

The draft planning document was subject to public consultations from December 2000 to February 2001. On the basis of the reactions the draft planning document will be amended and endorsed by the county councils as the supplementary planning document "The Wadden Sea and its surroundings" to the regional plan.

## Amendment of the National Park Act in Hamburg

The Hamburg National Park Act was amended in April 2001. The act entails a seaward extension of the national park up to the 3-nautical-mile limit. The extension has increased the area of the national park with approximately 2,050 ha to now 13,750 ha. The amendment entails both a harmonization between the National Park Act and the EU Habitat Directive and a new specification for fishing regulations within the National Park resulting in the extension of the already existing zero-use zone up to more than 75% of the National Park area. The act also entails stricter regulations of certain recreational activities such as, e.g. kite flying and the traditional collection of mushrooms.

The state government has decided to build an information center on the island of Neuwerk. The building is anticipated to be finished by autumn 2002. The center aims at promoting the environmental education and awareness of the National Park.

In March 2001, the Hamburg Wadden Sea Atlas was published as a first part of a National Park Plan. The atlas entails a recent and easy-to-understand overview about the status of the National Park.

## Amendment of the National Park Act in Lower Saxony

The Lower Saxon Wadden Sea National Park Act was endorsed in Parliament in May 2001. The amended act entails as in the Schleswig-Holstein case an extension of the National Park and a revision of the zoning scheme.

The National Park has been extended seawards partly beyond the 3-nautical-mile line off the islands of Borkum and Baltrum, it includes areas formerly outside the National Park in the Ems-Dollard estuary (Rysumer Nacken), the nature reserve in the Dollard and a transition zone between salt marsh and the geest south of Cuxhaven. The National Park also covers the large majority of the islands. Compared to the former National Park area well defined parts on the islands consisting of build-up and intensively used areas have been excluded and the boundaries redefined.

The zoning scheme within the National Park has been partly revised. The zone 1 has been extended on most of the islands to also include the primary dune areas on the eastern parts of the islands. Also in the tidal area, the zone 1 has been extended. The recreational zone has partly been extended. Some intensively used parts of the recreational zone have been excluded from the National Park. With regard to the tidal area, the zoning scheme will be modified concerning the protection of Sabellaria reefs, eelgrass beds, birds and seals.

The area of the National Park has, as a result of the amendment of the act, increased with about 400 km<sup>2</sup> up to 2,800 km<sup>2</sup> (280,000 ha). With the adoption of the revised act the boundaries of the National Park partly extends offshore beyond the trilateral Wadden Sea (Cooperation) Area.

## Key Planning Decision in the Dutch Wadden Sea

In February 2001, an amended key planning decision document was presented by the Dutch government (PKB, 3<sup>rd</sup> Note Wadden Sea). The document was subject to a public hearing in the period February – May 2001. On the basis of the reactions of organizations and citizens, the advice of the Wadden Sea Advisory Board and negotiations with the regional and local governments, the government will submit a note to the parliament for consideration and adoption.

The PKB is a national physical planning document which is the basis for all planning, conservation and management for the Wadden Sea under the jurisdiction of state, regional and local authorities. The planning document is subject to parliamentary endorsement and has, in substance, the status of a law. The PKB is valid for a period of 10 years after which the governments must indicate to the parliament whether it intends to amend it.

The area covered by the PKB is delimited by the dikes and dunes on the mainland and main islands, including those areas of the islands, which are regularly flooded. It covers about 2,400 km<sup>2</sup>. The government has refrained from amending respectively extending the area. It will not lead to a simplification because the various delimitations which exist for, e.g., the nature reserve and the Natura 2000 would continue to exist and efforts would have to be made for working towards a differentiated policy and measures for an enlarged area.

The objectives of the PKB have been amended to explicitly also include the conservation of the landscape qualities, in particular, the quietness, the openness and the naturalness. This objective is as indicated in the PKB closely related to the Targets, as entailed in the Wadden Sea Plan. It also encompasses a development vision for the Wadden Sea for the period until 2030.

The PKB lays down policy guidelines for the different activities in the Wadden Sea. A substantial amount of those guidelines are binding decisions for state authorities. Others are guidelines, which the regional and local governments will have to take into account in elaborating, e.g., regional and local planning. The PKB also includes a framework of balancing different interests in conformity with Art. 6 of the Habitat Directive.

In anticipation of the initiation of the discussion of proposed amendments to the PKB, the Dutch government decided to refrain from issuing permits for the exploration of gas in the Wadden Sea and in sites on the fringe of the Wadden Sea, because of the uncertainties with regard to potential environmental impacts. Further gas exploration and exploitation is currently not allowed with the exception of the existing 3 sites in the Wadden Sea Area.

## The Breeding Bird Season in the Wadden Sea in 2000

Joint Monitoring Group of Breeding Birds in the Wadden Sea (JMBB), Lars Maltha Rasmussen, Lieuwe Dijkse, Bernd Hälterlein, Ben Koks, Petra Potel & Peter Südbeck

### Introduction

The coordinators of the Joint Monitoring Group on Breeding Birds in the Wadden Sea (JMBB) present the most remarkable results and interesting observations from the recent breeding season in spring 2000 focusing on the species of importance to the joint monitoring program. The overview is aimed to inform all participating counters, administrators, and others interested shortly after the season. Except for a few species, the 2000-data are not complete.

The results of the last complete breeding survey in 1996 were published in autumn 2000 (Rasmussen et al., 2000). The report nicely presents the large amount of work that has been carried out in the field by many hundred enthusiastic counters. It is our hope that the report will inspire the fieldwork in the 2001-season, in which the next coordinated complete count of all the breeding birds in the Wadden Sea will take place after five years.

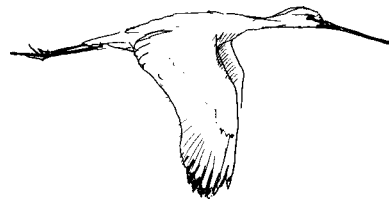
The impression by the JMBB is that the 2000-breeding season in the Wadden Sea was in total not as good as the 1999-breeding season. In both the northern and western Wadden Sea, large parts of the white beaches and low salt marshes, especially on the mainland, were flooded between the 27th and 29th of May. This caused extensive losses of eggs and young especially of Avocet (*Recurvirostra avosetta*), Oystercatcher (*Haematopus ostralegus*), Redshank (*Tringa totanus*), Kentish Plover (*Charadrius alexandrinus*), Arctic and Little Tern (*Sterna hirundo* & *albifrons*) and caused large displacements of the late breeding colony species. In Denmark, the single most important colony site Langli, holding 62 % of the colony breeders in the Danish Wadden Sea, was host to a fox rearing its young which had a severely negative effect on the overall breeding success of most species. In the Netherlands, increasing numbers of foxes mainly affected colonies of Avocets and Black-headed Gull (*Larus ridibundus*).

In the following names of the geographical parts of the area are abbreviated as following: DK for Denmark, SH for Schleswig-Holstein, LS for Lower Saxony and NL for The Netherlands

### Cormorant, Spoonbill, Egret, Raptors, Ducks and Owls

On Texel (NL), a colony of Great Cormorant (*Phalacrocorax carbo*) that established in 1999 (25 pairs) increased to 120 pairs in 2000. The colonies on Vlieland and De Hond decreased slightly. In LS numbers of breeding pairs slightly increased on Lütje Hörn and Memmert. On Trischen (SH), breeding numbers increased further to 265 pairs in 2000. In the Danish Wadden Sea, there were no colonies of this species.

For breeding Spoonbill (*Platalea leucorodia*), the Wadden Sea is of special importance after a large increase during the 1990s. Only in the last two



years numbers decreased slightly in the Dutch Wadden Sea after many years of increase: 1998: 709 pairs; 1999: 689 pairs and 2000: 640 pairs. This development was mainly caused by a 50% decrease in the important colony on Vlieland; other colonies were stable or increased slightly. In other parts of the Wadden Sea, Spoonbills established new colonies and expanded further: A new colony with 7 pairs was established on Balgzand, a Dutch mainland salt marsh site. In LS, 3 new colonies were established on the islands Norderney, Baltrum and Spiekeroog. Including the older colony on Memmert and Borkum, 49 pairs bred in total. In SH, the first breeding attempt with two pairs was found on a hallig salt marsh. In the Danish Wadden Sea, there were no breeding attempts. Overall numbers were still higher than in 1996, when totally 594 pairs were found.

The Little Egret (*Egretta garzetta*) is increasing and expanding into the Wadden Sea. The species bred for the second year in the Dutch Wadden Sea. There were successful pairs on Vlieland and Terschelling. On other islands, non-breeding individ-

uals were seen. In May, there were observations of Little Egrets on Föhr, Sylt, Eiderstedt (SH) and in LS. In NL, peak numbers were 80 in September 1997 and in December 2000, 10 individuals were seen.

In NL, the number of Common Eiders (*Somateria mollissima*) dropped significantly in the breeding season 2000. The drop in numbers followed high death rates observed in Common Eider in the winter and spring 1999 and 2000. The total number of Common Eiders has dropped significantly since the peak in 1997, when more than 10,000 pairs bred in the Dutch Wadden Sea. The 2000-breeding season was delayed and comparatively few nests were found in areas where also adult birds were counted. The overall success was moderate to low in large parts of the Dutch Wadden Sea. It is believed that this situation in NL is caused by a persistent food shortage for Common Eiders in a large part of the Dutch Wadden Sea in April through June 2000. The situation for Common Eider and Oystercatcher (see below) is causing great concern in NL and further research is conducted to reveal the causes. In SH, numbers of Eider has declined since 1996.

The majority of Hen Harriers (*Circus cyaneus*) in the Wadden Sea breed in the Dutch part. Here, numbers declined from 1999 to 2000 on Ameland (8 to 3) and Schiermonnikoog (10 to 6), were stable on Terschelling (34 to 33) and increased on Texel (18 to 22). In LS, numbers were stable.

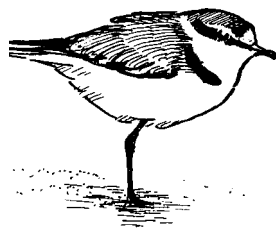
The Peregrine (*Falco peregrinus*) was increasing as a breeding bird in the Wadden Sea. One pair was found breeding on the northern coast of Groningen. There were also 2 successful pairs on high sands in SH. In NL, there was a resident pair on Vlieland but no nest was found. In LS, there were several pairs on anthropogenic structures in the Wadden Sea.

Numbers of Short-eared Owl (*Asio otus*) declined on Texel (12-7) and Ameland (7-3) from 1998 to 1999 and again in 2000. On Terschelling, however, a record peak of 12 pairs was recorded. Again in 2000, there were some pairs found on the mainland coast of Groningen. Local food conditions seem to play an important role in the annual variations. There were no breeding pairs in SH and on the mainland LS. However, on the islands of LS, the numbers were quite stable. Especially high numbers were found on Norderney and Borkum with 8 and nine breeding pairs. In DK, there have been two pairs on Mandø since 1998.

## Shorebirds

The breeding number of Oystercatcher (*Ostralegus haematopus*) in NL, LS and SH has increased steady since 1900. In recent years this development changed and numbers decreased. In NL, even groups of non-breeders disappeared. In 1999 and 2000, the numbers in SH decreased annually by 10%.

The Kentish Plover (*Charadrius alexandrinus*) increased further in DK where 105 pairs were found mainly on Rømø. The breeding success was estimated to be reasonably good despite loss of eggs and chicks and flooding at the end of May. It is not



known to what extent the pairs were recruited from the local pairs or from SH where numbers were reduced during 1990s. In SH, the number was at the same low levels as in 1999 with less than 200 pairs. In NL, the numbers declined, and for the first time no breeding pairs were reported from Vlieland and Schiermonnikoog. The species showed a further decline and serious status in LS.

In the Dollard (NL), numbers of Avocet (*Avosetta recurvirostra*) almost tripled from 500 to 1400 pairs but disappeared from the Leybucht (LS).

## Gulls and Terns

The Great Black-Backed Gull (*Larus marinus*) remained a rare species in the Wadden Sea, with only 4 pairs (at least 2 successful) on the Boschplaat, Terschelling in NL. In DK, only 1 pair bred compared with 5 in 1993. In LS, one breeding pair could be confirmed on Memmert, two pairs were seen on Mellum.

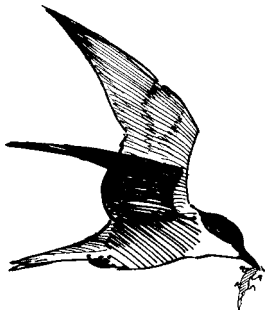
The Mediterranean Gull (*Larus melanocephalus*) has been expected to increase in the Wadden Sea for the last 10 years where several hundred pairs were found in the Dutch Delta area, but numbers were still low. In NL, 4 pairs were found: On Texel and the Groningen Coast respectively two and one pair were washed away in the high flood at the end of May. A successful pair bred on Griend were one young fledged.

On the 30th of May an Elegant Tern (*Sterna elegans*) was found in the Sandwich Tern (*Sterna sandvicensis*) colony on Langli. The bird acted as a breeding bird holding a territory in the central

part of the colony and stayed for 13 days after discovery. The finding was kept secret until the bird had disappeared to protect the breeding birds on the island. This caused an intense debate in DK about public information of birds in sensitive breeding areas. The species breeds on the West Coast of Mexico, but interbred with Sandwich Terns in France in the 1980s.

The same problem turned up in LS, where a single breeding bird of Roseate Tern (*Sterna dougallii*) was observed on the island of Minsener Oog. This bird paired with a Common Tern and founded a clutch. But the protection of such large tern colonies (below) is a matter of prime importance and has to be taken more seriously than the specific wishes of individual bird watchers.

The Gull-billed Tern (*Gelochelidon nilotica*) is severely threatened with extinction in its north-



ern most European breeding area in the Wadden Sea. But, numbers increased in the Elbe area (LS/SH) in 2000 from around 20 pairs in 1999 to 49 pairs in 2000. Interestingly the terns did not settle in a single colony but bred fairly equally dis-

tributed in salt marsh and inland areas which are managed for bird conservation. In DK, only one unsuccessful pair was recorded on Rømø. A pair with young was seen on the coast of Fanø (DK), but these birds are thought to have bred somewhere outside the Wadden Sea in DK. As late as 1996 86 pairs bred in the Wadden Sea.

The Common Tern (*Sterna hirundo*) increased in the largest colony on Minsener Oog in LS where 3,600 breeding pairs were counted. In NL, numbers seemed to be a little lower than 1999.

Numbers of Little Tern (*Sterna albifrons*) increased to 279 pairs in DK, the highest numbers since regular counts started early 1990s. Breeding success was unfortunately almost absent due to the flooding at the end of May 2000. No major changes were detected in the western Wadden Sea.

## Reference

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## Status Danish Wadden Sea

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# Environmental Quality Status in the Danish Wadden Sea – Monitoring and Assessment 2000

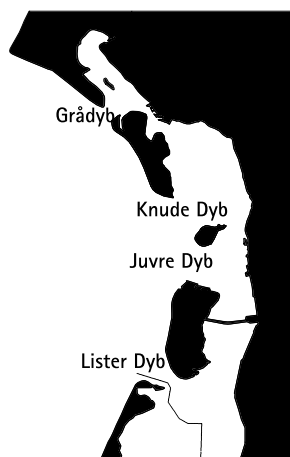


Figure 1: The Danish part of the Wadden Sea.

The environmental status of the Danish part of the Wadden Sea has been assessed in a recent report from the Counties of Sønderjylland and Ribe. It is concluded that the environmental status has been rather unchanged since the beginning of the Danish national monitoring program in 1989. The four tidal areas Lister Dyb, Juvre Dyb, Knude Dyb and Grådyb are still suffering from eutrophication, and xenobiotic substances are found in sediment and marine organisms. Morphological alterations and sterility among a gastropod species is a result of contamination with organic tin compounds used in antifouling agents. Hence the environmental quality criteria are not fulfilled.

## Monitoring Program and Assessment

The two counties carry out the environmental monitoring of the tidal areas in accordance with the Danish national monitoring program for the aquatic environment (NOVA) and with the Danish environmental law, i.e. the regional monitoring program.

The four tidal areas are assigned the highest environmental objective in the regional environmental management plan. This high objective demands an unaffected or only a slightly affected flora and fauna and a good bathing water quality. It is the purpose of the monitoring program to assess the marine water quality in relation to the assigned environmental objective.

The environmental monitoring program for the Danish Wadden Sea consists of the following physical, chemical and biological parameters: CTD-profiles (salinity, temperature, fluorescence, light, oxygen), secchi depth, nutrients (total nitrogen,  $\text{NO}_x$ ,

$\text{NH}_x$ , total phosphorus, phosphate ( $\text{PO}_4^{3-}$ ) and silicate ( $\text{SO}_4^{3-}$ ), chlorophyll-a, phytoplankton (species composition and biomass), macrophytes, macrozoobenthos, xenobiotic substances and heavy metals. Additional evaluations of the climate and the environmental impact from the hydrological catchment area including nutrient load from natural processes and human activities are taken into consideration in the description and assessment of the environmental status.

## The Danish Wadden Sea

The Danish part of the Wadden Sea constitutes about 10% of the total Wadden Sea area of 13,500 km<sup>2</sup>. The Danish part consists of 4 more or less separate tidal areas beginning in the south with the Lister Dyb tidal area, which is shared with Germany, the Juvre Dyb tidal area, the Knude Dyb tidal area and the Grådyb tidal area (Figure 1). The Lister Dyb tidal area is confined by the Hindenbug Dam in the south and the Rømø Dam in the north, which leaves the water exchange to the sea only through the deep Lister Dyb between Rømø and Sylt. The Juvre Dyb is confined by the Rømø Dam in the south and the Låningsvejen, a low dam in the north. Only on the occasion of high tide and strong wind from the west the water can pass the dam, thus leaving the only connection with the sea to the Juvre Dyb between Manø and Rømø. The Knude Dyb tidal area is connected to the Grådyb tidal area but there is a natural barrier caused by a watershed reducing the water exchange between the two areas. The tidal prism is about 2 m. The retention time of the water in the Lister Dyb tidal area is estimated to about 3 months while it is 17 days in the Juvre Dyb, Knude Dyb and Grådyb tidal areas.

## Results 2000

The four tidal areas are not identical in their physical, chemical and biological characterization but it is not in the scope of this paper to describe the detailed differences. Hence the following descriptions of the results for 2000 will be a generalization for the 4 areas and only a brief summary.

### Physics

The Danish Wadden Sea is an estuarine environ-

ment affected by the rivers. The salinity varied between 22–32 ‰ and is lower during winter due to precipitation and freshwater run-off. The water temperature varied between 3–4 °C in winter and 16–18 °C in late summer. The Secchi depth varied between 0.3–0.5 m in winter and 2.5–4.5 m in autumn. Fluorescence showed maximum values in April and May, and also in some areas in September. Statistical analyses for long-term trends (1989–2000) showed no changes in the physical parameters.

### Water chemistry

The following ranges of nutrient concentration represent the seasonal variation as monthly means: total nitrogen 200–2000 µg/l and in extreme cases up to 5000 µg/l, nitrogen oxides (NO<sub>x</sub>) 5–1400 µg/l, ammonium and ammonia (NH<sub>x</sub>) 30–550 µg/l, total phosphorus 20–210 µg/l, orthophosphate (PO<sub>4</sub><sup>3-</sup>) 5–55 µg/l, Silicon oxide (SiO<sub>2</sub>) 10–35 µg/l, chlorophyll-a 2–35 µg/l.

Potential nutrient limitation of phytoplankton by nitrogen occurred only in a few cases and not in all tidal areas. Potential limitation by phosphorus occurred in all tidal areas and is a regular phenomenon. Silicon was limiting in one tidal area.

Oxygen concentration is always high due to the strong tidal currents and a complete vertical mixing in all tidal areas.

Statistical analyses for long-term trends (1989–2000) in the water chemistry shows few significant changes (Kendall-Tau,  $p < 0.05$ ): NH<sub>x</sub> and PO<sub>4</sub> (summer means) have decreased in two tidal areas, NO<sub>x</sub> (winter means) has increased in one tidal area, as well as chlorophyll-a (winter means).

### Biology

In May – June 2000, a bloom of *Phaeocystis pouchetii* occurred and an abundance of  $32.7 \cdot 10^6$  cells/l and a carbon biomass of 820 µg C/l was measured. Other harmful or potential toxic algae species were recorded, e.g. species of the *Pseudonitzschia delicatissima*-group. No harmful effects were recorded in 2000.

Annual green macro algae requiring high nutrient concentration, i.e. *Chaetomorpha linum*, *Ulva* sp. and *Enteromorpha* sp. were widespread and occurred with up to a 100% cover in several places in all tidal areas. Distribution of sea grass was analyzed from aerial photographs and on field surveys. Less than 0.9 % of the total area of the Lister Dyb and the Grådyb tidal areas were covered with *Zostera noltii* or

*Rupia cirrhosa*. The latter species is the most prevalent and occurs with up to 100% cover at specific intertidal locations. *Z. noltii* has a maximum cover of 25%.

The macrozoobenthos consists of relatively few resistant species which can tolerate the fluctuating and harsh environment in the intertidal zone. 8 species are dominating and constitute approx. 90% of the total benthos abundance: Poychaeta: *Arenicola marina*, *Heteromastus filliformis*, *Hediste diversicolor*, *Scoloplos armiger*; Bivalvia: *Cerastoderma edulis*, *Macoma balthica*, *Mya arenaria* and Crustacea: *Corophium volutator*. Abundance, biomass, and species composition vary in time and space. In 2000, abundance and biomass was increasing in some areas or stagnant in others.

### Heavy metals and xenobiotic substances

Heavy metals (Hg, Cd, Cu, Pb, Ni, Zn) were present in low concentrations in the blue mussel, *Mytilus edulis*, in all tidal areas. In sediment, heavy metal concentrations were low but differed between areas. Chlorinated pesticide as polychlorinated biphenyls (PCB), Hexachlorocyclohexane (HCH) and DDT, DDD and DDE in *M. edulis* and sediment were present but in low concentrations. Polycyclic aromatic hydrocarbon (PAH) concentrations were high in *M. edulis* in one tidal area. Tributyltin (TBT) originating from antifouling agents was found in sediment and caused high frequency of intersex (figure 2) resulting in sterility among the gastropod *Littorina littorea*.

### Climate and nutrient load

2000 was climatically a rather normal year. There were no dramatic events like heavy storms or severe winter. The insolation was high in May and that could have been a triggering factor for the algal bloom of *Phaeocystis* in combination with high nutrient concentrations. Summer temperatures were low. The freshwater run off through the rivers is strongly correlated to precipitation

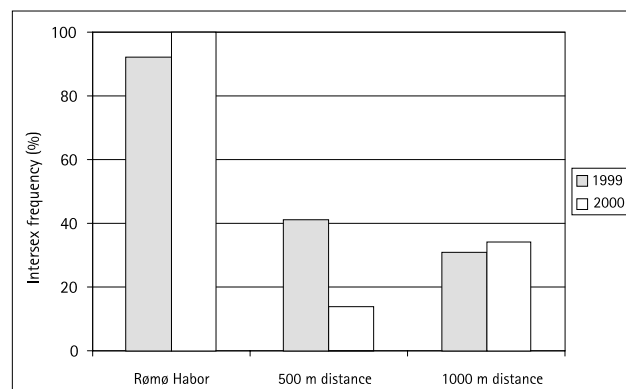


Figure 2: Intersex caused by TBT in the marine snail *Littorina littorea*. Frequency (%) at different distances from the supposed source of TBT, Rømø harbour in the Lister Dyb tidal area.

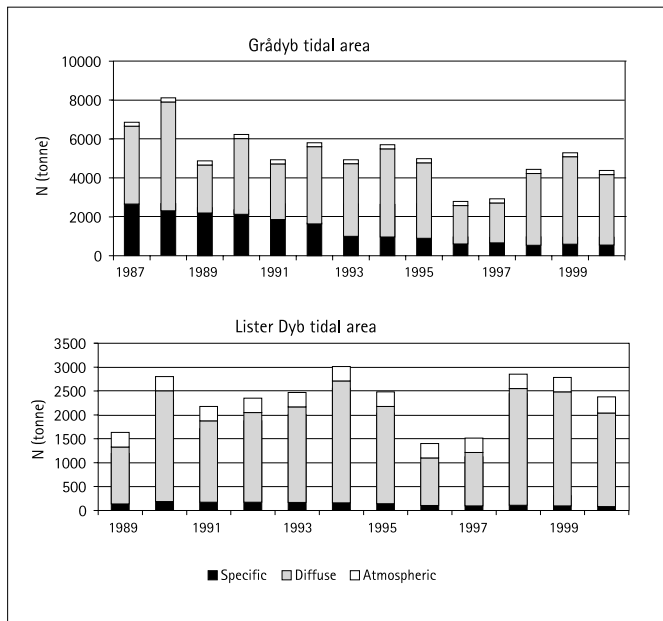


Figure 3: Nitrogen loads in the Grådyb and the Lister Dyb tidal areas. See text for further explanation.

and is high in winter and low in summer. The long-term development in the nitrogen load from the catchment areas and direct load to the Grådyb and Lister Dyb tidal areas are shown in figure 2. The total nitrogen load per year is divided into source of origin (Specific sources include wastewater treatment plants, overflow and industrial outlets; diffuse sources include washout from agriculture, drainage from single households and natural erosion; atmospheric deposition is the total of wet and dry deposition). Diffuse sources are the major contributor of nitrogen but differ from year to year depending on precipitation and erosion. Nitrogen from specific sources has declined due to improved treatment for domestic and industrial wastewater. This is most obvious for the Grådyb tidal area, which is a recipient for more sewage than the Lister Dyb tidal area.

## Conclusions

For the Danish Wadden Sea, it was assessed that the objective for the environmental quality is not fulfilled due to the results of the monitoring program in 2000:

- High loads of nitrogen and phosphorus from the catchment area.
- High nutrients concentrations in the seawater.
- No or spare potential nutrient limitation of phytoplankton.
- Periodically high chlorophyll concentration.
- Mass bloom of phytoplankton whereas some species are considered as harmful.

- Mass occurrence of annual green macro algae requiring high nutrient concentration.
- Spare occurrence of *Zostera noltii* and *Ruppia cirrhosa*.
- Levels of organic tin composition (TBT) in blue mussels, *Mytilus edulis*, which can cause harmful effects in the organism.
- Levels of organic tin composition (TBT) in sediment, which can cause harmful effects on benthic organisms and plants.
- High level of PAH in mussels.
- Intersex and sterility among the gastropod species *Littorina littorea*.

It is suggested that a considerable reduction in nutrient load, especially nitrogen from diffuse sources in the catchment areas, is needed to achieve an improved water quality and the fulfillment of the environmental objective. Further more the contamination with xenobiotic substances has to be reduced.

More information can be obtained from the technical report "Vadehavet 2000, Vandmiljø overvågning. Amternes Vadehavssamarbejde Ribe Amt og Sønderjyllands Amt 2001" by M. Brozek, G. Bruntse, H. Larsen, P. B. Madsen, T. Thomasen and K. Toudal. The report can be ordered at the 2 counties (in Danish only).

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# Toxicity of Dredged Material Polluted with Hexachlorobenzene (HCB) - Is there a Risk for Organisms Living in the Ems-Dollard Estuary?

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## Abstract

For the dumping of dredged material in the marine environment, a quality objective is used. For hexachlorobenzene (HCB) a temporal quality objective of 100 µg/kg is used for the Sea Harbor Channel in Delfzijl, the Netherlands, which is five times higher than the nationally accepted objective. Research was carried out to investigate the risk for organisms living in the Ems-Dollard estuary when the temporal objective is maintained. As conclusion was drawn that in the estuary no elevated risk is expected. However, for organisms living and feeding in the Sea Harbor Channel itself, the HCB-uptake is high. Additional research is recommended to assess the risk in this relatively small area.

## Introduction

Large amounts of hexachlorobenzene (HCB) were drained into the Sea Harbor Channel from Delfzijl (the Netherlands), due to industrial activities near the Channel in the period 1969 - 1986. This resulted in a relatively high HCB content in the channel sediment (concentrations up to 6000 µg/kg were found). In 1994, a large clean-up operation was carried out, resulting in a 97% reduction of HCB content. However, the content could not be reduced to meet the national accepted quality objective for HCB in dredge spoil (20 µg/kg). For political and economical reasons a temporal objective of 100 µg/kg has been used since 1985 only for the dredge spoil from the Sea Harbor Channel in Delfzijl. This should have lasted until the year 1998, when new policy on national quality objectives were formulated. Beside, the temporal elevation of the objectives it was decided to study in the field the possible risk of these HCB concentrations.

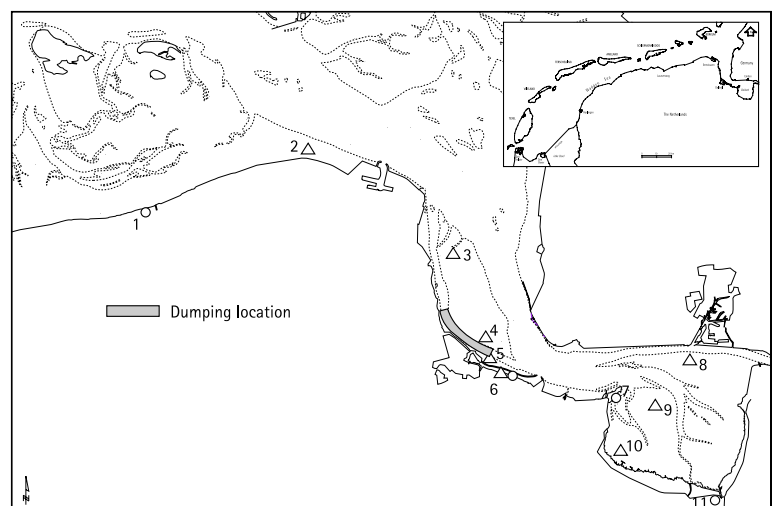
Hexachlorobenzene (HCB) was used as a pesticide in Europe. HCB is rather persistent and binds to particulate matter and easily bioaccumulates in the lipid rich organs of organisms. Elimination from organisms takes place via faeces and urine. Another possibility is to pass it on to the next generation via the lipid rich eggs and mother milk (Espeland et al. 1997; Nakashima et al. 2000). This results in a lower contaminant content in female

animals compared with males. Due to its persistence and its lipid solubility, HCB also bioaccumulates into the food chain (Gabrielsen et al. 1995).

To assess the concentration of HCB an objective is set: the Maximum Permissible Risk (MPR). The MPR is a value, which is derived from results from laboratory tests with higher organisms (in this case 4 rat tests and 1 bird test) and is based on the content in the food of birds and mammals. The MPR in sediment is derived (5 µg/kg; Van de Plassche et al. 1994) with conversion factors like the bioconcentration factor (BCF).

The dredge material from the harbor and Sea Harbor Channel from Delfzijl are disposed in an erosion area of the Ems-Dollard estuary (Figure 1). This area was chosen as research location to collect data from sediment, suspended matter and biota (polychaete; *Nereis diversicolor* and mussel; *Mytilus edulis* and Oystercatcher (*Haematopus ostralegus*) eggs and flounder (*Platichthys flesus*). The results were completed with data from the Dutch monitoring program and from the international monitoring program in the Wadden Sea (TMAP) to estimate the temporal trend in HCB content in the period 1991 - 1999 (Becker et al. 1998, Becker pers. comm.). The results from *Nereis* and in mussel were compared with the  $MPR_{\text{food}}$  to assess the risk for birds and fish in the mentioned area.

Figure 1: Sample locations for *Nereis* (triangles) and Oystercatcher eggs (circles) in the Ems-Dollard estuary. The shaded area is where the dredge material is dumped. The numbers correspond with the locations mentioned in Figures 3 and 4.



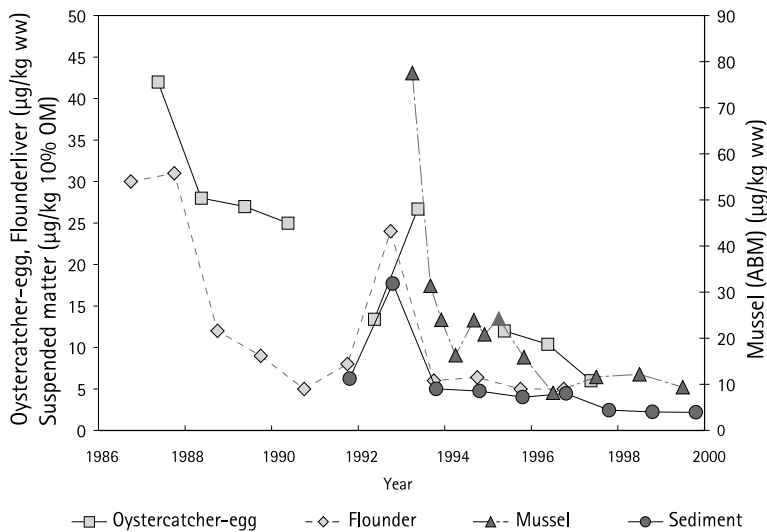


Figure 2: Temporal trends of HCB-content in sediment, suspended matter, mussel and flounder.

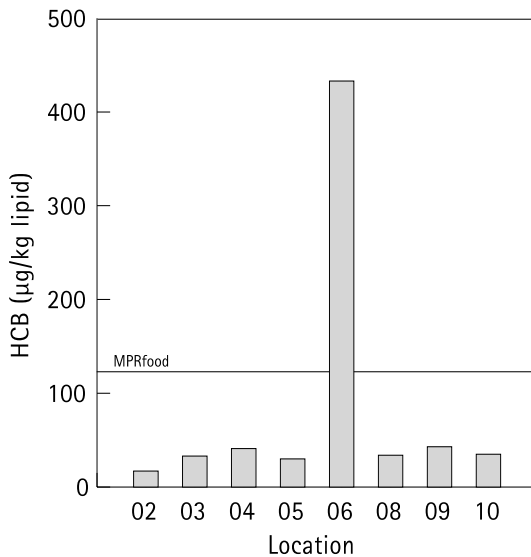


Figure 3: HCB-content in Nereis diversicolor collected at different locations. For location numbering see Fig. 1. The MPR<sub>food</sub> is drawn as a horizontal line

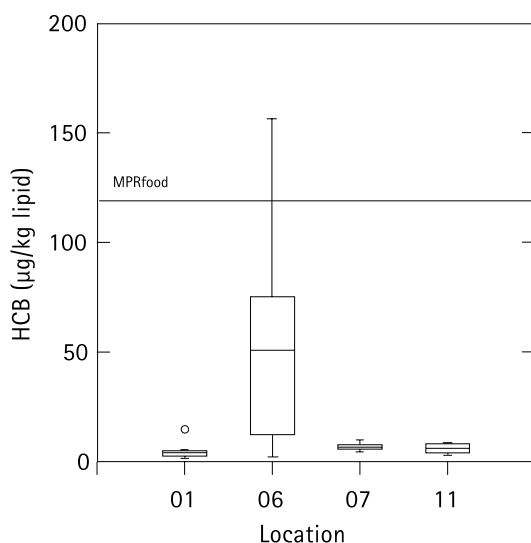


Figure 4: HCB-content in Oystercatcher (Haemotopus ostralegus) eggs collected at different locations. For location numbering see Fig. 1. The horizontal line represents the MPR<sub>food</sub>.

## Results and discussion

The temporal trends of HCB-content in sediment, suspended matter, mussel and flounder are shown in Figure 2. The results from Nereis and Oystercatcher eggs are shown in Figure 3 and 4 respectively. Clearly, a decreasing trend is shown between 1991 and 2000. Only a sudden peak was observed in 1992. Since this peak was observed in all measured compartments, it seems to be consistent. The reason for existence of the peak is unknown. Since even during this period the HCB-content in mussel and flounder was far below MPR<sub>food</sub> levels no significant increase in risk by HCB was expected for birds or mammals. As a consequence the temporal quality objective of 100 µg/kg for the dredge material from the Sea Harbor Channel can be maintained.

Although a high HCB-content in dredged material has been added to the Ems-Dollard estuary, the HCB-content in sediment and suspended matter is just below the MPR<sub>sediment</sub> value of 5 µg/kg. The reason for this is the dilution with relatively clean suspended matter in the estuary. Due to the spill of dredged material into an erosion area, the sediment mixes and dilutes with the suspended matter present in the Ems-Dollard estuary and is transported to other areas, so the concentration drops. Sediment with higher HCB-content (max. 100 µg/kg) is spilled into the Ems-Dollard estuary, where lower HCB-content is present in sediment and suspended matter. Therefore, the monitoring activity has to be continued over the years so that the higher quality objective is maintained, in order to control a possible increasing trend in HCB-content.

The HCB-content in all biota from the Ems-Dollard estuary is a factor 2 - 10 below the MTR<sub>food</sub> (120 µg/kg). On the basis of these data no toxicological risk has to be expected in organisms living in the estuary. Even the organisms living at the end of the food web.

Nereis collected in the Sea Harbor Channel contained ten times higher HCB-contents than those collected in the estuary. The HCB-values are more than three times higher than the MPR<sub>food</sub> of 120 µg/kg (Fig. 3). Based on the HCB-content, a potential risk is present for organisms which predate on Nereis in the Sea Harbor Channel from Delfzijl.

Oystercatchers, living near and feed in the Sea Harbor Channel, laid eggs in 1997 with a ten times higher HCB-content than individuals living and feeding in the Ems-Dollard estuary (Fig. 4). This is

caused by the fact that the HCB-contents in Nereis (main food source for the Oystercatcher) collected from the Channel is ten times higher than that in the Ems-Dollard estuary. For Oystercatcher eggs no MPR-value has been derived. However, as food the HCB-content in the "Channel" eggs largely exceed the  $MPR_{\text{food}}$  for organisms high in their trophic levels. For organism which predate on these eggs, like rat and gull, toxicological risk is present.

## Conclusions

No effects are expected due to dumping of dredged material from the Sea Harbor Channel into the Ems-Dollard estuary when the temporal quality objective of 100 µg/kg is maintained for a limited period. The HCB present in the sediment from the Channel itself causes a potential risk for organisms predated on Nereis in the Channel itself.

A potential risk is present in the Sea Harbor Channel due to the HCB present in the sediment. Difficulties have to be overcome to clean the sediment. Therefore, effect studies are recommended to study the actual risk of HCB on the Oystercatcher colony living near the Channel.

In addition, the HCB-content in the sediment should be monitored to investigate the temporal trend due to dilution by relatively clean suspended matter transported from the Ems-Dollard estuary into the Channel. This sediment is supposed to cover up the deeper contaminated sediment.

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## Wadden Sea Specific Eutrophication Criteria

### Framework

In 1994, at the 7<sup>th</sup> Wadden Sea Conference in Leeuwarden, the trilateral Targets were adopted. With regard to eutrophication a formulation was agreed upon which was consistent with the development of a procedure regarding the strategy to combat eutrophication within the framework of OSPAR. Part of this strategy is to classify the Convention Area in terms of Eutrophication Problem Areas, Non-Problem Areas and Potential Problem Areas. It was recognized that criteria for the classification would differ between different sea areas of the Convention Areas, given the large hydrological differences. This was the reason why it was decided that Wadden Sea specific criteria should be developed within the trilateral framework (Wadden Sea Plan Project 2.2.1).

In the period December 1998–December 2000 a trilateral project was carried out with financial support of the three countries and logistic support of the Alfred Wegener Institute (AWI, Wattenmeerstation Sylt) and the Wadden Sea Secretariat. The work consisted of a literature study, analyses of long-time data series from the three countries, and an expert workshop.

### Outcome

The main starting point for the analysis is the assumption that the Wadden Sea is a system which imports organic material from the adjacent North Sea (compare van Beusekom, 2000). This material is broken down (remineralized) in the Wadden Sea and the resulting products, amongst which nutrients, are used again for primary production in the Wadden Sea itself and in the adjacent coastal zone.

An important implication of this concept is that changes in the growth of phytoplankton (primary production) in the coastal zone will result in changes in the remineralization rate in the Wadden Sea. Consequently, remineralization products in the Wadden Sea can be used as an indicator of the eutrophication status of the Wadden Sea and the North Sea coastal zone. The main proposal from the study is to use ammonium + nitrite concentrations in autumn as such indicators.

The choice for the general concept and for the mentioned indicator could be substantiated by the

analyses of long-term data series. Several other indicator parameters were evaluated for their usefulness as eutrophication indicator. The general problem that arose was that none of the so-called eutrophication effect parameters (for example growth of macroalgae and mussels) could be directly linked to nutrient concentrations. Several other factors, such as weather and climate, also strongly influenced these parameters.

In the final phase of the project, a model was developed which would allow for the classification of the Wadden Sea into the three OSPAR categories. One of the principal problems that had to be faced was that the definition of „Eutrophication problem area“<sup>1</sup> contains a substantial normative aspect. It was recognized that the Wadden Sea is, also in a pristine state, a eutrophic area, where, under certain circumstances, eutrophication effects, such as large algal blooms, may occur. The question when such events must be regarded as undesirable can hardly be answered on the basis of scientific facts. Therefore, the choice was made to apply a model in which nutrient concentrations instead of eutrophication events are used, assuming that the frequency of eutrophication events will (statistically) increase with increasing nutrient concentrations.

On the basis of scientific literature it could be made plausible that during the 1970s a general increase in eutrophication events had occurred (e.g. a doubling of the primary production). This increase coincided with a doubling of wintery nitrate concentrations between 1970 and 1980. It was, therefore, decided, to regard these changes as indicative of the transition from potential-problem area conditions to problem area conditions.

Although autumnal ammonium + nitrite values for the early 1970s are available, these could not be applied directly as transition concentrations. That is because in the early 1970s the supply of riverine ammonium was very high because

<sup>1</sup> Eutrophication Problem Area: Problem Areas with regard to eutrophication are those areas for which there is evidence of an undesirable disturbance to the marine ecosystem due to anthropogenic enrichment by nutrients.

Table 1: Classification of the Wadden Sea into Non-Problem, Potential Problem and Problem areas based on autumn concentrations of  $\text{NH}_4 + \text{NO}_2$  ( $\mu\text{M}$ ). The division in subregions is based on the availability of seasonal data. The present autumn values refer to values during the 1990s.

	Non-Problem conditions	Potential Problem conditions	Problem conditons	"Present" values (1990s)
Western Dutch Wadden Sea	<3.0 $\mu\text{M}$	3.0 $\mu\text{M}$ - 8.3 $\mu\text{M}$	> 8.3 $\mu\text{M}$	12.3 $\mu\text{M}$
Eastern Dutch Wadden Sea	<4.0 $\mu\text{M}$	4.0 $\mu\text{M}$ - 10.2 $\mu\text{M}$	> 10.2 $\mu\text{M}$	16.7 $\mu\text{M}$
Lower Saxony Wadden Sea	<3.2 $\mu\text{M}$	3.2 $\mu\text{M}$ - 8.2 $\mu\text{M}$	> 8.2 $\mu\text{M}$	13.0 $\mu\text{M}$
Sylt Rømø Bight	<3.1 $\mu\text{M}$	3.1 $\mu\text{M}$ - 7.4 $\mu\text{M}$	> 7.4 $\mu\text{M}$	11.8 $\mu\text{M}$
Danish Wadden Sea	<2.5 $\mu\text{M}$	2.5 $\mu\text{M}$ - 6.5 $\mu\text{M}$	> 6.5 $\mu\text{M}$	10.3 $\mu\text{M}$

of the relatively low level of biological treatment in sewage treatment plants in the Wadden Sea catchment area. For this reason the concentrations of ammonium+nitrite demarcating potential-problem and problem area conditions were based on the values from after 1980, that is, after the large-scale introduction of secondary treatment in most of the Wadden Sea catchment area. The transition values, reflecting the early 1970 values shortly before the increase that occurred in the course of the 1970s, are assumed to be half of the post-1980 values.

All ranges were developed for the western Dutch Wadden Sea and adapted for five different subregions of the Wadden Sea on the basis of recent differences in autumn concentrations of ammonium + nitrite. In all these subregions, concentrations are such that they must be regarded as eutrophication problem areas (see Table 1). On the basis of a comparison of the different input sources of nutrients it was concluded that riverine inputs are the major source, but that, in order to arrive at non-problem area conditions, also atmospheric nitrogen inputs will have to be reduced.

The Final Report of the project (van Beusekom et al., 2001), will be published in the Wadden Sea Ecosystem series.

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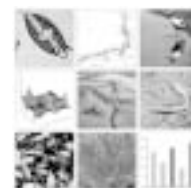
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## The Trilateral Monitoring and Assessment Program (TMAP) – Status and Developments



### Introduction

The Trilateral Monitoring and Assessment Program (TMAP) is an integral part of the Wadden Sea cooperation between the Netherlands, Germany and Denmark. The TMAP has the aim to provide a scientific assessment of the status of the ecosystem and to assess the status of implementation of the Targets, as laid down in Wadden Sea Plan. It consists of a "Common Package" of monitoring parameters including an associated data handling system adopted in 1997 (see WSNL 1998). Additionally, the TMAP aims at providing a framework for a concomitant research to further optimize the monitoring for future challenges (Kellermann 2000). Four years after the last Trilateral Governmental Conference in Stade 1997, the experiences with the monitoring program is evaluated – what has been achieved and what are the future tasks.

### Difficulties and Achievements

The establishment of the TMAP and the implementation of the "Common Package" have faced a lot of difficulties since 1993. Not all of the parameter groups, which have been selected based on issues of concern and scientific hypotheses, could be implemented on a common basis in all three countries. For financial and practical reasons, only the most important parameter groups were included in a common package covering a broad range of basic information directed toward the requirements of the Wadden Sea Plan. However, it is obvious that gaps exist which hamper a comprehensive assessment especially with regard to functional and process related parameters. A current evaluation of the experiences with the Common Package revealed that these gaps also concern monitoring requirements of the Habitat Directive (Natura 2000) and the new Water Framework Directive (TMAG 2001). Possibilities have been investigated how these requirements can be fulfilled in light of limited resources. This task will be the major challenge of the TMAP in the coming years.

In spite of all difficulties, the TMAP has now been established as the common monitoring pro-

gram in all three Wadden Sea countries. It has been proven successful as an integrated, multi-sectoral program also compared to other international programs and entails physico-chemical, morphological, hydrological, biological and human use aspects and covers all Wadden Sea habitats. Common monitoring guidelines are available for the different parameter groups and were implemented in the national programs resulting in an extension or modification of running programs or the establishment of new programs in one or two countries. A complete new program for all three countries is the monitoring of contaminants in bird eggs, which was implemented trilaterally in 1998. It enables an assessment of the biota contaminant level and the possible effects on the breeding success of birds. A trilateral assessment covering the whole Wadden Sea including data of 2000 is currently under preparation (Becker 2001).

The establishment of a harmonized, de-central organized data handling system is a major achievement of the TMAP. The technical concept was developed in 1997 (EU-project Demowad) and is currently being implemented in the three countries. Since 2000, two TMAP data units have been installed in Germany (Schleswig-Holstein/Hamburg and Lower Saxony) and are accessible via the Internet. The technical part of the data bases have been installed for several parameter groups, whereas for others a trilateral solution is under preparation. In the Netherlands and Denmark, the work has started last year and is currently in progress. However, the implementation of the data handling system is still behind schedule, mainly because of lacking or non-continuous financial and personnel support. Further efforts are necessary to develop the existing system into a fully operational data exchange system until the Governmental Conference in October 2001 and to guarantee a steady data flow into the TMAP assessment work in future.

### Monitoring of Blue Mussels, Salt Marshes and Dunes

The TMAP is based on common monitoring guidelines, which have been developed in the Demow-

ad Project in 1997 (TMAP Manual, December 1997). Since then, the guidelines have been reviewed and updated continuously. In 2000, two TMAP workshops were held to further develop technical details of the TMAP guidelines and to improve the assessment procedure. In October 2000, the blue mussel workshop developed a trilateral definition of a mussel bed taking into account that several difficulties exist to describe this highly variable habitat in quantitative terms. Furthermore, the application of different remote sensing techniques, intercalibration of field sampling methods and strategies of recruitment monitoring was addressed (TMAP Blue Mussel Workshop, 2000). A follow-up workshop will be held in autumn 2001.

A salt marsh workshop in November 2000 was also successful in developing common criteria for the classification of salt marsh vegetation based on the different existing national classification systems and prepared recommendations concerning future topics for monitoring and research. Unfortunately, Danish salt marsh experts could not attend the workshop because of unforeseen organizational difficulties. Therefore, not all proposals could yet be included in the TMAP guidelines. A second workshop will be organized in November 2001 to test the proposed classification system, discuss experiences with different remote sensing techniques and develop a common assessment procedure with regard to the trilateral targets (TMAP Salt Marsh Workshop 2000).

Concerning monitoring of dunes and beaches, the applicability of the European habitat classification (EUNIS classification) was investigated (Petersen 2001). From about 30 different habitats listed in the EUNIS classification for coastal habitats, 14 habitat types of dunes, dune slacks and beaches can be distinguished in the Wadden Sea. Most of them can easily be identified using aerial photographs.

## Making the Monitoring Results Available

During the last years, ten monitoring reports have been published in the "Wadden Sea Ecosystem" series entailing mainly results of already implemented programs like the monitoring of breeding and migratory birds which have been working successfully trilaterally for about 10 years. A comprehensive overview about the state of the Wadden Sea was presented in the QSR 1999. Because the TMAP is still in its implementation phase the QSR revealed several deficiencies with regard to

monitoring which will hopefully being solved after the TMAP is fully operational. The QSR also shows that monitoring, data compilation, scientific analysis, expert assessment and publication of the results, requires two – three years of preparation, an intensive coordination, as well as high personnel and financial efforts. The needed time span is comparable to other international assessment work, e.g., on OSPAR or EU level, but may not be sufficient for managers, scientists or the broader public.

A trilateral assessment covering the whole Wadden Sea requires, as a precondition, a functioning trilateral expert working structure to analyze the data and publish the results in a suitable way, e.g., as reports, brochures, via the Internet or a public information system. The reports on monitoring of breeding and migratory birds are good examples of such a well functioning structure. Also workshops on the trilateral and national level, like the yearly TMAP monitoring workshop in Schleswig-Holstein, makes the TMAP results better available and improves the collaboration between scientists and managers.

It will be a future challenge of the TMAP, to make the monitoring results also available for the whole Wadden Sea – for all topics, in a high quality, as fast as possible, and for all different users.

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## Experimental Mariculture

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# SEAPURA: Seaweeds Purifying Effluents From Fish Farms

An EU project coordinated by the Wadden Sea Station Sylt

Mass cultures of marine macroalgae (seaweeds) in the sea or on land serve as a "nutrient extracting aquaculture" reducing eutrophication along the Chinese coast or purifying outflow from intensive fish farms in Israel. This beneficial side-effect of seaweed cultures is also used in the recently SEAPURA project funded by the EU and coordinated by the Wattenmeerstation Sylt (AWI). Outdoor tank cultures of commercially important, perennial red seaweed species are used for extracting nutrients from fish farms in Spain and Portugal, and accompanying research is conducted in Germany and Northern Ireland. The cultivated seaweed biomass will be used for the human food market mainly in France, for extraction of pharmaceutical substances, or for fish feed additives, with possible antibiotic effects of the cultivated seaweed. Continuous short-day treatment with automatic blinds on top of the cultivation tanks will be used for year-round activation of cell division in the cultivated red algae for preventing the naturally occurring summer dormancy of perennial seaweeds.

## Introduction

Mariculture of seaweeds (marine macroalgae) in the sea or on land is an important tool for purifying eutrophicated waters. In the sea, an example is rendered by the Chinese mass cultivation of *Laminaria japonica* on floating ropes in bays near towns and along hundreds of kilometers along the shore, with use of the seaweed for human food and production of alginate and iodine. The beneficial side-effect of these cultures of *Laminaria* (kelp) as a "nutrient extracting aquaculture" has deteriorated in China since the 1990's when approximately 1 million tons of fresh weight of *Laminaria* were still produced per year. Since then,

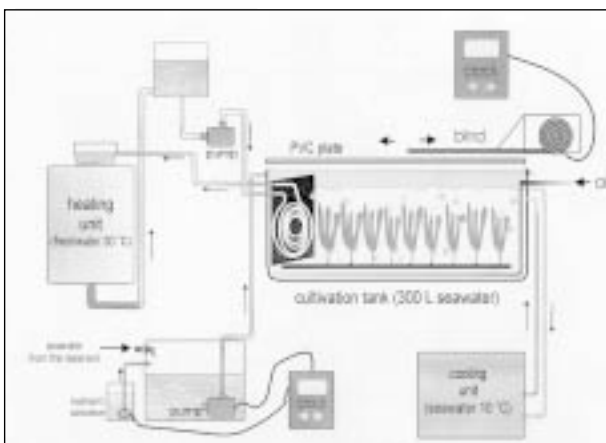
*Laminaria* cultures have been replaced increasingly by the more profitable production of invertebrates and fish in floating sea cages. These animal cultures add horrible loads of ammonium and phosphate to the coastal, domestic water runoff from the million-people towns, and the nutrient overloads in the bays that were formerly extracted at least partially by *Laminaria* are now causing the well-known blooms of unicellular and sometimes toxic algae. China will have to increase again nutrient extracting aquaculture, this was the recent take-home message issued by Prof. Charles Yarish and his Chinese marine botanical colleagues at the 17th International Seaweed Symposium held at Cape Town in January this year.

On land, a flourishing example for seaweed farms purifying outflow from fish farms can be seen at Eilat, Red Sea, set up by Dr. Amir Neori and his group during the last 10 years. Intensive fish culture is performed in tanks, and the overload of mainly ammonium and phosphate in the seawater flowing out from the fish tanks is largely absorbed by the green alga *Ulva* cultivated in raceways. A major question to be solved in such polyculture systems is of course "what to do with the seaweed biomass produced in polyculture?" This problem has been elegantly solved at Eilat by feeding the produced *Ulva* biomass to abalone, a mollusk feeding on seaweeds and a delicious and well-paid food for many gourmets throughout the world.

## SEAPURA Project: Red algae and Fish Farms

The EU announced to support studies on purification of fish farm effluents in the sub-program Sustainable Fisheries and Aquaculture (5.1.2) of the Quality of Life and Management of Living Resources Program. The project SEAPURA coordinated by the Wattenmeerstation Sylt (AWI) became funded with 1.1 M ECU, started in February 2001 and will run for three years. In this project, mass cultures of commercially important, perennial (longer than one year living) red seaweed species are used for extracting nutrients from fish farms in Spain near Telde, Gran Canaria, and Portugal,

Figure 1: Experimental outdoor tank system at the Wattenmeerstation Sylt. Marine macroalgae are cultivated at ambient daylength or in tanks with motor-driven blinds for year-round activation of cell division in continuous short-days, at 8 hours light per day.



near Faro and Porto, and the produced seaweed biomass will be channelled to different markets. Targets are uses of the seaweed biomass for human food mainly in France, where 11 seaweed species are allowed for human consumption, extraction of pharmaceutical substances, or as an additive to fish feed, with possible antibiotic effects of the cultivated seaweed, a special research aspect in one of the workpackages of SEAPURA.

### Main Danger: Summer Stop of Growth in Red Algae

A major cultivation problem with perennial seaweeds is caused by their natural growth dormancy during summer resulting in overgrowth by fast-growing annual algae or animals and potential loss of the cultivated perennial algal biomass. In the SEAPURA project year-round, high growth activity of selected, perennial seaweed species will be tried to be achieved by cultivation in continuous short-days, at 8 h light per day. Outdoor, experimental seaweed tanks (EST) fitted with motor-driven blinds are used for this purpose. The background for this comes from basic chronobiological research: in perennial brown algae growth dormancy in summer is caused by enzymatic deactivation of the cell division zones (meristems) due to the environmental long-day signal. The ecological purpose of summer dormancy is to direct the photosynthates produced in summer within the seaweed thallus into carbohydrate reserve materials to be used up during the light-poor winter, when new growth starts in many perennial seaweeds. Usually this happens in December or January, and even in complete darkness in polar zones or in turbid waters, e.g. at Helgoland in winter. Well ahead of the plankton spring bloom, the benthic seaweeds are thus able to use the rich load of nitrate and phosphate available in the sea in winter after remineralization of the plankton in late autumn. Endogenous, circannual clocks control the timing of seasonal development in perennial brown algae cultivated in the laboratory (Lüning, 1993) and the environmental annual course of daylength synchronizes (entrains) these clocks to exactly 365 days, as in many animals (Gwinner 1986). The artificial, continuous short-day signal throughout the year blocks the circannual oscillator and thus the natural sequence of "growth-on" and growth-off" in brown algae and leads to continuous high growth rate. Is this possible also in outdoor tanks, with changing light intensity all over the day? Probably yes, since summer dormancy in the

brown alga *Laminaria digitata* was recently successfully prevented in outdoor tanks with natural insolation at Sylt using artificial blinds on top of the cultivation tanks (Gomez and Lüning, 2001). It is a special aim of the SEAPURA project to find out whether the same is true also for commercially important, perennial red algae. Specialized, accompanying research in this respect is conducted at the Wadden Sea Station Sylt and at the Marine Biology Station Portaferry of Queen's University, Northern Ireland.

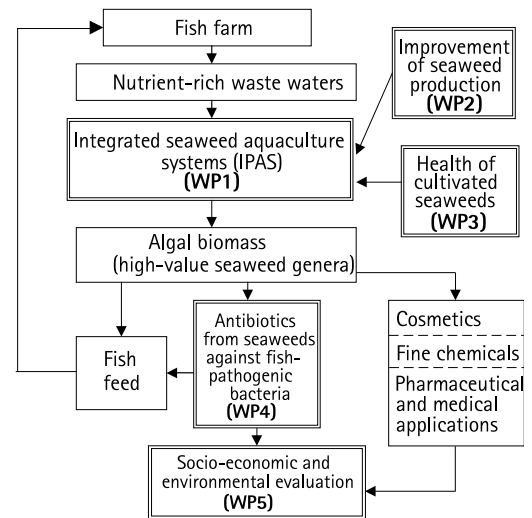


Figure 2: Function flow sheet of SEAPURA research steps

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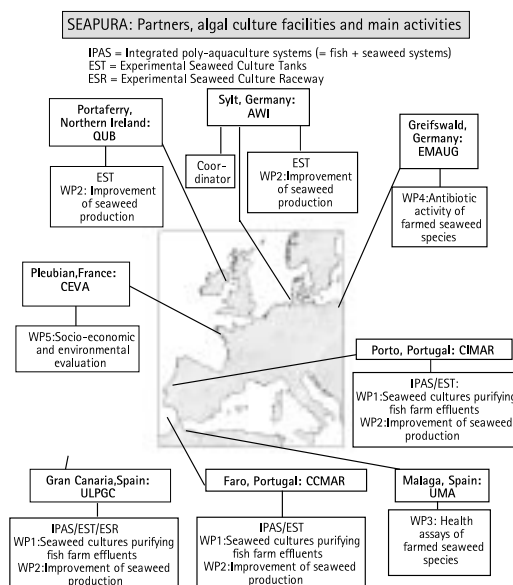


Figure 3: Partners and tasks of the SEAPURA project

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## New Publications

### Salt Marsh Management

Esselink, P., 2000. Nature Management of Coastal Salt Marshes. Interactions between anthropogenic influences and natural dynamics. Koeman en Bijkerk bv, Haren, Hfl 40 (Euro 18,20).



This is the title of an interesting thesis written by Peter Esselink, University of Groningen, The Netherlands. It was published in October 2000. It contains 8 chapters and 2 shorter 'boxes', in a well-bound, well-illustrated book (249 pages, 246 in English). Six of the chapters have been published in scientific journals since 1996; the others can only be found in the thesis. Most of the fieldwork of Peter Esselink was carried out in the Dollard area, the brackish bay on the Dutch-German border. One chapter deals with the effects of sheep grazing on the vegetation on Friedrichskoog, Germany.

The Dutch Dollard salt marshes (740 ha) proved to be very suitable for research on the effects of nature management. Two third of their total surface has been managed as nature reserve since 1981, including substantial reduction of grazing pressure and neglect of the drainage system. The other 270 ha are still in agricultural use, with high grazing pressure and ditching, and are excellent for comparison. So questions about long-term effects of nature conservation management in the direction of 'Naturbelassen' ('left to nature'), but with some grazing by cattle (according to the Dutch ideas about salt marsh nature management) could be investigated here! What would happen with erosion and sedimentation rates, and what about vegetation development in poorly drained situations?

Peter cooperated with several other scientists, and organized the help of quite a number of students. This explains partly the size of his thesis. It gives chapters on accretion, drainage, vegetation developments and the influences of grazing livestock on vegetation development, as well as the effects of grazing by geese. Especially graylag geese proved to be important. One chapter deals with the habitat preference of graylag and barnacle geese, and a 'box' of 7 pages reveals the relationship between breeding redshanks and vegetation development.

What I appreciate most are the general introduction (on the development of the mainland salt marshes and human influences since the early days of the Wadden Sea), and the concluding chapter

on future nature conservation. The latter stands for a careful analysis of the present situation and the expected developments in the mainland salt marshes, and judgments about strategies to make the best of them. The result is a book that may contribute to the background and vision of others, especially those who are involved in management of the Wadden Sea area. Highly recommended!

This book can be ordered directly at Peter Esselink (p.esselink@biol.rug.nl), Koeman en Bijkerk bv, PO Box 14; NL -9750 AA Haren.

Jaap de Vlas.

### Management of Polders

Goeldner-Gianella, L., 2000. L'Allemagne et Ses Polders. Conquête et renaissance des marais maritimes. CTHS Paris, pp. 254, 250 F.



This book shows how a traditional land-winning technique, the embankment of polders, has been abandoned at the Wadden Sea costs during the last decades. The different reasons for discontinuing these embankments, which had been carried out over about fifty years, are analyzed: the development of coastal protection policy and agriculture, the opposition of ecologists against the embankments, the increasing knowledge in salt marsh ecology, and also the progress in the nature protection legislation. The discontinuation of these embankment techniques and the possible consequences of the current sea level rise resulted in a completely new strategy for coastal protection.

The book widely addresses the questions of the general public concerning the development of the European coasts and the still existing interest conflict between nature conservation and coastal defense.

This case study of the German coast is of particular interest for scientists and managers concerned with the protection of wetlands and coastal defense in Europe. It is an excellent overview of the development of the coastal protection policy and techniques in the Wadden Sea with focus on Germany and the Schleswig-Holstein polders combined with factual information in tables and maps. The book is written in French, which, unfortunately, limits the number of readers. The author, Lydia

Goeldner-Gianella, has a degree in geography and is currently teaching at the University of Paris. Her work on this topic received an award from the Chancellor of the University of Paris in 1998.

## Monitoring in Schleswig-Holstein

Wattenmeermonitoring 1999. Schriftenreihe des Nationalparks Schleswig-Holsteinisches Wattenmeer. Pp. 51.



The results of the Schleswig-Holstein part of the Trilateral Monitoring and Assessment Program (TMAP) are compiled for the year 1999 and were presented during a two-day workshop on Sylt in November 2000. Besides the recent status and developments concerning breeding and migratory birds, common seals, fish, eelgrass, macroalgae and blue mussels the report focuses on socio-economic aspects. Since 1998, socio-economic monitoring (SÖM) has been carried out in the Schleswig-Holstein National Park (see also Gätje, WSNL 2000, No. 1). The 2000 report is currently under preparation.

## Hamburg Wadden Sea Atlas



Nationalpark-Atlas Hamburgisches Wattenmeer. Nationalparkplan Teil 1. Naturschutz und Landschaftspflege in Hamburg. Schriftenreihe der Umweltbehörde. Heft Nr. 50, 2001. Umweltbehörde Hamburg, pp. 168.

This publication is a valuable amendment of the two volumes of the "Umweltatlas Wattenmeer" (see WSNL 1999, No. 1) and focuses on the National Park of the Hamburg Wadden Sea, the smallest of the three German national parks. The atlas entails a comprehensive overview of the recent knowledge of all important aspects concerning nature values, human uses and historical and landscape values on the islands of Neuwerk, Scharhörn, Nigehörn and the surrounding tidal area supplemented with information about nature protection, management and monitoring. Each article consists of a thematic map together with one page of an easy-to-read text. The huge amount of detailed information can therefore easily be found and understood by everybody.

## Breeding Birds in the Wadden Sea

Rasmussen, L.M., Fleet, D.M., Hälterlein, B., Koks, B.J., Potel, P., Südbeck, P., 2000. Breeding Birds in the Wadden Sea in 1996. Results of a total survey in 1996 and of numbers of colony breeding species between 1991 and 1996. Wadden Sea Ecosystem No. 10. Common Wadden Sea Secretariat, Wilhelmshaven, pp. 122.



With the publication of this report, it is the second time that a complete breeding bird survey in the entire Wadden Sea is presented by the Joint Monitoring Group of Breeding Birds in the Wadden Sea (JMBB) in the framework of the Trilateral Monitoring and Assessment Program (TMAP). The results of the first complete survey of breeding birds of the entire Wadden Sea in 1990 were published in 1994 (Fleet et al. 1994, Wadden Sea Ecosystem No. 1). Considering the huge data set and the limited available time for a trilateral evaluation and the compilation of the report by the members of the JMBB, the publication of the results – only four years after the survey – can be seen as a great accomplishment.

The report includes the results of the 1996 total survey and a comparison with the first survey five years ago. Furthermore, for the colony nesting species, changes in distribution and abundance are given for the first time on an annual basis for the period between 1991 and 1996. The report reflects the fact that the joint breeding bird monitoring program has now been operational for a longer period of time, allowing for the analysis of long-term series. The evaluation consists of three main parts: firstly, an overview on the basic information regarding the study area and the methods used in the 1996 survey; secondly, the results, which are given separately for each of the concerned 31 species; and thirdly, the discussion chapter, which confirms the outstanding significance of the breeding bird fauna of the entire Wadden Sea. It is shown that the breeding bird monitoring provides a mechanism for evaluating the nature conservation actions and achievements in the Wadden Sea.

### Climate Change



Lozán, J.L., GraBl, H., and Hupfer, P., (Eds.), 2001. Climate of the 21th Century: Changes and Risks – Scientific Facts. pp. 448, ISBN 3-00-006227-0, \$ 30.

In this book, the reader will find information about future trends in air temperature, precipitation, sea level, mountain glaciers and other climate change related variables. An overview is provided on the history of climate and the causes of change. The consequences of climate change are described concerning warming and rising sea level but also future ones like the social impact of displacement of climatic zones and the consequences for the world economy, including water and food supplies which cannot yet be adequately assessed. The book gives a comprehensive description and an assessment of the main findings of recent climate investigations.

The book can be order directly at J.L. Lozán, Imbekstieg 12, 22527 Hamburg, Lozan@t-online.de

### Fish Migration



Jager, Z. Upstream fish migration: Northern Netherlands coastal zone. RIKZ Report 99.022, pp.37.

55 estuaries are located along the Dutch Wadden Sea coast, only one of which still has a relatively natural gradient between fresh water and salt water: the Ems Dollard. The rest is separated by dikes, dams and sluices that make it difficult or impossible for fish to migrate. As a result, of the 11 migrating fish species originally native in the Netherlands, four are now extinct and five are on the Red List.

An integrated approach considering the whole catchment area of an estuary is necessary to improve the conditions for migrating fish. This concerns the barrier between salt and fresh water but also the freshwater itself. Are there suitable habitats upstream, are they accessible, and is the water quality satisfactory? The report indicates which upriver locations may be suitable for the different fish species and which various management measures can be taken to improve the situation.

## Recommendations of the 10<sup>th</sup> International Wadden Sea Symposium

The 10<sup>th</sup> International Wadden Sea Symposium was held in Groningen, the Netherlands, from 30 October – 2 November 2000. The symposium was attended by about 150 scientists and representatives from governmental and non-governmental organizations.

The symposium, titled "Challenges to the Wadden Sea Area", addressed the integration of ecology and economy. Presentations were given on sustainable tourism development, coastal protection and climate change, mussel and shrimp fisheries, development of socio-economic targets, cultural heritage, salt marsh management and restoration of habitats. A special lecture was presented by Prof. Chul-Hwan Koh from the University of Seoul on the ecology of the tidal flats in South Korea and the current threats concerning large-scale embankments (see also WSNL 1999, No.1).

On the basis of the presentation and related discussions, the symposium formulated a number of recommendations to the Trilateral Governmental Conference in Esbjerg, 31 October 2001.

### The 10<sup>th</sup> International Wadden Sea Symposium

Having noted 43 oral scientific presentations and 24 poster presentations during the symposium,

Considering the discussions after the oral presentations and during the poster presentations as well as the discussions during the workshop on eider duck mortality,

#### Shore erosion

##### Concludes that

The Wadden Sea faces erosion of its shorelines in many places and consequently major human interventions resulting in artificial constructions.

That sand nourishment proves to be an ecologically sound alternative although the ecology of sandy beaches may require more attention.

##### Recommends

To use sand nourishment on beaches and fore-shore as the preferred technique for coastal protection.

To extract the sand needed for nourishment from places in the North Sea where the least damage to the underwater ecosystem is anticipated.

#### Salt marsh management

##### Concludes that

Although salt marsh management by means of sheep or cattle grazing can increase the carrying capacity for geese, these management measures would disadvantage other species within the habitat.

A management of all habitats for geese by means of intensive or moderate sheep grazing intensities is, therefore, neither necessary nor appropriate and would oppose other management options.

##### Recommends that

Salt marsh management – as already recommended at earlier symposia – should be based on clearly defined aims after which appropriate management measures should be taken.

#### Eelgrass restoration

##### Observes that

Eelgrass (*Zostera marina*) is declining in most of the Wadden Sea.

Restoration of estuarine gradients and decrease of nutrient loads are beneficial for eelgrass occurrence.

Bottom fisheries are able to destroy eelgrass occurrences.

##### Concludes that

Restoration of eelgrass beds in the Wadden Sea is a viable option, but that separate restoration programs might be required for two different morphotypes of *Z. marina*: the flexible (growing around Mean Sea Level) and the robust type (occurring around Low Tide Level).

In that case the flexible type of eelgrass should be restored first.

#### Harbour seal population growth

##### Concludes that

The population of the harbour seal in the Wad-

den Sea is growing fast and that this may result in conflicts with users of the Wadden Sea.

#### Recommends

To start trilateral research on how to reconcile the protection of the growing seal stock with the development of recreation and tourism and with fisheries management.

### Shrimp fisheries

#### Concludes that

That reduction of shrimp fishery during a few weeks in summer may contribute to better survival of juvenile plaice, without having much effect on the yields of the shrimp fisheries.

#### Considering

The wish for sustainable fisheries.

#### Recommends

A careful consideration of the feasibility of this reduction of fishing effort which may be supplemented by technical measures to reduce by-catch.

### Intertidal beds of mussels and cockles

#### Concludes that

Intertidal mussel beds, after having been destroyed, require much more time to restore naturally than earlier assumed;

There are indications that recruitment of cockles is negatively influenced by mechanized cockle fisheries.

#### Recommends that

These new findings will be made the subject of further research and that the available evidence will be used in the management of the shellfisheries.

### Mortality of eider ducks

#### Concludes that

The major cause of the mortality of eider ducks in the Wadden Sea in the winter of 1999/2000 was food shortage, possibly caused by a coincidence of structurally low resources since 1990 and even lower stocks in the winter 1999/2000, low quality of the shellfish, many crabs, and no *Spisula*;

That we have been unable to determine the cause(s) of this food shortage with certainty because major data were lacking or not available.

#### Recommends that

To better understand the apparent reduction of the carrying capacity of the Wadden Sea for shellfish consuming birds and to enable a suc-

cessful food reservation policy, more and reliable data about the shellfish resources have to be on hand, such as data on food quality of shellfish, stock assessments of blue mussels on the cultivation plots, intertidal and subtidal resources, as well as accurate counts of eiders ducks and other shell eating birds.

The Trilateral Monitoring and Assessment Group defines a catalogue of data to be monitored among which data of fishery activities. The data should be made available both at appropriate places on the Internet and in an annual report, along the lines of ICES annual working group reports.

To allow an appropriate assessment of the impact of shellfish fisheries, scientific investigations should be performed open and public, while results should preferably be peer reviewed. Any political translation of results into political decisions will have to follow a separate process.

The Baltic/Danish/German/Dutch Eider flyway population should be monitored on an international level.

To be better prepared for calamities, like the Eider mortality, the Common Wadden Sea Secretariat should be asked to draft a recording and analysis protocol.

### Monitoring of fish and fisheries

#### Concludes that

The Wadden Sea provides space for a variety of ecological functions regarding demersal and pelagic fish and shrimp populations.

Existing policy aims at restoration of estuarine gradients, including free (or improved) passage for migratory (so called diadromous) fish species, most of which are on the Red List for the Wadden Sea.

Monitoring of fish and shrimps is not included in the Common Package of the Trilateral Monitoring and Assessment Program (TMAP).

#### Recommends that

Monitoring of fish is included in the TMAP Common Package, taking into account already existing programs (e.g. Demersal Young Fish Surveys), and the development of additional monitoring programs (for pelagic and diadromous species)

### Socio-economic targets

#### Concludes that

Basic data for the socio-economic development of the Wadden Sea area are lacking for most areas.

**Recommends to**

Install a working group in order to elaborate socio-economic targets for the trilateral level.

Based on these targets, develop a socio-economic monitoring system that includes the basic parameters and database structures that allow for an assessment of the economic system of the Wadden Sea coastal region, in concomitance to the assessment of the ecosystem.

Stakeholders, inhabitants and users should be involved in this process at an appropriate stage. The Interregional Wadden Sea co-operation should be entrusted with this task.

Consider for this socio-economic monitoring to adapt the present delimitation of co-operation area, because so far the geographical delimitation of the co-operation area excludes regions with intensive human activities affecting the Wadden Sea. Therefore, it should be considered to extend the co-operation area to include adjacent mainland and sea areas.

Amend the Common Package of the Trilateral Monitoring and Assessment Program (TMAP) by integrating appropriate socio-economic monitoring parameters to monitor demographic changes, development of regional economics and social trends.

Integrate social, economic, cultural and ecological aspects in the sense of Agenda 21 and of Integrated Coastal Zone Management in the monitoring system.

**Loss of Korean wetlands****Observes**

The actual and potential losses of important coastal biotopes due to the embankment of very large tidal flat areas in South Korea.

**Recommends**

To the 9th Trilateral Governmental Conference to initiate a cooperation with South Korea to foster the transfer of knowledge and experience in the fields of tidal flat ecology and coastal zone management as gained in the European Wadden Sea area.

**Structure of the Scientific Wadden Sea Symposia****Concludes that**

The process of arriving at scientific conclusions at the Wadden Sea symposia and translating these into recommendations for management and policy may be optimised.

**Recommends that**

A small trilateral working group of scientists and government officials (with equal representations from the Wadden Sea countries) is set up to develop proposals for an efficient and unbiased transfer of scientific information [not: advice] from the Wadden Sea symposia to management and policy via the Trilateral Working Group and Trilateral Governmental Conference.

In addition to the above science-based conclusions and observations, and management and policy directed recommendations, the 10th International Scientific Wadden Sea Symposium

**Observes that**

Although there were 40% females among the participants of the symposium, no more than 15% of the oral presentations were given by female scientists.

There was a paucity of presentations really attempting to - at a conceptual level - integrate knowledge from biological and environmental sciences, technology, socio-economics and other disciplines towards policy development and management.

**Recommends that**

Home institutions and organizations encourage female scientists to submit contributions to the next International Scientific Wadden Sea Symposium.

The integrated approach of problems, such as dealt with in Integrated Coastal Zone Management, is better embedded in academic as well as in applied education programs in order to meet the future needs in this field.

## Calendar of Events

### 2001

#### Hydrobiological Variability in the ICES Area, 1990 - 1999

8 - 10 August 2001, Edinburgh, Scotland, UK, ICES Symposium, Info: <http://www.ices.dk/symposia/symposia.htm>

#### People and the Sea

30 August - 1 September 2001, Amsterdam, The Netherlands, Maritime research in the social sciences - an agenda for the 21st century. University of Amsterdam and Netherlands Institute for the Social Sciences. Info: Center for Maritime Research, Planete Muidergracht 4, NL 1018 TV Amsterdam, phone: +31 20 527 06 61, fax: +31 20 622 94 30, e-mail: [mare@siswo.uva.nl](mailto:mare@siswo.uva.nl), <http://www.siswo.uva.nl/mare>

#### Mapping the Landscape and Cultural Heritage in the Wadden Sea Region

17 - 19 September 2001, Bad Bederkesa, Germany, Conference & Workshops of the trilateral LANCEWAD project, co-financed by Interreg IIc (see page 29).

#### A Marine Science Odyssey into the 21st Century

17 - 23 September 2001, Menorca, Spain, 36th European Marine Biology Symposium. <http://www.ub.es/embs36/>  
EMBS 36 Organizing Secretariat, Agència de Projectes Institucionals, Universitat de Barcelona, Gran Via de les Corts Catalanes 585 Barcelona 08071 Spain, Tel.: +34 93 403 58 80, [embs36@pu.ges.ub.es](mailto:embs36@pu.ges.ub.es)

#### 1st International Congress of Seas and Oceans

18 - 22 September, 2001, Szczecin - Miedzyzdroje, Poland, Info: fax: +4891 489 40 03, e-mail: [icso@wsm.szczecin.pl](mailto:icso@wsm.szczecin.pl), [http://www.wsm.szczecin.pl/en/conferences/kongres/kongr\\_en.html](http://www.wsm.szczecin.pl/en/conferences/kongres/kongr_en.html)

#### Plankton Symposium

20 - 22 September 2001, Porto, Portugal, Info: IMAR- Institute of Marine Research, Department of Zoology, University of Coimbra, 3004-517 Coimbra, Prof. Ulisses Miranda, e-mail: [ulisses@univ-ab.pt](mailto:ulisses@univ-ab.pt)

#### Managing Coastal Change

25 September 2001, London, UK, European Workshop on issues arising from implementing the Habitats Directive on naturally changing coastlines, Info: <http://www.english-nature.org.uk/livingwiththesea/>

#### The Metapopulation Concept in Coastal Waters

26 - 30 September 2001, List/Sylt, Germany, Alfred Wegener Institute Foundation for Polar and Marine Research, Wadden Sea Station Sylt, 5992 List, Germany.

#### European Symposium on Knowledge and Information for the Coastal Zone

4 - 7 October 2001, Noordwijkerhout, The Netherlands, Info: Fax: +31 22 366 7050, [info@infocoast.org](mailto:info@infocoast.org), <http://www.infocoast.org>

#### An Estuarine Odyssey

4 - 8 November 2001, St. Pete Beach, Florida, USA, 16th Biennial Conference of the Estuarine Research Federation (ERF), Info: <http://www.erf.org>

#### WADSIS Workshop

12 November 2001, Ecomare, Texel (see page 31).

#### Food for Thought: Structuring Factors of Shallow Marine Coastal Communities

29 - 30 November, Texel, The Netherlands, Netherlands Institute for Sea Research (NIOZ). Contents: Competition for limiting resources in phytoplankton, pelagic-benthic coupling, self-structuring processes in benthic communities, predator-prey relationship. Info: <http://www.nioz.nl/jsr2001>

#### Oceans and Coasts at Rio+10

3 - 7 December, 2001, Paris, France, Assessing Progress, Addressing Continuing and New Challenges, Info: fax: +331-45-685810, [p.bernal@unesco.org](mailto:p.bernal@unesco.org)

### 2002

#### Acoustics in Fisheries and Aquatic Ecology

10 - 14 June 2002, Montpellier, France, ICES Symposium, Co-Conveners: Dr F. Gerlotto (France) and Dr J. Massé (France). Co-sponsors: Acoustical Society of America, UK Institute of Acoustics, Société française d'acoustique. Preliminary Announcement

#### Low-lying Coastal Areas. Hydrology and Integrated Coastal Zone Management

9 - 12 September 2002, Bremerhaven, Germany, Bundesanstalt für Gewässerkunde, IHP/OHP-Sekretariat, Postfach 200253, 56002 Koblenz, Info: <http://www.bafg.de/>, Fax 0261 1306 5422, [strigel@bafg.de](mailto:strigel@bafg.de)



Interreg IIC  
North Sea Programme

## LANCEWAD Project Conference & Workshops

17 – 19 September 2001

Museum Burg Bederkesa,  
Bad Bederkesa, Germany

After many years of trilateral cooperation in the Wadden Sea Region on environmental protection and nature conservation, cultural, historic and landscape values are now receiving attention as a third dimension in regional policies and landscape and management plans.

As a result, the LANCEWAD project was implemented about two years ago in order to map the landscape and cultural heritage in the Wadden Sea Region. The project has also been successful in making the local population and other stakeholders more aware of the landscape and cultural identity of their region. People's sense of identification with their region promotes their acceptance of sustainable management strategies. This in turn leads to better cooperation and the chance to find more productive solutions to conflicts based on measures and management plans for nature protection.

The cultural issue is an important theme and a useful tool for promoting integrated management and planning. In this project many bridges have been built between local authorities and governments, the planning sector and stakeholders in the agriculture and tourism sectors etc.. Furthermore, research institutes, museums and archaeologists, national park authorities and other organisations active in nature conservation have also been involved in the project. Further projects based on these newly established connections could be built up in the future. The results of LANCEWAD will be presented at the LANCEWAD Conference in Bad Bederkesa, Germany, in September 2001.

The conference will introduce the landscape and cultural values of the region on the basis of the LANCEWAD project results and will make links to more general themes by keynotes. The focus of the conference will be on planning and management issues regarding the landscape and cultural heritage of the Wadden Sea Region.

### Conference Program

#### Monday, 17 September 2001

- 12:00 Registration and lunch
- 13:00 Opening, welcome addresses: Ms Ulrike Wolff-Gebhardt, Regierungspräsidentin Lüneburg, Mr Johannes Höppner, Oberkreisdirektor Cuxhaven, Mr Guus Borger, University of Amsterdam, Conference chairman
- 13:15 Conference statement: Mr Ole Christiansen, Ministry of Nature, Forestry and Environment, Copenhagen
- 13:30 Keynote I, Perception of landscapes: Mr Ludwig Fischer, University of Hamburg
- 14:15 Introduction of the project: Mr Niels Hørluck Jessen, Chairman WADCULT
- 14:30 Cultural values of the Wadden Sea Region: Mr Otto Knottnerus, Historian
- 15:30 Keynote II, Management and planning of the cultural inventory: Mr Christopher Young, English Heritage
- 16:15 LANCEWAD project results: LANCEWAD project team
- 17:00 Plenary Discussion
- 17:30 End of session
- 19:30 Conference dinner, Burg Bederkesa

### Tuesday, 18 September 2001

- 09:00 Conservation and management: Mr Adriaan Haartsen, Expertise Center LNV, Wageningen
- 09:20 Lancewad recommendations and introduction to the workshops: Mr Jens Ene-mark, CWSS
- 09:40 **Workshops A:** Cultural environment and planning: Mr Frank Strolenberg (Project Bureau Belvedere) & Mr Dirk Meier (FTZ Büsum)  
**Workshop B:** Land use and water management: Mr John Frederiksen (IRWC) and Mr Allan Zinn (Sønderjyllands Amt)  
**Workshop C:** Town development and buildings: Mr Michael Müller and Mr Jan Joost Assendorp (Bezirksregierung Lüneburg)
- 13:00 Lunch
- 14:00 Plenary: Results of the workshops: Chairs and rapporteurs
- 14:30 Plenary discussion: Mr Guus Borger, Conference chairman
- 15:30 Coffee break
- 16:15 Recommendations and future plans: Mr Carsten Paludan-Müller, Head of Division of Cultural History, Copenhagen
- 16:45 Final thoughts: Mr Joachim Reichstein, Archäologisches Landesamt Schleswig-Holstein
- 17:00 End of session
- 19:30 Dinner

### Wednesday, 19 September, 2001

- 8:30 – 15:00 Excursion to the Land Wursten: The excursion will start and end in Bad Bederkesa, early enough to reach the trains from Bremerhaven to Bremen and from Cuxhaven to Hamburg.

### Language

The conference language is English.

### Conference details

There is a limited number of 80 participants. The full conference fee is DM 80,00 including tea/coffee, conference dinner on Monday and lunch on Monday and Tuesday.

On Wednesday, an optional excursion to view the historic landscape and cultural heritage of the region will take place. Fee DM 20,00.

Accommodation is available in hotels in Bad Bederkesa and Bremerhaven. A shuttle service from the hotel in Bremerhaven to the conference venue and back is organized.

The deadline for hotel booking through the organizers is 9 July 2001. Later bookings have to be made by the participants themselves.

For further information and organizational support, please contact:

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### LANCEWAD project partners

Common Wadden Sea Secretariat (Lead partner)

National Forest and Nature Agency, Denmark

University of Kiel, Germany

Bezirksregierung Lüneburg, Germany

Ministry of Agriculture, Nature Management and Fisheries,

Department North, The Netherlands

### Overall coordination:

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Latest Information on Internet:

<http://cwss.www.de/lancewad>

# Demonstrator for a Transnational Wadden Sea Information Service

## Workshop of the WADSIS Project within the framework of the EU DG13 INFO 2000 Programme

With the purpose of improving the accessibility of environmentally relevant information about the Wadden Sea, public and private organisations from The Netherlands, Germany and Denmark have, since the beginning of 2000, been cooperating in the EU supported WADSIS project.

The purpose was to initiate an operational and transnational infrastructure between public data source holders, in order to provide better overview and background information on professional GIS-datasets, maps, and data source holders in the countries around the Wadden Sea. Moreover, to interest and to make the general public (society) more aware of the Wadden Sea Environment, its nature and management framework, a popular scientific multi-media CD-ROM was developed.

The Wadsis project will be finished by the end of this year. The results of the project and the experiences gained in the cooperation of public and private organisations will be presented at a one-day workshop. During the discussions it will be assessed whether and how the concept can be applied to other European regions.

The workshop, which will be limited to 50 participants, will be held on Monday 12 November 2001, at ECOMARE, the Wadden and North Sea Centre, at the Dutch Wadden Sea Island Texel, Ryslaan 92, 1796 AZ De Koog, Texel.

### Provisional Program

#### Sunday 11 November 2001

Registration and excursion within ECOMARE Centre and Isle of Texel

- 14.00 Registration and visit to exhibitions if Eco-Mare
- 16.00 Excursion on the island
- 18.00 Reception by the municipality of Texel
- 19.30 Social event and dinner

#### Monday 12 November 2001

- 08.30 Registration and Coffee
- 09.30 Welcome by EU-representative and WADSIS Coordinator
- 10.00 Overview WADSIS Project, including two-tier approach of public Web Service in combination with a privately marketed multi media CD-ROM
- 10.45 Coffee
- 11.00 Results of the WADSIS Project, including demonstration of Web Service and multi media CD-ROM
- 12.00 Lunch
- 13.30 Discussion about application possibilities of the WADSIS two-tier approach for other environmental valuable and/or threatened regions within Europe, including presentations of examples for the
  - Gulf of Gdansk, Poland: Maciej Dembski, Maritime Institute Gdansk
  - Black Sea, Snesjana Moncheva, Project Coordinator of EU CESUM Project, Centre for Sustainable Development and Management of the Black Sea Region, Varna Bulgaria
- 15.00 Coffee/Tea
- 15.15 Discussions and Closure of the Workshop

Registration for the workshop can be done via the WADSIS website on [www.waddenseamaps.net](http://www.waddenseamaps.net). On this website, also background information about The WADSIS project, participating organisations and a web service for geographical Wadden Sea meta-data can be found.

## Notes for Contributors

### Contents

The Wadden Sea Newsletter is a trilateral periodical to inform scientific, nature management and policy-making institutions in Denmark, Germany and The Netherlands about research projects, their results, management measures and topical news in the Wadden Sea area.

### Length and Structure

"Main theme" articles should be about 3 printed pages (about 1500 words with one figure on each page), short contributions of about one page (about 500 word with one figure) and brief notes are also welcome.

The "main theme" articles should include an abstract of 4 - 7 lines in easy English. The body of the article should be organized in sections with headings.

Only a few (2 - 4) recent references should be added to the contributions.

Example: Becker, P.H., S. Thyen & K.R. Schneider, 1998. Monitoring Pollutants in Coastal Bird Eggs. Wadden Sea Ecosystem No. 8, Common Wadden Sea Secretariat, Wilhelmshaven, pp 59 - 101.

Reference in text: (Becker et al. 1998) or (Beukema & Vlas 1979).

Authors are advised to consult this issue of the Newsletter and follow the conventions for section headings, tables, captions, references, addresses, quotation marks and abbreviations. (see also: <http://cwss.www.de>)

### Language

The Wadden Sea Newsletter is published in English.

### Format

A hard copy of the text, tables and figures and an electronic copy of the manuscript in WORD or RTF format should be submitted, either as a file attached to an e-mail (preferred) or on a diskette.

With the exception of species names (*italics*) the text should not contain any further formats (e.g. bold, underlined, hyphenation, justified setting). Record numbers up to 9999 should be written without a space, for higher numbers, such as 10 000 leave a space at the thousand interval.

### Photos, Figures, Illustrations, Tables

Photos, figures and illustrations with useful captions and legends are welcome and should be included wherever possible.

Photos should be submitted as slide or photo print. Electronic versions of figures, illustrations and tables should be delivered in black and white and as separate files in the program they have been created with, e.g. Excel, Freehand, CorelDraw or as an Adobe Illustrator format (or another format which can be edited).

### Please, send your article to the

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Virchowstr. 1  
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