SCIENTIFIC AND TECHNICAL PAPERS

2002 - 2019

Hydrographic Institute of the Republic of Croatia

Content

Scientific and technical papers

2002

Joining of Croatia in the development of the European nautical tourism

Favro, Srećko

http://bib.irb.hr/prikazi-rad?&rad=353235

First European yacht tourism cogressRogoznica : Croatian Paneuropean Union SPLIT , 2002. 81-89 (ISBN: 953-6921-02-2). Rogoznica, Hrvatska, 16-18.05.2002

Croatia, like all other Mediterranean countries, is tourist-orientated. After the Patriotic War Croatia started renewing intensively its nautical capacities. The Croatian nautical capacities, as recorded on 31st December 2001, are numbering 66 marines with 14, 009 berths. There are 11, 003 boats using berths throughout the year, 91% of which on the sea, 9% ashore. 14, 0594 boats and yachts have been hosted and 68, 476 boats/days realized. This was achieved with 45% boats flying the Croatian flag and the rest from the European countries. The holders of navigation permit were mostly the Germans, the Italians and the Austrians, making 85% of all foreign navigation permits in the Adriatic Sea. These three groups of tourists take precedence in everything on the Croatian coast of the Adriatic Sea. By the type of boat, about 85% marine business have been done with sailing boats and 15% with motor-boats.

History of chart production and printing

Jeličić, Tonći

Book of proceedings / 6. znanstveno stručni simpozij hrvatskih grafičara, ed. I. Zjakic, Senj, 2002, technical paper

First charts, made by hand on parchment, were crumbling and very sensitive to moisture, and also involved a time-consuming production. A great turning point occurred in the beginning of the 16th century, with the development of new techniques as wood and copperplate engraving. Smaller press runs were printed, which were hand coloured in the cartographic workshops. However, paper was still inadequate to meet the application requirements of a nautical chart. Further development of the printing technology, parallel with other fields of science including the production of paper, ensured a continuous advancement in the production and quality of charts. Nowadays, the principal printing technique used in the cartographic reproduction is the modern offset with its technical possibilities. Charts are printed on the special cartographic paper, in five standardised colours: black, yellow (in some countries either grey or orange is used instead of yellow), blue, sepia and magenta. Future development of the chart production is related to the development of the technology of large format printers, especially as regards the printing paper and colours, taking account of the application requirements of a chart. When these conditions are met, the so-called "print on demand" will be probably introduced in the chart production, which will solve the problem of maintenance of charts in stock and their updating.

Adriatic sea level: scientific basis and managing the data

Vilibić, Ivica; **Srdelić, Mladen**; **Vidović, Bruna**; **Strinić, Goran**

http://bib.irb.hr/prikazi-rad?&rad=110607

Proceedings on GIS Odyssey 2002 / Kereković, Davorin (ur.). Zagreb : GIS Forum, 2002. 133-145 (predavanje, međunarodna recenzija, objavljeni rad, znanstveni)

This paper overviews basic findings about sea level variations, both on the global and on the local (Adriatic Sea) scales. The characteristics of tides, storm surges and seiches, and climatic sea level fluctuations are described in the text, as they act together and having impact on the coastal

infrastructure, especially in the North Adriatic. Therefore, various projects have been launched, both on local and regional (Mediterranean, Europe) scales, in order to better explore the factors influencing the sea level, as well as to make available the knowledge to the users and to the wider community. Moreover, data management is suggested herein, based both on web and GIS tools.

A study of seiches in the Split harbor (Adriatic Sea)

Vilibić, Ivica; **Mihanović, Hrvoje**

http://jadran.izor.hr/acta/hr/v43_2_5.htm

This paper examines the occurrence of seiches inside the Split harbor (Adriatic Sea). The measurements indicating the seiche periods were carried out with the pressure gauge placed near the harbor entrance. Spectral analysis of the data suggests a resonant behavior appearing in front of the harbor, that covers the periods between 7.7 and 28.5 min. The seiches were documented to occur at the periods of 6.5, 3.0, 1.6 and 1.15 min, and were verified by the barotropic 2D numerical model. In addition, two model runs were executed: the first one with the present topography and the second one with the nautical marina removed (built in 1972). The comparison should quantify the influence of the marina on the seiche characteristics. Namely, the leading seiche modes of 7.1-min and 5.0-min periods, calculated for the present topography, were probably joined in the 6.2-min mode before 1972. On the other hand, the numerical model showed that the 3.0-min seiche mode keeps its period, having the maximum amplitude at the north end of the harbor calculated for both runs. Finally, the seiches may endanger the navigation near the entrance and within the marina during the enhanced seiche episodes.

2003

Cartographic reproduction

Jeličić, Tonći

7. znanstveno stručni simpozij hrvatskih grafičara, ed. Z. Bolanca, 153-158, Senj, 2003., technical paper

In this paper the concept of cartographic reproduction and its historical development are explained. It examines traditional procedures of chart preparation and the process of making a cartographic representation. The paper describes the use of reproduction camera, copying procedures, striping preparation and the use of copying screens. Finally, a modern procedure of chart production is briefly described, providing an insight into the present situation and development prospects, and then final conclusions are given.

Accuracy of sea charts and navigational publications and the influence of printing

Jeličić, Tonći; Bićanić, Zlatimir; **Kasum, Josip**

Acta Graphica 15(2003)2, 73-82, Zagreb, 2003., research paper

The main printed products of hydrographic organizations are sea charts and navigational publications. The disproportion of their information content with the actual data is a direct consequence of processes applied in their production, updating and actual changes. The information content of sea charts and navigational publications contains inherent and influent deviations. The accuracy of sea charts and navigational publications changes and decreases in the course of time. It equals the maximum accuracy of applied technology, including the graphic technology during the process of production, i.e. printing. The accuracy is in the function of time and updating procedure. The role of printing in the process of production is to increase the accuracy of sea charts and navigational publications by applying appropriate technology, standardization and reducing the time of graphic preparations and printing.

A study of resonant oscillations in the Split harbour (Adriatic Sea)

Vilibić, Ivica; **Mihanović, Hrvoje**

http://linkinghub.elsevier.com/retrieve/pii/S0272771402003049

Estuarine, Coastal and Shelf Science. 56 (2003) , 3-4; 861-867

The study examines the occurrence of Proudman resonance in front of the Split harbour (Adriatic Sea). The dataset comprises air and sea pressure (sea level) data collected at the harbour entrance during August to October 2000. The interval was characterized by rather strong synoptic disturbances that took place over the harbour. The analyses encompass empirical tools, such as timeseries analysis, high- and band-pass filtering, spectral and wavelet analyses, while the theoretical approach includes the conceptual model of the resonance. Resonance appears in front of the harbour and then propagates inward, covering periods between 7.7 and 28.5 min as a result of complex atmospheric gravity wave structure. Gain between sea level and air pressure equals 0.05-0.40 dbar/hPa (5-40 cm/hPa).

2004

Charts and nautical publications

Jeličić, Tonći

Book of proceedings / 8th International conference on printing, design and graphic communications "Blaž Baromić", ed. Z. Bolanča, M. Mikota, 23-28, Lovran, 2004., technical paper

This paper endeavours to define the terms of marine chart and nautical publication. It explains the legal foundation for their publishing in accordance with international and national standards, international conventions, agreements and recommendations. The paper also explains the role of the International Maritime Organisation (IMO) and International Hydrographic Organisation (IHO) in the publishing process. Separate chapter deals with the role of the Hydrographic Institute of the Republic of Croatia (HHI), a public institution responsible for the hydrographic service in Croatia as laid down by the law on hydrographic activities. Organisational structure of the HHI is described, especially its Reproduction Department and publishing activities. Different types of charts are listed, publishing methods described, as well as procedures of correcting and updating. The ways of distribution/sales and copyright protection are also presented.

ESEAS-RI in Croatia: a step towards sea level service

Vilibić, Ivica; **Domijan, Nenad**; **Leder, Nenad**; **Strinić, Goran**; Orlić, Mirko; Pasarić, Miroslava

http://bib.irb.hr/prikazi-rad?&rad=173627

Systematic monitoring of sea-level fluctuations in Croatia started in 1950s, when three long-term stations (Rovinj, Split, Dubrovnik) were installed, joining the tide gauge at Bakar which was mounted already in 1929. All of these gauges have been operational till nowadays, having little or no gaps in the records, even during the war activities in the early 1990s. In addition, new stations at Sućuraj, Zadar and Ploče were installed in the last two decades, becoming members of the sea level monitoring network. However, the gauges had no digital recording till 2003, when all of Croatian tide gauges were upgraded through the ESEAS-RI and Jadran projects. All of these tide gauges are float type in stilling well, with weekly chart records, being digitized and archived as hourly values before 2003. Although the data quality is regularly checked, a number of possible systematic and random errors had been occasionally detected in the observing system, such as clock errors, charts shifts in time and height, digitisation errors, problems with ink diffusion and recording system, etc. These errors were eliminated when digital equipment was installed, consisting of A/D converters mounted on old devices, remote data acquisition system via GSM lines and operational software. Since June 2003 the sea-level data have been downloaded on daily basis, checked and stored as 1 min sea level values, enabling the analyses of high-frequency sea-level oscillations. The choice of 1 min sampling interval instead of a greater recording interval was fully justified soon, only two weeks after the upgrade. Namely, a travelling air-pressure disturbance struck the Middle Adriatic in the morning hours of 27 June 2003, and caused flooding in some areas and a severe damage of shell plants. It was shown by 2D numerical model that the disturbance excited high-frequency sea-level oscillations (0.01-0.1 min-1), with the respective sea-level and current amplitudes surpassing 1 m and 1 m/s in some areas. The disturbance was captured by MedGLOSS station having 2 min sampling interval of air-pressure, being a cosine-like wave with amplitude and period of about 3 hPa and 80 min, respectively. It moved towards ESE at a speed of 22 m/s and was resonantly coupled with the gravity wave in the sea 50 m deep. This mechanism is called Proudman or open-sea resonance and, since several bays in the area have funnel-shaped form and are opened to the west, the forced wave was further amplified due to the imposed topographic constraint. In addition, the forcing atmospheric wave and its counterpart in the sea encountered many bays and harbours while travelling over the Middle Adriatic. Having broadband spectral characteristics, they excited normal modes of the coastal

basins through the mechanism called harbour or coastal resonance. Harbour resonance was particularly pronounced in Stari Grad Bay, where the disturbance excited seiches in the harbour (6.1 min) and bay (10.6 min). The seiches flooded a great part of the city, with the maximum amplitude of 120 cm, being three times larger than tides in the area. All of these mechanisms have been reproduced by a 2D numerical model, however none of them could have been verified if the tide gauges had not been upgraded thanks to the ESEAS-RI and Jadran projects.

CGPS Station collocated at Split tide gauge (Croatia)

Mihanović, Hrvoje; **Leder, Nenad**; **Domijan, Nenad**; **Čupić, Srđan**; **Strinić, Goran**; **Vilibić, Ivica**; Halfdan-Pascal, Kierulf

http://bib.irb.hr/prikazi-rad?&rad=173645

Book of Abstracts of the Workshop on Observing and understanding sea level variations / Plag, Hans-Peter; Xiuhua Zhang (ur.). Malta : IOI - University of Malta, 2004. 25.

In this abstract we describe collocation of tide gauge with CGPS station in Split, Croatia. The work is carried out in the frame of Work package 2 (Absolute sea level variations) and Work package 4 (Improving the sea level observing system; Task 4.3 - Co-location of Tide Gauge Stations with GPS) within the ESEAS-RI project. Split tide gauge is located in the town's port, on a small peer near Harbour-Master building. The TGBM (PN-165) was installed on the Master's building, which had been erected on the bedrock near a city center. There is also an auxiliary benchmark (R-1) on the tide gauge edifice. Historical precise leveling that took place during last 50 years did not show any significant changes in height between Harbour-Master's TGBM and tide-gauge auxiliary benchmark. It is also important to emphasize that during CROREF96-CRODYN96 GPS campaign new benchmark was established on the concrete roof of the tide gauge, and precise leveling was done. This benchmark was used to determine the height of Antenna Reference Point (ARP) above the national datum. Ashtech Micro-Z CGRS receiver with Dorne-Margolin antenna was an optimal choice for our tide gauge, which is installed in the tide gauge building powered by batteries and equipped with GSM modem for communication with the instrument and downloading the data. CGPS station was installed on 5 May 2004, and daily files (station name SPLT) are available starting from 6 May 2004 (day 126). Batteries are being replaced on weekly basis, and RINEX files obtained from the instruments are compressed using Hatanaka compression software, version 2.4. Preliminary analysis of the data showed that: - the number of measurements and the number of outliers is normal, - the mean residual for the code measurements is very good, - the mean residual for the phase measurements is acceptable. Knowing that the local geodetic network is very stable over the last 50 years the site chosen for locating CGPS antenna is very good and the data obtained by the CGPS station we hope will be substantial for the long-term analysis of the vertical land movements in this region.

Large-amplitude internal Kelvin waves trapped off Split (Middle Adriatic Sea)

Vilibić, Ivica; Dadić, Vlado; **Mihanović, Hrvoje**

http://linkinghub.elsevier.com/retrieve/pii/S0272771404001714

The paper documents the occurrence of long-period internal Kelvin waves in Split Channel in spring 2002. The analyses were performed on thermohaline and current data measured at three moorings and one hydrographic section. The internal oscillation had a period of 5–6 days, being larger just after the generation which was probably excited by the alongshore Sirocco wind. The recorded current amplitude was up to 0.3 ms-1 in the surface layer, while the observed pycnocline displacement was 10–15 m. The oscillation was reproduced by one-dimensional two-layered model

of a channel, imposing nodal lines at its entrances. Cross-shore properties of the oscillation, such as observed offshore decrease in pycnocline amplitude, are explained by the dynamics of an internal Kelvin wave propagating along channel boundaries, because the internal Rossby radius is smaller than the width of the channel. Conclusively, the observed oscillation probably represents the fundamental mode of internal waves trapped in the channel complex off Split.

2005

Contemporary problems of nautical tourism development in Croatia

Favro, Srećko; Glamuzina, Nikola

http://bib.irb.hr/prikazi-rad?&rad=344360

PROMET TRAFFIC - TRAFFICO (0353-5320) br. 2/2005 (2005); 107-112

The paper deals with the problems that have rised due to the rapid development of nautical tourism on the Croatian coast. The fact is that Croatia, unlike other Mediterranean tourist countries still do not control nautical tourism development in sense of spatial planning and implementation of specific laws. There are other problems that are generated by the growing number of tourists in Croatian marinas and uneven geographic distribution of harbours.

Sea charts print on demand (POD)

Jeličić, Tonći

Book of proceedings / 9th International conference on printing, design and graphic communications "Blaž Baromić", ed. Z. Bolanča, M. Mikota, 227-230, Lovran, 2005., technical paper

This paper analyzes use of plotters in paper sea chart production. Information content of the traditionally offset printed sea charts in long print runs, which are stored in warehouses for a longer time (a few months or years) decrease in accuracy because of changes in actual state. The process of updating sea charts refers to regular receiving of Notices to mariners and correcting charts by hand according to those data, which are published daily, weekly or monthly. In order to increase accuracy of information content of sea charts, new printing technologies can be applied, too. That is provided by the use of plotters in production of paper sea charts. So, after the order was taken and all changes have been added, the chart is printed in ordered number of copies. In that way, a user has a chart which is up-to-date on the day of purchasing. POD charts must not be inferior in quality to traditional paper charts produced in offset on cartographic paper. That is the reason for examining their characteristics: durability, specific usage demands and different outer influences. The paper describes tests performed in hydrographic offices where paper sea charts have been in use for several years. Besides the characteristics of printed charts, what is also examined are graphic materials which are in use, technology of file management, transfer and printing that supports POD charts production, that is hardware and software demands. This paper gives advantages and disadvantages of POD charts compared to those produced in traditional presses. POD charts will not eliminate traditional charts, but they will be used alongside as additional product and definitely contribute to more quality offer. Probably POD charts will take chart production of short run editions and charts of areas which are subject to frequent changes. Further development of POD is expected as well as commercialisation of POD charts production, because of their main advantage which is speed of delivery of chart or information to end user.

A new approach to sea level observations in Croatia

Vilibić, Ivica; Orlić, Mirko; **Čupić, Srđan**; **Domijan, Nenad**; **Leder, Nenad**; **Mihanović, Hrvoje**; Pasarić, Miroslava; Pasarić, Zoran; **Srdelić, Mladen**; **Strinić, Goran**;

http://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=255&lang=hr

Geofizika (0352-3659) 22 (2005); 21-57

The paper comprises an overview of recent international and national efforts and activities directed towards the improvement of tide gauge network on the eastern coast of the Adriatic Sea. A brief

overview of the available measuring techniques is given first. Then the characteristics of Adriatic sea level are outlined, followed by a note on the history of sea level measurements and research in the Adriatic. The present sea level related activities are introduced by the institutional structure in Croatia, followed by a summary of recent projects and programmes (European Sea Level Service – Research Infrastructure (ESEAS-RI), Mediterranean Global Observing Sea Level System (MedGLOSS), Project Adriatic and Adriatic Tides and Sea Level On-line). Concrete activities on the upgrade of Croatian tide gauges, data acquisition and maintenance, and on-line data presentation are presented in detail. In addition, the initiation of measurements of vertical land movements is documented, as a Continuous GPS antenna and receiver (CGPS) has been installed in 2004 at the roof of the Split Harbour tide gauge. A lot of effort has been put into the rescue of historical sea level records, both by digitising and scanning of the charts, which will prevent data loss in case of their ruination or disappearance. Finally, the impact of the recent activities on the scientific exploration of high-frequency resonant coupling of air pressure disturbances with the eastern Adriatic waters is highlighted in the paper, as such research is not possible to carry out properly with the measuring systems based on the analog records

Recent sea level activities in Croatia

Vilibić, Ivica; Beg Paklar, Gordana; **Čupić, Srđan**; Dadić, Vlado; **Domijan, Nenad**; **Gržetić, Zvonko**; Ivanković, Damir; **Leder, Nenad**; **Mihanović, Hrvoje**; Orlić, Mirko; Pasarić, Miroslava; Pasarić, Zoran; **Srdelić, Mladen**; **Strinić, Goran**;

http://bib.irb.hr/prikazi-rad?&rad=210443

An overview of recent international and national efforts and activities directed towards the improvement of tide gauge network on the eastern coast of the Adriatic Sea is given in the paper. Present sea level related activities are introduced by the institutional structure in Croatia, followed by a summary of recent projects and programmes. A major technological step occurred in the sea level recording, acquisition and data storage through the upgrade of tide gauges with a/d converters and GSM communication package. Therefore, the availability of the data is shortened from a couple of months, which were needed to collect and digitise the charts, to a day, as the data is downloaded once a day. However, a number of technological problems have been recorded in the first year of operation (systematic drift at some stations, communication problems), although substantial improvements have been achieved through the upgrade of tide gauges (removal of clock errors, chart positioning and digitising errors, availability of high-frequency data, easier and cheaper maintenance). In addition, Bakar tide gauge is equipped by the KALESTO radar gauge, installed just a few hundred meters from the existing long-term station. The first year of the data has been preliminary analysed, revealing no existing problems in the radar system. The initiation of measurements of vertical land movements at the Split tide gauge has been recently achieved, as a Continuous GPS antenna and receiver (CGPS) has been installed in 2004 at the roof of the Split Harbour tide gauge. Preliminary analysis of the data, carried in the Norwegian Mapping Authority, showed that the number of measurements and the number of outliers is normal, the mean residual for the code measurements is very good and the mean residual for the phase measurements is acceptable. In addition, a lot of effort has been put into the rescue of historical sea level records, both by digitising and scanning of the charts, which will prevent data loss in case of their ruination or disappearance. Finally, a number of web pages have been created in the last few years, comprising near-real time sea level graphs as well as general information on the sea level monitoring and research in the Adriatic Sea.

Contribution to ESEAS-RI project 2002-2005 by Hydrographic Institute of the Republic of Croatia

Domijan, Nenad; **Leder, Nenad**; **Mihanović, Hrvoje**; **Čupić, Srđan**; **Srdelić, Mladen**; **Strinić, Goran**; **Gržetić, Zvonko**; **Vilibić, Ivica**;

http://bib.irb.hr/prikazi-rad?&rad=210461

A summary of efforts and activities undertaken by the Hydrographic Institute of the Republic of Croatia and directed towards the improvement of the sea-level observing system along the eastern coast of the Adriatic Sea is given in this paper. HHI owns and operates a network of four long-term tide gauge stations (Rovinj, Zadar, Split-harbour, Dubrovnik) working continuously from 1955 until present. Within the ESEAS-RI project, from 2002 to 2005, HHI contributed in WP1 - Quality control of the sea level observations, WP2 - Absolute sea level variations and in WP4 Improving the sea level observing system. The emphasis was placed on T1.4 - Data rescue (scanning old marigrams, development of digitalization package) as HHI had approximately 210 years of analogous marigrams which were not converted into digitalised format. Another important contribution was in the framework of T4.2 Upgrading tide gauge stations. In May 2004, CGPS collocation campaign had been organized at the Split-harbour tide gauge station (T4.3 - Co-location of tide gauge stations with GPS). Finally, a software package has been created for converting collected sea-level data into the ESEAS-RI format defined for ESEAS Tide Gauge Data web site. The problems which were encountered during different stages of HHI involvement in ESEAS-RI are also going to be stressed and presented. One of the most interesting and peculiar examples was the problem with the installation of satellite telephony antenna on the roof of Split tide gauge during International Boat Show in April 2005. Between 2 and 1 1 April CGPS data quality was very poor, since CGPS antenna was almost completely covered by satellite dish fixed on the roof without any notice or approval.

Resonance in Ploče Harbor (Adriatic Sea)

Vilibić, Ivica; **Mihanović, Hrvoje**;

http://jadran.izor.hr/acta/hr/v46_2_2.htm

In this paper, we extract and validate high-frequency oscillations in the port of Ploče, based on sea level data from one year (March 2002-March 2003) measured at a tide gauge in the harbor. Frequency was analyzed by applying stationary (spectral) and non-stationary (wavelet and filtering) analyses of the data to extract temporal characteristics of the fundamental seiches with a period of 30 min. Seiches are pertinent throughout the year, but their maximum amplitude doubles (up to 25 cm) during the summer. Modeling studies showed that seiches are primarily a result of incoming waves from the open sea, generated by resonant coupling with air pressure traveling waves. In contrast, direct wind forcing has a minor influence on seiche generation. Seiches endanger ferries and small moored boats as well as large cargo ships in harbors where strong currents (greater than 50 cm s-1) appear during extreme events.

2006

Competitiveness of Croatian Nautical Tourism

Horak, Siniša; Marušić, Zrinka; **Favro, Srećko**

http://bib.irb.hr/prikazi-rad?&rad=315454

Tourism in Marine Environments (1544-273X) 3 (2006), 2; 145-161

While nautical tourism is experiencing a strong demand in the Mediterranean, this growth presents a significant challenge to destination planners. The question of how well nautical tourism destinations are meeting increased demand, in terms of both capacity and quality, is of crucial importance for nautical tourism destinations and their competitiveness. While measuring destination competitiveness is a common practice worldwide, the competitiveness of nautical tourism has not received much research attention. The study reported here aims to fill gap by addressing not only the competitive position of countries in the Mediterranean, especially Croatia, but also by providing a valuable discussion on issues relating to measuring nautical tourism competitiveness. The study focused on nautical tourism supply, price competitiveness, and nautical tourists' perceptions of competitiveness. The results revealed that the natural resources and feeling of safety are strongest Croatian advantages, but this is undermined by the lower standards of infrastructure and services with accompanied lower value for money. While this, at the moment, does not appear to adversely affect demand for the Croatian nautical tourism, failure to address these issues would reduce competitiveness and threaten the long-term sustainability of nautical tourism.

Physical plans in Managing Sea and Coastal Area

Favro, Srećko; Kovačić, Mirjana

http://bib.irb.hr/prikazi-rad?&rad=356014

25th Ineternational conference on organizational science developmentPortorož : 25th Ineternational conference on organizational science development Portorož, Slovenia, 15-17.03.2006

This paper systematically and clearly indicates the negative effects in sea and coastal area and the need for systematic and multidisciplinary physical planing. The area in development plans has a double role, as an indispensable factor of socio-economic development and as the object of development processes. Development systems in the area develop and comply with each other. This indicates the fact that the area cannot be considered out of its development processes, as the development processes cannot be realised without the effects of the area. In order to archieve efficient managing of coastal and other area, it is necessary to plan the area and continuously monitor its exploitation. It is especially important for the sea and coastal areas which are great assets, and have to be protected and guarded by all means and measures. In spite of natural and historical conditions and resources, the Adriatic region is subject to harmful consequences of uncontrolled actions and other deviations in the development. This happens as a consequence of increased pressure to ecological systems, when the development of tourism, especially of nautical tourism, has to be planned systematically, so that man may preserve the quality of living, because otherwise, the development loses its meaning. Nautical tourism, with its specific activities and the need for the area, most often around the coastal line within the maritime domain, emphasises the problem of protection of the environment, which makes the physical planning one of the most

important issues. Therefore, physical plans have to be subordinated to the protection and promotion of the enviroment, which implies efficient, but sensible managing of the coastal area.

Structure in managing port authorities of the Republic of Croatia

Jugović, Alen; Kovačić, Mirjana; **Favro, Srećko**

http://bib.irb.hr/prikazi-rad?&rad=288798

Tourism, Regional Development and Education : use of tradition in tourism : proceedings Tabor : Jihočeska univerzita v Českych Budejovicich , 2006. 48-56. Tabor, Češka Republika, 15.09.2006.

The aim of this paper is to emphasise the importance and the significance of organisational structure in managing port authorities of the Republic of Croatia. The importance of the organisational structure is illustrated by the fact that it is the essential basis without which even the best effect in ali other managing areas will remain inefficient. In this paper the analysis of organisational structure of the Port Authority of Rijeka was performed, because it has been the first established port authority in the Republic of Croatia and serves as a model to other ports. The present organisational structure was investigated, which was then compared to the known scientific theories and theses. Besides the implemented organisational structures, the research also considers the models of organisational structures which have not been applied but may be implemented if necessary. Properly deftned organisational structure contributes to the realisation of the main objectives of the organisation: it satisfies the client (user) and consequently gains profit, a primary generator of growth and development ofthe organisation, i.e. the port authority.

Sustainable development of nautical tourism in Croatia

Favro, Srećko; Saganić, Iva;

http://bib.irb.hr/prikazi-rad?&rad=343859

New Perspectives and Values in World Tourism & Tourism Management in the Future / AKTAS, AHMET prof.dr (ur.). - Alanya TURKEY : Akdeniz University, Alnya Faculty of Business , 2006. 602-620 (ISBN: 975-7666-82-3) TURK - KAZAKH INTERNATIONAL TOURISM CONFERENCE 2006 Alanya, TURKEY, 20-26.11.2006

Having in mind Croatian littoral zone with its attractive coast and islands, it can be said that nautical tourism is absolutely authentic and distinctly recognizable Croatian "tourist product". Croatia has ideal conditions for nautical tourism development, and it has a great number of advantages such as good coastline indentedness, great number of well arranged and sheltered harbours, better geographical position in relation to countries that nautical tourists come from, preserved nature, and clean sea. However, nautical tourism still hasn't reached the level of quality proportional to the available resources. It is necessary to perceive realistic needs and spatial possibilities for the development of nautical reception capacities when choosing particular locations where ports of nautical tourism will be built. During further development of the capacities for the nautical tourism, spatial and environmental goals that should ensure high-quality regional planning and sustainable development of nautical tourism without endangering basic values of the natural resource will be put in the first place. By emphasizing special importance of the environment preservation, long term use of the Croatia's most valuable natural potential – Croatian Adriatic – will be guaranteed.

Evaluating the significance of nautical tourism for tourism and economy

Bošković, Desimir; **Favro, Srećko**; Kovačić, Mirjana;

http://bib.irb.hr/prikazi-rad?&rad=262484

CHANGE MANAGEMENT / Vukovič, Goran (ur.). - Kranj, Slovenija : Universa V Mariboru, Fakulteta za organizacijske vede Kran , 2006. 957-967. 25. International Conference Organizational Sciences „ ; CHANGE MANAGEMENT“ ; Portorož, Slovenija, 15-17.03.2006

In this paper the authors present clearly and concisely the significanice of nautical tourism for economy and tourism. Its role in the economy is definited and the need to apply systematic approach in evaluating in evaluating its effects is emphasised. Nautical tourism is one of the most propulsive kinds of tourism, which has the characteristic of recreation. It is a new socio-economic phenomenon in our society and its future is yet to come. With its multiple effects id contributes to diverse and opulent aspect of living, urbanization and development of the space, and also has a number of other effects which are directly or indirectly related to the integral tourist humanisation of the space. Exceptional economic effects and high profitability of nautical tourism and numerous multiplicative effects best illustrate and increasing interest fot this maritime activity. Increased interest in investments into nautical tourism and port construction arise from its high profitability rate which in the result of positive effects of numerous functions which are repeatedly generated in this business activity. It is exactly in nautical tourism that many business activities are interntwinwd and create a high nautical and tourist consumption per a boater and a vessel, on average two times higher than the consumption of the standard tourists. The author emphasise the importance of continuous research and systematic approach to evaluation of the effects of nautical tourism in this development.

Optimisation of the use of printing systems of hydrographic organisations

Jeličić, Tonći; **Kasum, Josip**;

Book of proceedings / 10th International conference on printing, design and graphic communications "Blaž Baromić", ed. Z. Bolanc, M. Mikota, 163-168, Senj - Novi Vinodolski, Croatia, 2006., technical paper

Sea charts and navigational publications are produced and updated in compliance with international and national standards, which are partially included in international conventions, agreements and recommendations, and national regulations. In general, the International Hydrographic Organization (IHO) recommend that the data contained in sea charts and navigational publications published by various hydrographic organisations have to be accurate and reliable. The purpose of this paper is to define the concept of printing systems of hydrographic organisations, that is, the system of preparation and printing of sea charts and navigational publications. The problem of their accuracy in printing technology, and the solution to it may be found through optimisation of the system. Optimisation refers to maximising or minimising a given function subject to various limitations, or, the procedure of finding the most convenient solution which best satisfies the determined requirements. Optimisation of the use of printing systems of hydrographic organisations is designed to determine the most convenient method of printing procedures, at given costs and available technology. A combined approach is proposed for the development of optimisation of the use of printing systems. It is assumed to use mathematical modelling and to develop the necessary management algorithms. It is also assumed that for a particular sea chart it is possible to determine

the optimal printing technology designed to maximum accuracy and consequently, to an increased safety of navigation.

CGPS Stattion collocated at Split tide gauge

Mihanović, Hrvoje; **Domijan, Nenad**; **Leder, Nenad**; **Čupić, Srđan**; **Strinić, Goran**; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=285052

GIS Applications and Development / Kereković, Davorin (ur.). Zagreb : Hrvatski Informatički Zbor-GIS Forum, 2006. 55-61

Split tide gauge is located in the town' s port, on a small peer near Harbour-Master' s building. The tide gauge benchmark PN-165 (TGBM) was installed on the Master' s building, which had been erected on the bedrock near a city center. There is an auxiliary benchmark (R-1) on the tide gauge edifice. Historical precise levelling that took place during last 50 years did not show any significant changes in height between Harbour-Master' s TGBM and tide-gauge auxiliary benchmark. The benchmark established on the concrete roof of the tide gauge during CROREF96-CRODYN96 GPS campaign was used to determine the height of Antenna Reference Point (ARP) above the national datum. An optimal choice for Split CGPS station was Ashtech Micro-Z CGRS receiver with Dorne-Margolin antenna. The station is powered by external power supply and equipped with GSM modem for communication with the instrument and downloading the data. CGPS station was installed on 4 May 2004 and daily files (station name SPLT) are available starting from 5 May 2004. RINEX files obtained from the instruments are compressed using Hatanaka compression software, version 2.4 and uploaded to the ESEAS-RI Data Server (European Sea Level Service). Preliminary analysis of the data showed that the observing site was well selected, and that the measurements will enable long-term analysis of the vertical land movements in this region. The problems which were encountered during different stages CGPS collocation are also going to be stressed and presented.

Diurnal internal tides detected in the Adriatic

Mihanović, Hrvoje; Orlić, Mirko; Pasarić, Zoran;

http://www.ann-geophys.net/24/2773/2006/angeo-24-2773-2006.html

Strong diurnal oscillations, documented by temperature data that were collected along a submarine cliff on the Lastovo Island (southern Adriatic), are studied and compared with sea level and wind measurements at Dubrovnik and Komiža (island of Vis). Three thermistors were deployed at the depths of 15, 22 and 36m between March 2001 and March 2002. Pronounced diurnal temperature oscillations were detected at 15 and 22m during the stratified season. The correlation between the sea surface and thermocline displacements was highest in June 2001, when diurnal wind changes were not significant, while diurnal sea level oscillations achieved annual maxima. Thermocline oscillations were in phase with sea level changes. The range of diurnal sea surface variability was close to 19 cm, while the range of corresponding thermocline variability was about 5.4 m. The findings summarize the outcome of the first dedicated study of internal tides in the Adriatic.

Wintertime buoyancy forcing, changing seawater properties, and two different circulation systems produced in the Adriatic

Orlić, Mirko; Dadić, Vlado; Grbec, Branka; **Leder, Nenad**; Marki, Antun; Matić, Frano; **Mihanović, Hrvoje**; Beg Paklar, Gordana; Pasarić, Miroslava; Pasarić, Zoran; **Vilibić, Ivica**;

http://www.agu.org/pubs/crossref/2006/2005JC003271.shtml

Measurements performed in winter 2002/2003 and spring 2003 off the east Adriatic coast showed that the East Adriatic Current (EAC) peaked in January/February (as expected from previous findings) and again in May (not expected). The first maximum corresponded with the considerable cross-shore variability of seawater properties, the colder, fresher water prevailing close to the coast, the warmer, saltier water dominating the open sea. The second maximum coincided with the massive intrusion of warm, saline water from the south Adriatic. Meteorological and hydrologic forcing was anomalous over the measurement interval: during winter 2002/2003 the cooling and river outflows were strong, during spring 2003 the pronounced warming coincided with exceptional dryness. In order to interpret the two EAC maxima a simple numerical model reproducing response of the Adriatic-Mediterranean system to the wintertime forcing was developed. It was found that the first maximum could be related to the coastal freshwater input and offshore evaporation in the Adriatic area, and that the second maximum was probably due to the wintertime surface cooling of the Adriatic while warmer conditions prevailed above the Mediterranean. The resulting horizontal density gradients supported two different circulation systems, one within the Adriatic, the other between the Adriatic and east Mediterranean, and they differed not only in spatial but also in temporal scales, therefore supporting the occurrence of two distinctive EAC maxima.

Five decades of continuos tide gauge measurements at Split – Harbour (1956 – 2006)

Čupić, Srđan; **Domijan, Nenad**; **Mihanović, Hrvoje**; **Leder, Nenad**; **Strinić, Goran**; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=285058

In May 1929 tide-gauge station in Split was founded by the Hydrographic Office of the Kingdom of Yugoslavia and operated continuously up to beginning of the Second World War in 1941. During the war the collected data were lost, but the mean values calculated for the period 1930-1938 were rescued. The Split-harbour tide-gauge was renewed in 1946 with installed portable gauge A.Ott-X. However, continuous time series of measurement commenced in 1956 when analog gauge A. Ott-Kempten with 1:5 ratio was fitted in the small house in front of the harbour office. In 2002 tide gauge was appended to European Sea Level Service project (ESEAS-RI) and equipped with Thalimedes A/D converter during 2003, in order to enable a near-real time data transfer at web page of the Hydrographic Institute of the Republic of Croatia (www.hhi.hr). In May 2004 the tide gauge was collocated with CGPS (Continuous Global Positioning System) and appended to European Vertical Reference System project (EVRS).

In this paper we emphasize importance of continuous long year's operation of the Split-harbour tide gauge. It is significant for the safety of navigation in the Split – harbour for hydrographic and geodetic surveys in the wider Split islands archipelago and for international data exchange (climate changes processes). Furthermore, the extreme sea levels measured at the tide gauge are beneficial for the coastal work in the whole region.

2007

Contribution to the development of general model of management and strategic decision-making in nautical tourism ports

Kasum, Josip; **Gržetić, Zvonko**; Marušić, Eli;

http://bib.irb.hr/prikazi-rad?&rad=316652

Promet - Traffic & Transportation. 19 (2007) ; 295-299

It is assumed that in strategic decision-making in managing nautical tourism ports (NTP) various decisions are made on the basis of descriptions, calculations, statistic, economic and other indicators, and also of inadequate number of precise indicators (Branch, A. E., 1998). Therefore, strategic decision-making is slightly uncertain , which, it is assumed, may be modified. This article explores the new measuring elements. They are developed on the sample of 47 NTPs in the archipelagic sea of the Republic of Croatia. It is assumed that by applying the new measuring elements it will consequently result in lowering the unreliability of strategic managing, which will eventually increase the profit of NTP.

Multiscale ENC Data Management on an Archipelagic Sea Area - Example of the East Adriatic Coast

Duplančić Leder, Tea; **Leder, Nenad**; Lapaine, Miljenko;

http://journals.cambridge.org/action/displayFulltext?type=1&fid=997068&jid=NAV&volumeId=60&issueId=02&aid=997060

Journal of Navigation. 60 (2007) , 2; 315-326

This paper briefly outlines ENCs as a digital nautical chart, produced by National Hydrographic Office (HO)according International Hydrographic Organization (IHO) specifications S-57 Edition 3.1. Production of ENCs is based on the theory of multiscale data management (usage bands). Multiple representations of ENC data is controlled by SCAMIN attributes. A solution to the problem of multiscale data management as a part of ENC data production for archipelagic sea areas, using the East Adriatic Coast as an example was presented. This solution is based on a long-standing experience in the production of paper charts and recently ENC production for eastern coast of the Adriatic Sea, which is supposed to be the second largest archipelagic area in the Mediterranean. Finally, a new usage band scale range, compilation scale for all navigational purposes and method of using SCAMIN attributes for archipelagic seas were proposed.

Distribution of maritime safety information - radio notices in the period 2001. - 2005.

Kasum, Josip; **Vladislavić, Kristina**; **Ivančić, Paško**;

14th TIEMS Annual Conference 2007 Book of Proceedings page:296. - 307.

The full implementation of GMDSS requires also a detailed understanding of the concept of maritime safety information. The concept of national coordinator for maritime safety information has also been described, including the analysis of these. The analysis comprised the original data relating to the distribution of radio notices in Croatia in the period 2001 – 2005, referring in particular to: COASTAL/NAVAREA, COASTAL/NAVTEX and LOCAL. This paper also indicates the crucial importance of high level of reliability of maritime safety information in automated technical/technological processes and of acquiring satisfactory equipment of the services which

participate in the distribution of maritime safety information. The analysed issues indicate the need to conduct further scientific research.

Swot study of the nautical tourism develompment in Croatia

Kovačić, Mirjana; Kesić, Blanka; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=355823

26th International Conference on Organizational Science Development CREATIVE ORGANIZATIONUniversity of Maribor - Faculty of organizational sciences , 2007. 875-883 (ISBN: 961-232-185-X). Portorož, Slovenia, 28 - 30.03.2007

This paper gives clear and systematic review of the SWOT study results for the nautical tourism development in Croatia. Also, basic characteristics of developmental trends of nautical tourism in the Mediterranean are defined, as well as expected demand. The authors are doing research of the quality of stay in the ports of nautical tourism, and possibilities of the development of nautical tourism in accordance with spatial and environmental specific qualities and with the respect for laws of nature. This ensures undamaged visual identity of the coastline, and provides to the boater stay in the authentic area with all the possibilities that it can provide. Acknowledging the fact that the statistical coverage and monitoring of the nautical tourism in Croatia is incomplete, and that its effects on the environment and its economical effects can merely be estimated, the authors have participated in the Research of the nautical tourism development in Croatia. The research was conducted in counties (Croatian spatial units) during 2005 to serve the needs of making Study of the nautical tourism development in Croatia whose holder was Hydrographic Institute of the Republic of Croatia in Split. Results obtained in the research were analyzed and SWOT matrix was made as the basis for making strategic decisions for its long-term sustainable development. In doing so, SWAT matrix enables defining of the basic guidelines for the nautical tourism development in Croatia.

Importance of the safety of navigation and safety protection to nautical tourism

Zec, Damir; Kovačić, Mirjana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=346015

The International Emergency Management Society, 14th Annual Conference Proceedings The International Emergency Management Society, 14th Annual Conference Split, 12-15.10.2007.

Marketing plan for the development of Nautical Port System on the Croatian Islands

Favro, Srećko; Kovačić, Mirjana; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=354885

II Biennial International Congress (1451-5113) 9-10, Year 4. (2007); 775-783

The paper gives clear and easy to consult definitinos of marketing activities in wider terms, or promotional activities in narrower terms, which are essential to the accomplishment of marketing plan for the development of tourist ports on the Croatian islands. In that process in terms of protection of the ecosystem, the sea and marine enviroment, the construction of tourist ports should observe established requirement and measures for the protection of the sea and coastal

area. New tourist ports should be built on locations which have proved to be the best solutions in terms of prodetermined criteria. The authors anlysse the main elements implying the accomplishment of marketing plan for the development of nautical port system on the Adriatic islands. They define the conception, creative solutions, feasibility programmes, and implementation, according to the defined target groups. Special consideration is given to overall activities based on the promotional mix or a blend of advertising, PR activities and events. Target groups are identified for ther diversification and specific approach and accomplishment schedule is defined. Author's systematic approach is defining the marketing plan and implementation of the marketing mix provides for the fulfilment of targeted communication and market goals.

Influence of printing systems of hydrographic organizations on time of production and use of sea charts and navigational publications

Jeličić, Tonći; **Kasum, Josip**;

Book of proceedings / 11th International conference on printing, design and graphic communications "Blaž Baromić", ed. Z. Bolanča, 63-67, Zadar, Croatia, 2007., original scientific paper

The time elapsed from data collecting and cartographic processing to the chart reproduction is the time covering the chart production. The sea chart should be most accurate at the time of printing and publication. As the time of production is shorter, the chart information outline is more precise in comparison with real state. The time after the sea chart issuing, its distribution and use, in other words the lifetime of printed chart is significantly different from other graphic products lifetime. The basic difference refers to the fact that sea charts need to be updated, as to make them compatible to the real state in nature. The role of printing systems in the process from producing to publishing, as well as the use of sea charts is to influence on reduction of time needed and consequently on increase of sea chart and navigational publication accuracy. This is achieved applying relevant technology, standardizing and reducing time of graphic preparatory procedures (prepress), printing and updating.

A reappraisal of the extreme sea levels along the Croatian Adriatic coast

Domijan, Nenad; **Čupić, Srđan**; **Mihanović, Hrvoje**; **Leder, Nenad**; **Strinić, Goran**; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=298335

CIESM-38e Congres, Commission Internationale Pour l, Exploration Scientifique de la Mer Mediterranee / Briand Frederic (ur.). - Monaco

Sea-level time series from 1955 to 2004 relevant to the northern (Rovinj), middle (Split-harbour) and southern (Dubrovnik) part of Croatian Adriatic coast have been analysed to make estimates of return sea levels for 100-years return period. This was done by fitting observed annual sea level maxima and minima to an assumed parametric "Generalised Extreme Value" (GEV) distribution function which has three parameters. A little discrepancy in the predicted return sea levels estimates for 100-years return period exists in comparison with previous studies, due to different methodologies used in the analysis and diverse length of time series data.

New approach in sea level measurements - Example of Split harbour tide gauge station

Čupić, Srđan; **Domijan, Nenad**; **Mihanović, Hrvoje**; **Leder, Nenad**; **Strinić, Goran**; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=298330

HRVATSKE VODE I EUROPSKA UNIJA - IZAZOVI I MOGUĆNOSTI / Dragutin Gereš (ur.). - Zagreb : Sveučilišna tiskara -Zagreb , 2007. 99-106 (ISBN: 978-953-96455-9-3)

Sea level has been continuously measured for many years using analogue instruments at tide gauge stations on the East Adriatic coast. In order to determine extreme sea levels related to the tidal force, atmospheric influence (air pressure and wind) and resonant oscillations in coastal areas, it was necessary to modernise tide gauge network. In this way tide gauge data became available in real time. Main objective was to calculate characteristic of sea level changes on the Adriatic coast and to predict extreme flooding events. Data collected from the tide gauge network on the East Adriatic coast are available on web pages of the Hydrographic Institute of the Republic of Croatia. This enables all potential users to have reliable sea level measurements and predicted data. In 2003, Split – harbour tide gauge station was equipped with Thalimedes A/D converter, setup to record sea level with a resolution of one minute. In May 2004 the tide gauge was collocated with Continuous Global Positioning System (CGPS), necessary to determine vertical land movements. Tide gauge was appended to the European Sea Level Service – Research Infrastructure project (ESEAS – RI) which allows scientific analyses of global sea level rise and development of coupled atmosphere – sea models necessary to predict sudden flooding of coastal areas on the East Adriatic coast.

2008

Phytoplankton abundance and pigment biomarkers in the oligotrophic, eastern Adriatic estuary

Viličić, Damir; Terzić, Senka; Ahel, Marijan; Burić, Zrinka; Jasprica, Nenad; Carić, Marina; Caput Mihalić, Katarina; **Olujić, Goran**;

http://bib.irb.hr/datoteka/323939.Vilicic_et_al._2008_EMAS.pdf

Environmental Monitoring and Assessment (0167-6369) 142 (2008), 2; 199-218

Phytoplankton distribution and environmental characteristics were determined in a shallow, highly stratified and oligotrophic estuary (Zrmanja, eastern Adriatic). Samples were collected in two contrasting seasons ; winter (February 2000), when river discharge was high, and in summer (July 2003), a period of drought. Phytoplankton distribution was closely related to salinity gradients, nutrient levels, and water residence time. Microscopic analysis revealed that phytoplankton was composed mainly of marine diatoms, dinoflagellates, cryptophytes, green flagellates, and coccolithophorids. The dominant biomarker pigments were fucoxanthin, alloxanthin and 19-hexanoyloxyfucoxanthin, while lower, but indicative contributions of peridinin and chlorophyll b were also noted. Maximum abundance and biomass were found in the middle estuary in winter and in the upper estuary in summer. The estuary is mostly P-limited. Development of chain-forming marine diatoms was evident in winter. Due to the reduced nutrient input in summer, the biomass accumulated in the upper estuary (1000 ng chlorophyll a/L) was composed mostly of nanoplanktonic unicellular diatoms, nanoplanktonic marine dinoflagellates, cryptophytes, and chlorophytes. The concentrations of about 200 ng/L hex-fuco, suggested that the contribution of prymnesiophytes to total biomass was comparable to that of diatoms and dinoflagellates. In the middle estuary and coastal sea, PO4 and TIN were 3.5 times lower, resulting in a 5– fold decrease in biomass (< 100 ng chlorophyll a/L). The oligotrophic Zrmanja and other karstic rivers discharging in the eastern Adriatic Sea, provide insufficient source of nutrients and low productivity of the eastern Adriatic Sea.

Spatial and Environmental Characteristics of Croatian Adriatic Archipelago as an Important

Favro, Srećko; Saganić, Iva; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=358477

International Conference on Studying, Modeling and Sense Making of Planet Earth Mytilene, Lesvos, Grčka, 01-06.06.2008

This paper analyses spatial and environmental characteristics of Croatian Adriatic from the aspect of nautical tourism development. Sea and coastal area are the most important natural and geographical elements for nautical tourism development. However, together with natural basis, attractiveness of Croatian coast for nautical tourism is also in its historical, cultural, social, economic, and trendy characteristics that rank this maritime zone among the most attractive nautical destinations, together with the Carribean and Greek archipelago. This paper analyses natural basis for nautical tourism development, such as geomorphologic forms, hydrographic elements, that is physical, thermal, and chemical quality of water, and climatic characteristics (air temperature, precipitation, winds, sunny and cloudy days, air humidity). Abundance of relief forms, bays and islands is one of attractive elements for nautical and tourist navigation and stay. Indentedness and natural attractiveness of the coast enable cruising and provide good natural shelters. Boater that sails in the Croatian local waters can enjoy views of the coast that indicate longtime coexistence and

harmony between man and nature. Development of nautical tourism in accordance with spatial and environmental characteristics and with respect for natural laws enables nondisrupted visual identity of the coastal area and ensures to boaters the stay in authentic area with all the possibilities that it offers. Analysis of the characteristics important for nautical tourism development will deal with the most attractive locations on the Croatian Adriatic, and it will recommend and suggest further development of all the elements of nautical tourism together with its complementary activities – nautical economy.

The importance and role of crisis management in crisis situations

Kovačić, Mirjana; **Gržetić, Zvonko**; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=355835

27th international conference on organizational science development Universitiy of Maribor - Faculty of organizational sciences , 2008. (ISBN: 978-961-232-212-0).

In this paper, the authors clearly and systematically present the nature and the process of strategic management. Its importance is identified and the necessary expertise of managers at various managing levels is indicated. Problems of modern society and crisis situations (conditions) put emphasis on specific knowledge and information efficiency. The significance of making plans and decisions in various situations is particularly required in specific conditions and unstable environment when prompt actions are required. The role of management in such circumstances is decisive and dominating. The management is the beginning and the ending of responsibility, success and failure. The author defines the kinds of plans, and particularly analyses the situational plan for prompt performance. The importance of decision-making based on ethical consideration and social responsibility is emphasised. Particular accent is placed on the importance of evaluation of the results and strategic control of the process of strategic management aimed at developing the system and minimising the risk in acting and resolving crisis situations and conditions.

Traditional agriculture as impectus for tourism development in Dalmatia

Favro, Srećko; Saganić, Iva;

http://bib.irb.hr/prikazi-rad?&rad=372389

INTERNATIONAL TOURISM CONFERENCE 2008: Cultural and Event Tourism: Issues & Debates Alanya, Turkey, 05-09 November 2008.

Croatian coast has traditionally been oriented towards agriculture as the most important activity for existence of its inhabitants. That also refers to Dalmatia. Because of geographic position of Croatian coast, its relief and climatic characteristics, some agricultural branches developed that have up to this day remained important for people's lives and for identification of Dalmatia. They are olive growing, grape growing, sheep breeding, pig breeding, and fruit growing. Olive growing has been traditional activity in this area since ancient times. Thanks to specific soil, climatic conditions and traditional way of processing, autochthonous sorts of wine grape give their maximum in these endemic geographical conditions. Some parts of Dalmatia have long tradition of sheep and pig breeding. Specific relief, climatic and soil conditions are ideal for growing marasca cherry used to prepare various drinks. All of this should be used to create brand of Dalmatia as an ecologically preserved area with unique geographic conditions that have created predispositions for growing

field crops of exceptional quality by using traditional autochthonous ecological procedures. That can attract tourists who can see traditional way of life in this area, and also feel it.

Vision and mission of nautical tourism of the Republic of Croatia

Favro, Srećko; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=355976

Conference Proceedings of the 17th Annual CHME Research Conference Glasgow SCOTLAND, UK, 14-16.2008

The authors analyse natural conditions as the resource basis, present development and planned activities for the development of nautical tourism in the Republic of Croatia. Owing to special and exceptional natural and artificial attractions of the coast and islands, nautical tourism is unquestionably authentic and specially recognised Croatian " tourist product" . The results of the different researches articulated the main objectives of the future development of nautical tourism at the principles of sustainable development. By defining the vision and the mission of nautical tourism, guidelines will be determined for the sustainable development of nautical tourism and complementary activities – nautical economy in the following 15 years. The conclusions of the Study of development of nautical tourism were the basis for scientific analysis of this issue presented in the doctoral thesis of the author Srecko Favro, entitled " Spatial features of the Croatian Adriatic as a comparative advantage for the development of nautical tourism" .

Nautical tourism development in Croatia - ecological threat

Favro, Srećko; **Gržetić, Zvonko**; Saganić, Iva;

http://bib.irb.hr/prikazi-rad?&rad=372393

GOSPODARKA REGIONALNA I TURYSTYKA IV MIEDZYNARODOWA KONFERENCJA NAUKOWA Kielce ISSN: 1733-4314

Croatian littoral area is distinguished by unique attraction of its coast and islands, making a geographic basis for the development of nautical tourism as an authentic and recognizable Croatian „ tourist product" . What is more, it may well be said that precisely nautical tourism is the original and most distinctive trademark of Croatian tourism, especially of its most important and most valuable part – the sea and adjacent unique natural coastal and insular areas. In spite of the present achievements in the development of nautical tourism, it has not yet achieved, in many parts and as a whole, the quality level to accord with the available spatial basis. Further undefined and unorganized development may become a serious threat to the long-term preservation of quality and attraction, and to the complete desired spatial-geographic and economic evaluation. Besides evident economic and social profits that were made in the development of nautical tourism in the past period, and all its consequences, such development has also been the cause of certain disadvantages. The survey of potential negative influences of marinas on the marine environment, and on its living world, imposes the obligation to harmonize the development of nautical tourism in Croatia with other priorities, following the principles of sustainable development. By applying sustainable development model in the strategic planning for the development of nautical tourism and complementary activities, Croatian most valuable natural potential can be used over the long term to improve economic-and-social image of the Croatian nautical area (seaboard and islands).

Nautical tourism – advantages and effects of development

Favro, Srećko; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=372391

SUSTAINABLE TOURISM III / F.D. Pineda / C.A.Brebbia (ur.). - Southampton, Boston : WIT Press, Southampton , 2008. 35-44 (ISBN: 978-1-84564-124-5).

In the last thirty years, when a more significant development of nautical tourism in Croatia started, nautical tourism has proved to be one of the most propulsive and stable forms of tourism. Using its comparative advantages, nautical tourism attracts most demanding clients and initiates a number of accompanying business activities and foreign investments. Positive effects of nautical tourism are evident at all levels, from national to local, but also at the level of business activities. Besides a series of indisputable and clear economic and social benefits realised during the development of nautical tourism and its effects, such a development led to a number of disadvantages. Possible negative effects of marinas to the marine environment and its living world necessitate harmonisation of the development of nautical tourism with other priorities, all based on the principles of sustainable development. One of the significant priorities of Croatia is environment protection. When compared to other categories of dispersed sources of pollution/contamination from urban settlements and agriculture, marinas and nautical tourism cannot be characterised as significant sources of dispersed pollution. However, marinas and nautical tourism may lead to a decrease of the seawater quality from the local aspect and of a negative influence to biological communities of marine organisms and ecosystems. Strict observance of the principles of sustainable development through implementation of the current regulations and laws related to environment protection may ensure that marinas be a guarantor of preservation of natural values of the water area.

Ecological Evaluations of Cres - Lošinj Archipelago for the Purpose of Tourism

Saganić, Iva; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=419257

TURIZAM - INTERNATIONAL SCIENTIFIC JOURNAL (1450-6661) 12, 2008 (2008); 36-45

The topic of this paper is ecological evaluation of the Cres archipelago and the way it could be used for tourism purposes. Rapid growth of population and increasing human economic activity influence the quality of the environment. That is why the concept of sustainable development has been made, as well as new kind of tourism - eco - tourism or sustainable tourism. Today there is a small number of regions with preserved nature. The Cres- Lošinj archipelago is one of them. There is a large number of preserved plant and animal species on the archipelago, as well as some rural areas with preserved local architecture. With the development of eco-tourism, this archipelago would get the image of the area with preserved and authentic natural and cultural surroundings and healthy living environment.

Nautical tourism the basis of the systematic development

Favro, Srećko; Kovačić, Mirjana; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=372456

POMORSTVO Journal of Maritime Studies (1332-0718) vol.22 (2008), Br./No.1; 31-51

This paper deals with the study of nautical tourism, stressing the importance of efficient management of nautical tourism as a system. Nautical tourism is a complex system requiring the use of all patterns and regularities of the general system theory and principles for the management of integrated complex systems. The study aims to identify essential elements and characteristics of the nautical tourism in Croatia. Croatia has very favourable natural conditions for the development of nautical tourism, such as a long coastline, a great number of islands, islets and bays suitable for leisure mariners, as well as favourable climatic and hydrographic conditions. Besides basic natural spatial conditions and development potentials of nautical tourism, special importance is also given to the development of complementary activities. The authors examine the possibilities for the development of such activities, defining the concept of nautical economy as a basic guideline for the future development of nautical tourism in Croatia. Special emphasis is given to the development of complementary activities on islands, and parallels are drawn between the achievements in nautical economy of Croatia and nautical economy worldwide.

Proposal of model of applying optimal procedure of reproduction of sea charts and navigational publications

Jeličić, Tonći; **Gržetić, Zvonko**; **Kasum, Josip**;

Zbornik radova 12. savjetovanja tiskarstva, dizajna i grafičkih komunikacija "Blaž Baromić", ed. Z. Bolanča, 63-67, Split, 2008., technical paper

Printing systems of hydrographic organisations are systems of preparation/prepress and reproduction of sea charts and navigational publications. Different procedures (conventional and digital) indicate the necessity to optimise reproduction procedure (Jeličić T., Kasum, J., 2006). Conventional printing system refers to conventional cartographic processing of the original and copying procedures for producing the reproduction original as the base for offset press. Digital printing systems use computer technology in car-tographic and graphic prepress. Instead of conventional, in modern procedure reproduction originals are obtain-ed by the use of computer to... technology (film, plate...). Another possibility of digital system is reproduction of sea charts by ink jet printing (print on demand - POD). The subject of this paper is the possibility of use of various reproduction technologies and the possibility of selecting the most effective, i.e. optimal technology. The authors propose the model of applying the optimal repro-duction of sea charts and navigational publications.

Hrvatske službene elektroničke navigacijske karte (ENC) dostupne krajnjim korisnicima

Čala, Mendi; **Bročić, Pejo**; **Bradarić, Željko**; **Gržetić, Zvonko**;

Hydrographic Institute of the Republic of Croatia (HHI) has released, according to plan, a basic package of 107 official electronic navigational charts (ENCs). The package includes 80 ENC cells for all the six usage bands, according to the criteria of the International Hydrographic Organization (IHO). In this way, the central Adriatic international maritime route is covered by one overview chart cell (ENC). Approach routes are covered by four general chart cells (ENC). A total of 24 cells of coastal and approach charts (ENC) cover approach interinsular routes to ports. The areas of six ports open to traffic, of international economic interest to the Republic of Croatia, as well as many smaller ports are covered by harbour and berthing charts, a total of 51 ENC cells. ENCs are provided to their end users through official ENC distribution centres – Norwegian Primar, British IC-ENC, and the world-renowned C-MAP by Jeppesen. Accomplishing this plan, Croatia has met the requirements resulting from the latest regulations under which ENC display systems (ECDIS) and ENCs have become the

mandatory navigational equipment for very fast ships since 1 July 2008. The entire process including production, control, validation, and distribution, which is highly demanding in technological, organizational and financial terms, was carried out at the HHI, with the assistance of the Norwegian Hydrographic Service and the staff of the Primar distribution centre. The HHI have acquired new technology, and trained its staff, which guarantees success in future challenges regarding ENCs, as they are likely to become mandatory for other categories of SOLAS ships as well.

Continuous updating of navigational charts by means of automated chart correction on plotter

Bročić, Pejo; **Gržetić, Zvonko**;

Hydrographic Institute of the Republic of Croatia (HHI) produces and maintains official navigational charts. The charts are printed in the HHI printing office, each containing the printing date, i.e. the date to which the chart is correct (updated). Within the area of its responsibility the HHI has published about 100 different official charts which are continually updated. After printing, the charts are deposited in the HHI chart store. From the store they are supplied to authorised sales agents on order. As a result of such production process, some charts may be no less than several years old, containing many corrections published in subsequent Notices to Mariners (OZP). Sales agents have contractual obligations to update charts to the latest OZP before supplying them to their end users. Until recently corrections were made manually, rendering the updated chart unattractive. So far the HHI managed to update some charts in stock using offset printing to add all subsequently published corrections in magenta. However, due to a large amount of work, this technique could be used just for some most critical charts. In recent years, the HHI has been searching for the best method of keeping every chart up to date before supplying it to sales agents or users (some kind of automated correction). In other words, it was necessary to build a database of all corrections for each chart using adequate software, to find a plotter, and train the staff for that job. Corrections are made on HP Designjet Z2100 Photo plotter, which makes it possible to position a chart each time in the same place according to alignment marks on the plotter. The plotted corrections in magenta are stable in daylight, and water-repellent, meeting all the requirements regarding readability of cartographic representation, thus satisfying all the conditions of chart usability.By means of this technique, a significant breakthrough has been achieved in the quality and appearance, as well as in the reliability of the HHI official navigational charts for their end users.

Numerical Modelling of the Destructive Meteotsunami of 15.7.2006 on the Coast of the Balearic Islands

Vilibić, Ivica; Monserrat, Sebastia; Rabinovich, Alexander; **Mihanović, Hrvoje**;

http://www.springerlink.com/content/r0823243960x8454/?p=21de14a7f46d4446ac24de65c1a2de02&pi=9

A destructive tsunami-like event (locally known as “rissaga” waves) occurring on 15 June, 2006 in Ciutadella Harbour (Menorca, Balearic Islands) is reproduced by a numerical model forced by a travelling atmospheric disturbance. The disturbance is reconstructed from microbarograph measurements, being the only available instrumental data at the time of the event. The model is verified based on two weaker 1997 events, which were recorded by a number of bottom pressure recorders operating at that time on the Menorca shelf, in Ciutadella Inlet and adjacent Platja Gran Inlet. Both 1997 events are numerically simulated and good agreement is achieved with

observations in time, frequency (including eigenfrequencies of the affected inlets) and wave heights. Subsequently the same model is applied to simulate the 2006 event. The vigorous currents with speeds up to 400 cm/s are found to occur specifically at those areas of the harbour where the most severe damage and sinking of boats had been reported. Maximum simulated sea-level heights of 2.5 m were about one half of those reported by eyewitnesses. This difference is apparently caused by quality and spatial resolution of bathymetry data. However, in general, the model is capable of reproducing the event fairly well and can probably be used for future assessment and mitigation activities on the coasts of the Balearic Islands.

Summer breakout of trapped bottom dense water from the northern Adriatic

Vilibić, Ivica; Beg Paklar, Gordana; Žagar, Nedjeljka; **Mihanović, Hrvoje**; Supić, Nastjenjka; Žagar, Mark; **Domijan, Nenad**; Pasarić, Miroslava;

http://www.agu.org/pubs/crossref/2008/2007JC004535.shtml

Journal of Geophysical Research - Oceans. 113 (2008) , C11; S1102-1-S1102-19

The paper deals with an intriguing dense-water breakout episode in mid-August 2004 which has been observed in the bottom layers of the oil rig located in the middle of the northern Adriatic. Various data (temperature series and vertical T-S profiles, currents, meteorological measurements, and satellite images) have been analyzed in order to understand conditions which preceded, were active, and followed the breakout episode. A stationary bottom pool of dense water, generated during the previous winter, has been suspected to be a source of the dense water observed during the breakout, with a permanent position established by a stationary northern Adriatic cyclonic-anticyclonic gyre system. The breakout lasted for 3 days, advecting the bottom waters more than 2°C colder than residing waters at the oil rig site. The main result of modeling experiments concerns the generative force for the observed breakout which was found to be a mesoscale storm that occurred over the open north Adriatic on 8 August 2004. The storm has been reproduced by the Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS®) atmospheric model which was then used to force the Princeton Ocean Model (POM) at the surface. Results of simulations reveal the capability of the storm to break the thermohaline fronts through the wind-induced baroclinic transport and downwelling at the exposed shorelines. This is the first study in the Adriatic which evaluates the impact of mesoscale summer storm to the sea, driving bottom layer circulation through the convergence/divergence dynamics in addition to the direct impact on the sea surface through the wind stress forcing.

2009

ENC - Central Theme of the Conference XVI Hydrographic Commission Mediterranean and Black Sea

Gržetić, Zvonko; **Bradarić, Željko**;

http://bib.irb.hr/prikazi-rad?&rad=470253

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 19 (2009)

The International Hydrographic Organization realizes most of its five basic working programs through the work of regional hydrographic commissions. Croatia as full member of the Commission for the Mediterranean and Black Sea (MBSHC) regularly participates in the work of the Commission in the interval between two conferences, as well as during the conference of the Commission that is held every two years in one of the member states. Last XVI MBSHC Conference was held in Odessa, Ukraine, from 22 to 25 September 2009, with the participation of representatives of the Hydrographic Institute of Croatia. Electronic navigational charts were the central topic of the Conference. This paper presents extracts from the discussion, the most important decisions and recommendations that should be implemented in the period until the next conference. It also presents activities of the Croatian delegation at the meeting of the Commission.

Traffic on the inland waterways of the Republic of Croatia

Ivančić, Paško; **Vladislavić, Kristina**;

Međunarodna konferencija o pomorskoj znanosti,IMSC 2009, zbornik sažetaka STR .43.

One of the earliest modes of the transport of goods is the river waterway transport. This kind of transport of goods becomes more and more attractive. Networks of European inland waterways connect ever bigger European countries. The integration of Croatian inland waterways into a network of European inland waterways is not sufficiently developed. This paper deals with capacities of the Drava, the Danube and the Sava as the mainstay of inland navigation, with the development of a network of these rivers, and its integration into European corridors, as well as with the safety of navigation and the protection of environment. Safety of navigation at European waterway network level acquires a new dimension through the implementation of River Information Services (RIS), especially through the Vessel Tracking & Tracing System (VTS). In the river traffic, Croatia gives high priority to the development of river information services.

Socio-cultural effects and consequences of construction of nautical tourism ports– Case study - CROATIA

Favro, Srećko; Kovačić, Mirjana; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=490972

IV Biennial International Congress „Hotel Plan 2009“. Hospitality and Touriam – Holistic Approach,Beograd IV Biennial International Congress „Hotel Plan 2009“. Hospitality and Touriam – Holistic

This paper gives systematic and laid out review of all economic effects of nautical tourism, with special emphasis on the effects of the improvement of socio-cultural living conditions of local inhabitants on the coast and islands. This is particularly important segment of the sustainable development of nautical tourism, and that is creating the economic and social necessary conditions

for the life of local inhabitants employed in service industry in nautical tourism. The development of nautical tourism can also be seen as the process of social change not only of living conditions in nautical destinations, but also as stimulating process that can affect the change of social and economic structure of activities on the coast and islands. The effects of nautical tourism on particular complementary economic activities that together form nautical economy are especially important. When we are talking about the effects of nautical tourism on tourism in the whole, this implies all those activities or economic areas and their parts that are directly or indirectly connected with tourism. Authors analyze negative effects of nautical tourism, and give suggestions how they can be prevented or reduced. In that process harmonious relation toward environment is emphasized in a way that will maintain and improve service quality in order to satisfy yachtsmen's needs together with preservation of the value of the coast. Such relation of ports of nautical tourism and yachtsmen toward environment is a contribution to socio-economic prosperity of nautical destination and region where the activity takes place.

Sar system in Croatia - yachtsmen's feedback research

Kovačić, Mirjana; **Favro, Srećko**; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=437977

SAR SYSTEM IN CROATIA - YACHTSMEN'S FEEDBACK RESEARCH TIEMS 16 th ANNUAL CONFERENCE,ISTANBUL, TURSKA, 9-11.06.2009

The paper analyzes the results of research that was conducted in 2006 for the purpose of Study of the nautical development in Croatia. The aim of the research was to bring nautical services and nautical destination, including SAR (Search and Rescue services) to a higher level based on yachtsmen's views and suggestons. The emphasis was on the Croatian part of the Adriatic. Survey was intentionally conducted during the winter period when yachtsmen from the vacation. Topical, questions were about specific problems and services in nautical tourism, where yachtsmen could give relevant guidelines with their answers and suggestions. Due to incrased demands for overall safety and efficient control and data analysis in nautical tourism, it is very important to establish computer intergration of the system. Thus established computer connection will ensure quick and efficient decision making in order to solve crisis situations and regular system operation. Authors point out at a few ways that can be done amd suggest establishing responsible subject, not only an administrative level, but also on practical level. Authors put special emphasis on the role and importance of constant communication of ports of nautical tourism with nautical market and individual nautical destination, and on communication inside the parts of the system. Establishing good communication with yachtsmen and between parts of the system stimulates competitivness, safety, improvement of services' quality, and overall yachtsmen's satisfaction.

Review of researches on nautical tourism and nautical ports

Favro, Srećko; Kovačić, Mirjana; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=419267

CHME 18 th ANNUAL RESEARCH CONFERENCEBrighton : University of Brighton, School of Service Management, 2009.

This paper gives review of past researches of nautical tourism and ports for mariners and their yachts in Croatia. Authors point at role and importance of nautical tourism in economic growth of Croatia. The paper emphasizes systematc approach in the research of nautical tourism, and compares it with researches in the rest of the world. Because of the specific location where activities in nautical tourism are performed and that is maritime property, more recent researches, especially planning of new locations, include scientists from fields of law, maritime affairs, technology, economy, and other fields. Nautical tourism attracts more and more attention in thewhole world, as well as in Croatia, because of its importance in the economy and total tourist income, and especially because of development of new capacities for its realization on unused coastal areas. Ports of nautical tourism become specific places for realization of this selective form of tourism. In countries that have long tradition of nautical tourism there are integral programmes and systematic monitoring of the development through controlled development and management of ports of nautical tourism taking into consideration principles of sustainable development. In some countries there are also specialized research institutes o departments that moniter the phenomenon of nautical tourism and economy of nautical ports, and there are also specialized journals from that area published. Authors emphasize great contribution of Croatian and foreign authors tounderstanding of problems with situation of ports of nautical tourism, economic, effects of nautical tourism and possibilities for development taking into consideration environment and principles of sustainable development.

Significance and role of interantional standards in development of nautical tourism

Favro, Srećko; Kovačić, Mirjana; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=424113

PROMET- TRAFFIC& TRANSPORTATION, Scientific Journal on Traffic and Transportation Research (0353-5320) vol.21 (2009); 167-174

In this paper it is studied the trends of increasing demand in nautical tourism. The increasing demand is followed by a significant increase of threats to the environment, but also to boaters and their vessels participating in nautical activities. The authors emphasise the obligation to observe safety requirements through defined and controlled procedures in marinas and at sea and implementation of international standards during the stages of organisation of nautical economy, i.e. nautical tourism with complementary activities. In paper is given an explicate the implementation of international standards for selecting locations for marinas, construction and equipment of marinas and vessels, training of boaters – skippers, business operations of subjects and objects of nautical tourism and promotion of their services. Special attention is given to safety standards and procedures during extraordinary situations at sea and in the ports. It is expected that each vessel will have a GPS (Global positioning system) device and a box similar to a black box in aeroplanes which could be used for reconstructing accidents. Radar systems, AIS system (Automatic Identification System) and systems of alarm will minimise the time for interventions. The intervention procedures at sea are currently being determined aimed at minimising the time, but improvements are sill needed. Special attention is also given to activities related to resolving crisis, analysis of existing and potential causes and to defining preventive actions.

Controlled and Managed Adventure - Croatian Approach to the Development of Nautical Tourism in Croatia

Favro, Srećko; Saganić, Iva; **Gržetić, Zvonko**;

http://bib.irb.hr/prikazi-rad?&rad=466920

Turizam : znanstveno-stručni časopis (1450-6661) 13 (2010); 69-74

Ecological preservation of intact nature, of mystical and genuine Mediterranean cultural environment is the most crucial requirement for the development of nautics, but also for upgrading present capacities and complementary activities in the Adriatic. At the same time, preservation of natural beauties, intact bays, but also development of sufficient amenities in marinas for overnight stay, sevices and entertainment, requires such development strategy that will balance and show consideration for all these aspects. That could be called a "discretely controlled and managed adventure" that will always have the price it has deserved. One has to bear in mind, though, that boaters primarily come in order to be at sea, that a marina is a necessary element of navigation, and thet boaters want to spend the major part of their time abroad, in the sphere of "adventure". The leading part in implementing this decision lies with government bodies that have to be able to adapt the boaters? desire for high services to local specific aspects.Nautics has to be administred, but administrative and expert entities have not proved to be the best solution. It may be assumed that the development one of the institutions into a body permanently responsible for monitornig, analyses and expert proposals could be a solutions that would find place in the current vacant space between performers (mostly private companies) and administration (few and inadequately qualified). Also, strict standards have to be determined and controlling system established, so that attractiveness is kept, while sustainable and controlled development of the littoral and islands is enabled.

Proposal for advacement of the distribution model for official charts and navigational publications, and other editions of hydrographic organisations

Jeličić, Tonći; **Gržetić, Zvonko**; **Kasum, Josip**;

Book of proceedings / 13th International conference on printing, design and graphic communications "Blaž Baromić", Senj, Croatia, 2009

Basic paper editions of hydrographic organisations are official charts and navigational publications. Their specific quality as compared to other printed products is that they need to be regularly maintained. Maintenance is necessary in order to ensure that charts and navigational publications, after being printed, are fully representative of what is seen in reality. Hydro-graphic organisations are responsible for editing and publishing the update information. It is the responsibility of hydrographic organisations to maintain charts and publications after print or press, while they are in stock, and after that the maintenance process becomes the responsibility of distribution agents, and later of users. Such procedure requires an organised network of authorised distribution agents, permanent education and availability of relevant information to users. Within their publishing and printing activities, hydrographic organisations also produce other paper editions which are not subject to maintenance. They are available not only through authorised distribution agents, but also from bookshops, shops in ports and nautical centers, etc. Such editions include charts and publications which are not intended for navigation, scientific and technical publications, textbooks, conference proceedings, leisure nautical books, and other editions dealing with the activities of hydrographic organisations. This paper deals with the publishing and printing activities of

hydrographic organisations, describing maintenance procedures and the distribution model for official editions. In addition, it proposes an improved distribution model for all editions in terms of their classification and purpose.

Multiplication of the Official Sea Navigation Charts Edited by the Hydrographic Institute of the Republic of Croatia Considering Modern Techniques

Solarić, Radovan; **Bročić, Pejo**; **Gržetić, Zvonko**;

It is typical for the sea navigation charts to be completely up-to –date. Due to possible permanent sea surface changes, it is necessary to come up with a technology of the permanent updating. Such updating is to be solved with published changes and updates in the Notice to Mariners (OZP). The sea navigation charts are up-to-date immediately upon publishing, but in a due time, changes and updates are necessary. Based on the Notice to Mariners, charts are updated before possible use by the final user. This kind of the sea navigational charts updating is usual, conditioned by technology of multiplication (offset print). Up to now, such updating were performed by manual changes laying on each chart. A modern new technology application by machine inputs (plotter) created a possibility to input changes and updates on each printed chart. In addition to that, it is possible to distribute such updated sea navigation charts by new multiplication technology i. e. plotting on demand (POD). Plotting on demand means production of the charts using computer in a vector format, as well as permanent maintaining organization in updating shape of the vector charts format, in order to acquire a possibility to multiplicate them in any time and quantity for the user.

West Adriatic coastal water excursions into the East Adriatic

Vilibić, Ivica; W. Book, Jeffrey; Beg Paklar, Gordana; Orlić, Mirko; Dadić, Vlado; Tudor, Martina; J. Martin, Paul; Pasarić, Miroslava; Grbec, Branka; Matić, Frano; **Mihanović, Hrvoje**; Morović, Mira;

http://linkinghub.elsevier.com/retrieve/pii/S0924796309001456

Journal of Marine Systems. 78 (2009) , S1; S132-S156

A pool of less saline surface waters was observed in late June 2006 at the northern edge of the South Adriatic Pit (SAP). Three possible sources were considered: (1) Albanian rivers, (2) local Croatian rivers, or (3) relatively fresh West Adriatic Current(WAC) waters. Available CTD and ADCP data, together with satellite images indicate that WAC waters are the most likely source. This requires an excursion of WAC water across the width of the Adriatic and is especially surprising as low winds and stable atmospheric conditions prevailed in mid/late June. However, quite strong NNW winds occurred during the first 12 days of June, with peak winds close to the western shore. These winds were the result of the translation of the Azorean high to the British Isles, producing strong pressure gradients over the Adriatic. The winds enhanced the WAC during early June 2006, preconditioning a cross-basin eddy circulation that appeared during the wind relaxation and calm conditions. As the unusually calm conditions persisted for more than two weeks, the WAC eddies and filaments grew freely and had enough time to reach middle east Adriatic waters. Navy Coastal Ocean Model (NCOM) simulations, using high-resolution Adriatic bathymetry and realistic atmospheric forcing show that such excursions are plausible and can occur when eddies and instabilities push WAC waters across the hyperbolic flow point separating the WAC and Eastern Adriatic Currents near the Palagruža Sill. During the latter half of June 2006, NCOM simulations show that the hyperbolic point was particularly well formed as an anticyclonic WAC, a cyclonic SAP rim flow, an anticyclonic cell

southeast of Lastovo Island, and a cyclonic cell over the centre of the Palagruža Sill all bordered on each other. A simplified channel model suggests that the presence of the escarpment is a critical factor for producing cross-basin exchange of the coastal current following the relaxation of strong winds with a cyclonic wind-stress curl. However, the introduction of the Gargano Peninsula in the simulations was critical to the production of mesoscale eddies in the exchange flow, and such eddies qualitatively agree with the convoluted structures observed in satellite images.

Diurnal thermocline oscillations driven by tidal flow around an island in the Middle Adriatic

Mihanović, Hrvoje; Orlić, Mirko; Pasarić, Zoran;

http://linkinghub.elsevier.com/retrieve/pii/S0924796309001468

Oceanographic data collected between February and September 2006 have been examined in order to detect and interpret different physical processes in the Adriatic shelf break area. One of the main objectives was to gain more information on internal tides. The work comprised thermistor measurements carried out at the islands of Biševo, Sušac and Lastovo at 10 equidistant depths, between 4 and 40 m, on submarine cliffs opened to the southeast. Significant diurnal temperature oscillations were detected at Lastovo. The strongest variations were driven by the sea/land breezes (middle of July 2006). However, during several episodes between June and August 2006 diurnal wind forcing was not significant, whereas barotropic currents at an ADCP station close to Lastovo, as well as sea levels at Split and Dubrovnik, contained a pronounced diurnal signal. The wind and tidal influences on the temperature variability were separated by applying a multiple cross-wavelet spectral analysis with the hourly pseudo wind stress and sea level (or barotropic current) data treated as the inputs and the isotherm heights at Lastovo considered as the output. The analysis confirmed that significant correlation between tides and thermocline oscillations existed at the end of June, at the end of July and in August 2006. Diurnal internal tidal observations were consistent with simple theoretical nearresonant interaction of tidal flow with the island of Lastovo under stratified conditions, resulting in the generation of baroclinic island-trapped waves. This study revealed that even in a shallow area of high bathymetric complexity subjected to micro-tides, large amplitude internal waves at diurnal tidal frequency could be generated.

2010

Official Electronic Navigational Charts for Maritime Administration Available through the Web

Bradarić, Željko;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 21 (2010)

The official electronic navigational chart (ENC) shall become a mandatory navigational tool for SOLAS vessels as from 1 July 2012. Special device, designed according to the performance standard of the International Maritime Organization (IMO), is used for the display and use of ENCs on board, uniquely named Electronic Chart Display and Information System (ECDIS). Applying the standard for the display of cartographic content on the web (Web Mapping Specification), a variety of potential users onshore are provided access to the official ENC on their PC. This paper presents the use of ENC through the web according to the results of the Norwegian PRIMAR project, in which the Croatian Hydrographic Institute participated. It also presents the use of WMS for ENC in the Croatian maritime services.

A Serious Case of Mismatch between ECDIS and ENC

Bradarić, Željko; **Čala, Mendi**;

http://bib.irb.hr/prikazi-rad?&rad=470254

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 20 (2010)

Inconsistency between the performance standards for ECDIS and the information contained in the electronic navigational charts (ENC) was discovered almost quite accidentally. In case that, during the preparation of ENC, a depth value in isolated shoals, less than the depth of the surrounding area, had not been encoded as Obstruction or with Additional Depth Contour, it was not displayed on the screen in "standard" and "basic" mode of ECDIS. Having identified this safety-significant inconsistency, the IHO ordered all ENC-producing member states to urgently check their ENCs, and in the detected cases to apply encoding of shallows to ensure their appearance on the screen in all modes of ECDIS. Meanwhile, users were informed about the problem through navigation warnings. Croatia, i.e. its Hydrographic Institute took the necessary action according to the instructions by the parent organization and solved this safety issue within just a few days. This paper describes why the problem arose and how it was resolved.

Fortnightly oscillations observed in the Adriatic Sea

Vilibić, Ivica; Šepić, Jadranka; Dadić, Vlado; **Mihanović, Hrvoje**;

http://springerlink.com/content/r4328r63772841n1/fulltext.pdf

Ocean dynamics. 60 (2010) ; 57-63 (članak, znanstveni)

This paper documents the occurrence of strong fortnightly oscillations in the Adriatic Sea frequently observed in the current measurements. For that purpose, we analyzed half-decadal sea level series and long-term currents collected within different parts and layers of the Adriatic Sea. Harmonic analysis and band-pass filter with cutoff periods at 10 and 20 days have been applied to the series. The sea level Mf tide is found to be the only significant tidal constituent over periods between the diurnal and semi-annual ones, having no significant phase variations in the Adriatic Sea. Moreover, the currents on periods between 10 and 20 days could only partially be explained by atmospheric

forcing. The fact that they are in-phase with the Mf tide gives a hint on a possible mechanism responsible for the generation of these oscillations. Additionally, these currents are usually strongly amplified during a weakly stratified season, indicating a baroclinic mechanism responsible for the multiplication of the fortnightly currents.

Proposing a model for determining the print run of official charts

Jeličić, Tonći; **Kasum, Josip**; **Vladislavić, Kristina**;

Book of Abstracts / 14th International Conference on Printing, Design and Graphic Communications "Blaž Baromić", Senj, 37, 2010

After publishing, official nautical charts require permanent maintenance so as to be fully representative of what is seen in reality, and completely reliable in navigation. Maintenance refers to the time while a chart is in stock with the publisher, the period of distribution, and the period of use. This paper investigates the influence of print run on the maintenance of charts in stock. This paper aims at proposing a model for determining the print run of a particular chart. The objective of this research is to reduce the volume of the maintenance in stock, as it is a demanding task involving a large number of different editions. The data used in this respect include hypothetical annual print run data in the 10-year period. Another required parameter is the number of corrections for each chart. Recommended print run can be calculated by correlating the number of corrections to the chart print run data.

Use of HP Latex technology in official nautical charts production

Jeličić, Tonći; **Kasum, Josip**; Zjakic, Igor;

Book of Abstracts / 14th International Conference on Printing, Design and Graphic Communications "Blaž Baromić", Senj, 19, 2010

Official nautical charts have to be produced so as to be a reliable navigational tool, and the basic requirement is their accuracy. In order to increase the accuracy level of a nautical chart, instead of offset press, new printing technologies - ink-jet systems may be implemented. They allow for a Print On Demand or POD procedure. Charts produced in POD procedure should not be of inferior quality in comparison to a conventional nautical chart printed on cartographic paper in offset technique. It is therefore necessary to study their properties of exploitation. Studies presented in this paper relate to simple practical tests: water test, coffee test, dunk test and external influences test. In this paper the authors used samples of nautical charts produced in Latex ink-jet technology, based on aqueous-dispersed polymer technology with pigmented water-based inks.

Usability of nautical charts after mechanical effects on the printing surface

Jeličić, Tonći; Zjakic, Igor; **Kasum, Josip**;

MATRIB 2010., Abstracts book, International conference on materials, tribology, recycling, page 31 (professional paper, international review)

Technological development of digital press sets new qualitative standards to conform with users' requirements. The use of new technologies, besides its advantages, may result in undesirable developments which, if late discovered, might cause various problems and consequences. Official

nautical chart must be produced so as to provide a reliable aid to navigation, and therefore accuracy is considered to be its basic requirement. The use of digital press in the production of nautical charts has many advantages as compared to the conventional offset press, but it can have consequences which may even endanger human life at sea. This implies colour rubbing from the print, and consequently the loss of maritime safety information, which may endanger the safety of navigation. This paper deals with the results of investigation into tribological characteristics of the surface of paper used for nautical charts. Investigation is conducted under conditions of the contact with colours used in conventional and digital press techniques for the production of nautical charts. A comparison between their usable values is also presented.

Maritime accidents and activities of international community

Kasum, Josip; **Ivančić, Paško**; Stanivuk, Tatjana;

GIS Odyssey 2010 Proceedings: Space, Heritage & Future / Davorin Kerekovic (ur.). Zagreb : HIZ GIS Forum, Croatia, UNIVERSITY of SILESIA, Poland, 2010. 63-68

The aim of the research presented in this paper is to study the causes and consequences of maritime accidents. The concept of maritime accident will be explained, as well as factors affecting their occurrence in their cause-effect relation. Amendments in international regulations will be presented, and their expected influence to the increase of navigational safety and decrease of the number of accidents.

Croatian Adriatic – Natural Resources as the fundation for tourism based economic development

Favro, Srećko; **Gržetić, Zvonko**; Božić Fredotović, Katja;

http://bib.irb.hr/prikazi-rad?&rad=493329

Croatian Adriatic – Natural Resources as the fundation for tourism based economic development GOSPODARKA REGIONALNA I TURYSTYKA IV MIEDZYNARODOWA KONFERENCJA NAUKOW Kielce, Poland, 2010

A wide variety of relief features, bays, islands, and islets is an attractive element of leisure navigation. Indented coastline provides opportunity for an interesting cruising, providing safe natural shelters. Adriatic Sea is a deeply indented gulf of the Mediterranean Sea extending in NW-SE direction. Eastern coast of the Adriatic Sea is among the most attractive and best indented coasts in the Mediterranean. According to the UN Convention on the Law of the Sea, such type of coastline belongs to the so-called archipelagic waters. In the internal waters and the territorial sea of the Republic of Croatia, there are 1,246 islands, islets, and rocks, ranking Croatia second in the Mediterranean, after Greece. The length of coastline in the Croatian part of the Adriatic is 6,278 km, out of which 1,880 km account for the mainland coast, and 4,398 km for island coasts. With a coefficient of 11.10, Croatian coastline is, after Greece, the second best indented coastline in the Mediterranean. This paper gives an overview of the Croatian littoral counties, pointing at major towns and localities in the coastal area and on islands. Possibilities for the development of different forms of tourism are examined, taking into consideration specific qualities and comparative advantages of a particular area or archipelago. Such approach provides a basis for drawing up local and county plans of sustainable development of particular areas based on the activities that evaluate historical issues of natural resources in a modern way.

Possibilities and limitations in the development of selective forms of tourism in the Croatian archipelago Case Study – Istrian islands

Gržetić, Zvonko; Kovačić, Mirjana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=469594

Possibilities and limitations in the development of selective forms of tourism in the Croatian archipelago Case Study – Istrian islands FIRST INTERNATIONAL CONFERENCE ON ISLAND SUSTAINABILITY - ISLANDS 2010

Istrian islands are not inhabited, and besides two islands in Pula that have urban orientation, they have no alternative to tourism ; hence, it may be accepted that these islands may be used for daily accommodation of tourists. However, because of their specific features and position of each of the islands, it is necessary to make additional researches, taking into consideration the method of evaluation and presentation of the present situation, especially of current practice of their exploitation. In this paper, the authors point to the importance of the research and analysis for the purpose of development and valorisation of the islands. The directions of the future development have been defined as the main support to planning and decision-making. Analytical approach is of particular importance for the long-term development of Istrian tourism. The approach and methodology applied in the research are based on the analysis of data from primary and secondary sources. The data from primary sources indicate the current situation in the unique and distinct area of special importance. Primary sources data have been collected and processed in the Programme of sustainable development of the islands in the Istrian County. The authors have observed the data through their causal connection in the space, especially among selective forms of tourism and preservation of the environment, and socio-economic processes caused by the development of tourism. The secondary sources of data are various data obtained from the Croatian Bureau of Statistics (demographic and economic), marine and topographic charts, and results of multi-criteria site researches of Croatian archipelago. Methodological approach to the processing of various data (geographic, economic, ecological and sociological) through which main characteristics of effects of tourism to the space of the Croatian littoral are observed, is based on multi-criteria analysis. The aim of the research was to identify possibilities and limitations of further development and improvement of selective forms of tourism in the Istrian archipelago. On the basis of the researches and analyses and by applying theoretical knowledge, the authors have defined measures for qualitative development of selective forms of tourism.

Croatian Adriatic - natural resources as the foundation for tourism based sconomic development

Favro, Srećko; **Gržetić, Zvonko**; Božić Fredotović, Katja;

http://bib.irb.hr/prikazi-rad?&rad=490808

GOSPODARKA REGIONALNA I TURYSTYKA IV NIEDZYNARODOWA KONFERENCJA NAUKOW Kielce, Poljska, 2010

A wide variety of relief features, bays, islands, and islets is an attractive element of leisure navigation. Indented coastline provides opportunity for an interesting cruising, providing safe natural shelters. Adriatic Sea is a deeply indented gulf of the Mediterranean Sea extending in NW-SE direction. Eastern coast of the Adriatic Sea is among the most attractive and best indented coasts in

the Mediterranean. According to the UN Convention on the Law of the Sea, such type of coastline belongs to the so-called archipelagic waters. In the internal waters and the territorial sea of the Republic of Croatia, there are 1, 244 islands, islets, and rocks, ranking Croatia second in the Mediterranean, after Greece. The length of coastline in the Croatian part of the Adriatic is 6, 278 km, out of which 1, 880 km account for the mainland coast, and 4, 398 km for island coasts. With a coefficient of 11.10, Croatian coastline is, after Greece, the second best indented coastline in the Mediterranean. This paper gives an overview of the Croatian littoral counties, pointing at major towns and localities in the coastal area and on islands. Possibilities for the development of different forms of tourism are examined, taking into consideration specific qualities and comparative advantages of a particular area or archipelago. Such approach provides a basis for drawing up local and county plans of sustainable development of particular areas based on the activities that evaluate historical issues of natural resources in a modern way.

The issue of coastal area management in Croatia- beach management

Kovačić, Mirjana; **Favro, Srećko**; Perišić, Mate;

http://bib.irb.hr/prikazi-rad?&rad=490801

CONFERENCE OLIBIA, SICILIA, ITALY : OLIBIA, SICILIA, ITALY, 2010

Croatia is well known for its sun, clear sea, many islets and peninsulas and these are, of course, the key elements in tourism development. All-Inclusive Coastal Management (AICM) in Croatia defines tourism as one of the most imporatnt economic activities in coastal areas. The beaches in Croatia have particular importance among other touristic resources. Natural beaches are scarce in Croatia ; coastal areas are mostly rocky or artificial beaches ; this makes natural beaches even more important. Local communities are entrusted with beach management ; this is the task they usually perform well, enuglfing the principles of nature preservation and growing demand in touristic market. Ever growing demand for atttractive locations and quality services demands holistic approach in beach management. This document analyzes beach management in Croatia, with the aim of emphasizing the necessity for sustainable management of coastal areas, especially beaches. Authors advocate systematic approach thru regulated legal and public institutions and suggest activities to be undertaken in order to improve the system of efficent beach management, by introducing quality criteria (efficiency level), including business communication. They stress out the implementation of System for support in decision-making (SSDM), as they see in it a solution for more efficient beach management, as well as the use of Geographic information systems (GIS).

Towards sustainable yachting in Croatian traditional island ports

Favro, Srećko; **Gržetić, Zvonko**; Kovačić, Mirjana;

http://bib.irb.hr/prikazi-rad?&rad=488369

Towards sustainable yachting in Croatian traditional island ports Environmental Engineering and Management Journal

Islands at the east coast of the Adriatic were the area with a poor local community. Tourism, especially nautical, ensures new way of life, including some bad experiences, too. Attention is given to permanent preservation of Adriatic islands and the sea, as the most valuable Croatian natural resource. The project defines joint activities of local self-government, private investors and the

government aimed at the synergy which will ensure the conditions for long-term implementation of the sustainable development model. The presented model, based on the principles of sustainable development, defines development activities for improvement of nautical services in the Croatian Adriatic with results in the increase of the safety of boaters and their vessels. The implementation of such project ensures the improvement of economic and social situation of local island communities and of the entire Croatian coast.

Coastline in marine spatial data infrastructure

Duplančić Leder, Tea; **Leder, Nenad**;

http://bib.irb.hr/lista-radova?autor=192292

„III simpozij ovlaštenih inženjera geodezije - GIS, fotogrametrija i daljinska istraživanja u službi geodezije i geoinformatike, Zbornik radova, Hrvatska komora ovlaštenih inženjera geodezije, Opatija 22-23. listopada 2010, 120-125.

One of major tasks of hydrographers is to delineate the coastline during the survey, and of marine cartographers to plot it to nautical charts and hydrographic survey sheets. This paper provides a definition of coastline adopted by the Hydrographic Institute of the Republic of Croatia on the basis of recommendations of the International Hydrographic Organization (IHO). The paper describes the coastlining geodetic methods used in the hydrographic practice, exploring the possibilities of plotting the Croatian maritime demesne on nautical charts and maps. Factors that affect the variability of coastline are described. It has been pointed out that the mean sea-level increase recorded on the eastern Adriatic coast is still weak, but in the near future the new coastline should be calculated. The conclusion is that in the national spatial data infrastructure it is advisable to use one coastline both on nautical charts and on topographic maps, so that the users could easily and consistently refer their object in a coastal zone.

Tourism valorisation of lighthouses on Croatian islands and along the coast

Vuk Opačić, Tvrtko; **Favro, Srećko**; Perišić, Mate;

http://bib.irb.hr/prikazi-rad?&rad=469335

Island Sustainability / Favro, S. ; Brebbia, C. A. (ur.). - Southampton, Boston : Wessex Institute of Technology Press , 2010. 37-48 (ISBN: 978-1-84564-434-5).

On nowadays demanding tourism market Croatia wants to present itself not just as a country of classical “3S (sea, sun and sand)” tourism offer but also as a destination with great potential for the development of a more complex tourism product that would carry a development of high-quality sustainable tourism intended for an individual, more demanding, more educated, well-off and ecologically conscious tourist. “Robinson tourism”, in which tourists search isolation and peace in intact environment, is becoming a very popular type of tourism in the world. Considering stressful living conditions in ecologically more polluted cities with a low life quality, the above mentioned is not a surprise. In order to enrich island and coastal tourism offer in the early 2000 a process of tourism valorisation of lighthouses began mostly on secluded locations of Croatian islands and along the coast. Due to the automation of light-mechanisms on numerous Croatian lighthouses there are less and less lighthouse keepers that opened the possibility to renovate apartments for tourists where once a lighthouse keeper and his family lived. For lighthouse maintenance and its tourism

conversion Plovput Ltd. from Split is in charge. The company started this rent a lighthouse project that doesn't just bring profit but it also provides funds for reconstruction of these cultural heritage monuments built in the 19th century and the first part of 20th century. Today, due to this project 14 lighthouses have been integrated into this tourism offer. The main aim of this research is to define characteristics of Croatian lighthouses accommodation offer as well as main features of the structure and volume of a tourism flow in 2008.

Untouched nature-challenge to nautical tourism sustainable development

Favro, Srećko; **Gržetić, Zvonko**; Božić Fredotović, Katja;

http://bib.irb.hr/prikazi-rad?&rad=469382

ECOLOGICAL TOURISM: TRENDS AND PERSPECTIVES OF DEVELOPMENT IN THE GLOBAL WORD / Prof. ANDREY SELIKHOVKIN (ur.). - SAINT PETERSBURG

Croatia has one of the most beautifful and best indented coastlines in the world. The Adiatic Sea, its coastline and islands, whose values have been recognized on a global scale, schould be holders of economic development of Croatia, particulary of its coastal and insular part. General orientation during the process of improvement of marina capacities should implement the protection of nature and orginality of the Mediterranean cultural heritage. Protection of particular areas is still the basic method of preserving bilogical and landscape diversity. Protected areas make up the framework of overall protection and key nodes in the ecological network, representing refuges and depositories of biological diversity. The principles of sustainable development point at the need for a balanced use, occupancy, and development of the marine and coastal area, protecting the natural characteristic of the environment. This paper proposes the methodology and criteria o be applied when selecting particular locations and marinas for the construction of nautical tourism facilities.

Contribution of graphic technology in the production of nautical charts and navigational publications

Jeličić, Tonći; **Gržetić, Zvonko**; **Kasum, Josip**;

Space, Heritage & Future / Kereković, Davorin (ur.). Zagreb : Hrvatski Informatički Zbor-GIS Forum, University of Silesia, 2010. 49-60

Early nautical charts used to be made on parchment by hand. They were dilapidated and sensitive to moisture, requiring long-lasting individual work. Until the advent of first printing techniques, handmade charts were designed for and available to a small number of users. A significant breakthrough occurred in the 15th century and in the early 16th century, with the development of wood engraving, copper-plate engraving and copper-plate etching techniques. Small print runs of charts were printed, being coloured by hand in cartographic workshops. Development of printing techniques determined the development of cartographic reproduction and chart printing. With the possibility of rapid reproduction, charts became the products intended for a wider circle of users. In the 20th century, after the invention of offset printing, traditional (conventional) method of chart production was developed. Using new technologies in the production reproduction originals, determined by computer-aided cartography, modern (digital) method was developed by the end of the 20th century. Today's offset printing with its technical-technological possibilities is major printing procedure in the cartographic reproduction. New technologies of digital printing (plotter printout) have given rise to the latest turning point, Print On Demand (POD). Throughout the history,

graphic technology increasingly supported the production of nautical charts and publications, primarily contributing to accuracy of reproduction, higher quality of printing inks and printing surfaces, and shorter time needed for realisation, providing therefore a reliable support for maritime cartography, and for maritime activity in general in terms of navigational safety.

Record-breaking sea levels in the northern Adriatic on 1 December 2008

Pasarić, Miroslava; **Čupić, Srđan**; **Domijan, Nenad**; **Leder, Nenad**; Orlić, Mirko;

http://www.ciesm.org

Rapport du Commission Internationale pour l'exploration scientifique de la Mer Mediteranee, 39, 157.

Exceptionally strong storm surge that occurred on 1 December 2008, when record-breaking sea level was recorded in the Northern Adriatic, is analysed using sea-level data from tide gauges along the eastern Adriatic coast. The event was a result of fine tuning between the storm surge brought about by a series of synoptic atmospheric disturbances, the tide and the preexisting Adriatic basinwide seiche, all uperimposed on a significant sea level rise due to the low-frequency atmospheric disturbance related to planetary waves, whereupon the local seiche activity additionally increased the sea level.

Gamma radiation and dose rate investigations on the Adriatic islands of magmatic origin

Petrinec, Branko; Franić, Zdenko; **Leder, Nenad**; Tsabaris, Christos; Bituh, Tomislav; Marović, Gordana;

http://www.oxfordjournals.org/

Radiation Protection Dosimetry, 1-9, doi:10.1093/rpd/ncp302.

Natural radioactivity of Middle-Adriatic Sea islands and islets was measured. Gamma spectrometric measurements, both in situ and in laboratory, as well as radon measurements in the seawater were performed. Activity concentrations and the associated dose rates due to naturally occurring 232Th, 238U and 40K radioisotopes were determined. Dose rates calculated from in situ gamma spectrometry are in correlation with dose rates calculated from activity concentrations measured in collected samples of pebbles and rocks. In situ gamma ray spectrometry in the seawater has been performed, showing activity concentration of 220 and 240 Bq m−3 for 214Bi and 214Pb, respectively due to the presence of magmatic rocks in the seabed. The radium equivalent activity varied from 13 to 53 Bq kg−1. These values are lower than the limit values, indicating that the radiation hazard is not significant. The highest mean activity concentrations of naturally occurring radionuclides in rock samples collected were found on the islands of magmatic origin.

Evolution of surface wave spectra in extreme sea states along the eastern Adriatic open sea and channel areas

Leder, Nenad; Andročec, Vladimir; **Čupić, Srđan**; **Domijan, Nenad**; Lončar, Goran;

http://www.ciesm.org

Rapport du Commission Internationale pour l'exploration scientifique de la Mer Mediteranee, 39, 135.

The process of formation and development of surface waves may be considered as a function of three basic variables: wind direction and speed, length of fetch over which the wind blows and duration of wind of a particular direction. Occurrence of a fully developed model of wind waves is unusual in the Adriatic Sea, which is a semi-enclosed sea of limited fetches. However, instrumental measurements and visual onboard observations of surface wave elements show that during strong gale force winds of longer fetches (SE, W, SW and NE) wave models of respectable dimensions may be developed in the Adriatic Sea area. Absolute maximum of wave height in the Adriatic Sea Hmax= 10.8 m was measured in the north Adriatic (near station V1) and extreme expected value of wave height in the Adriatic is about 14 m.

Monthly and seasonal oscillations of the Eastern Adriatic Current

Leder, Nenad; **Domijan, Nenad**; **Gržetić, Zvonko**; **Mihanović, Hrvoje**; **Mlinar, Marko**;

http://www.ciesm.org

Rapport du Commission Internationale pour l'exploration scientifique de la Mer Mediteranee, 39, 134.

Eastern Adriatic Current (EAC) is a branch of the general Adriatic cyclonic circulation along the eastern part of the Adriatic Sea with predominant NW direction. It is well known that EAC varies seasonally, being strongest in winter and weakest in summer [1]. In 2007 the scientific and research program – „The Adriatic Sea Monitoring Program" was implemented. A part of this program consisted of current measurements along the Croatian internal and territorial waters, during a year long period. The measurements started in November 2007 and finished in December 2008. They represent a novel to Croatian physical oceanography, incorporating the greatest number of stations up to date, as well as providing the longest time-series available.

Forecasting of coastal flooding in Croatia: the task of operative oceanology

Leder, Nenad; **Domijan, Nenad**; **Gržetić, Zvonko**;

Zbornik radova „Hrvatska platforma za smanjenje rizika od katastrofa", Državna uprava za zaštitu i spašavanje, Zagreb, 213-215.

In this paper short review about knowledge of processes and causes of flooding of Croatian part of Adriatic coast is given. In some cases flooding of coast can be forecasted by using oceanographic-meteorological numerical models. Despite of developed existing tide gauge network along the Croatian coast, oceanographic-meteorological numerical models are not developed to be used for making accurate forecast of possible flooding with the aim of giving warnings to the coast living population.

Catalogue of Charts and Nautical Publications - Internet and Google Earth Edition

Strinić, Goran; **Čala, Mendi**; **Bročić, Pejo**; **Višić, Boris**;

Space, Heritage & Future / Kereković, Davorin (ur.). Zagreb : Hrvatski Informatički Zbor-GIS Forum, University of Silesia, 2010. 43-48

During preparations for producing the Internet Catalogue of Charts and Publications by the Hydrographic Institute of the Republic of Croatia, many questions and challenges occurred. Main source of data was the last paper edition of Catalogue of Charts and Nautical Publications. Production technology for the Internet Catalogue allows much more features than the one for the paper edition. We therefore lay emphasis on making the most of the technology, to offer more data to our customers. As at the same time we created the application for Internet edition of Notice to Mariners, the possibility of connecting charts as final products with publications for correcting charts (NtM), proved to be indispensable and innovative. Maintaining of these two services is divided into two functional units: cataloguing of charts and publications, and listing of Notice to Mariners. These functions are separated into two Institute departments: Cartographic Department and Nautical Department. Employees of both departments enter the data into two databases that are connected, so that the final product is a complete catalogue with listed corrections from NtM. Additional product, in its development phase, is a sort of GIS browser of navigational charts and ENC's on the Google Earth ™ and Google Maps ™ platforms. These two platforms were chosen as easily accessible and free applications. Almost all the materials and data needed for this kind of GIS catalogue have already been collected during the preparation and design of the Internet Catalogue.

The borders of the northern Adriatic (1948th-2009th) with special emphasis on the chronological cartographic display

Gržetić, Zvonko; Barić Punda, Vesna; **Filipović, Valerija**;

Znanstveni skup Hrvatske akademije znanosti i umjetnosti Jadranskog zavoda Izazovi i perspektive u pomorskom pravu i pravu mora:Interesi Republike Hrvatske

Maritime boundaries can be boundaries of certain maritime areas of states, or delimitation lines of marine and submarine areas among states where the coasts of states continue on from one another or lie opposite each other. In this paper, all the boundaries in the North Adriatic are analysed, that is, the boundaries of certain marine and submarine areas of coastal states, as are the boundaries of maritime areas among states and, in particular, disputable questions of delimitation between Croatia and Slovenia whose negotiations commenced immediately after independence, but which have not culminated into a final solution. Research commenced with 1948 when the first Yugoslav regulation, the Coastal Sea of the Federal National Republic of Yugoslavia Act was enacted by which straight starting lines were drawn for the first time through the Croatian part of the Adriatic Sea (Art.3) and a with of 6 miles of territorial waters for the former state was determined (Art. 5), and ended in 2009 with the implementation of the official Slovenian e-atlas okolja (environmental e-atlas) in which the Slovenian maritime boundary (external boundary of territorial sea waters) was drawn in front of the Croatian coast. A cartographical analysis of all boundaries of certain maritime areas of coastal states in the North Adriatic was chronologically given, the boundaries of the marine and submarine areas among those states were determined (drawn), as were the standpoints of Croatia and Slovenia in the disputable delimitation, and the maps of their unilateral acts.

Archives of nautical charts and publications, HHI museum in its formative stage

Bročić, Pejo; **Kordić, Ivana**; **Sarajlić, Emin**;

Hydrographic Institute of the Republic of Croatia is successor to the Hydrographic Office of the Austro-Hungarian Navy established in Trieste in 1860. This year marked the beginning of an organised hydrographic survey in Eastern Adriatic. Throughout its 150-year long production of navigational charts and publications, the Hydrographic Institute has built valuable collections of its own charts at different scales, and nautical publications. It also keeps in its holdings nautical charts received on exchange basis from related institutions both in Europe and worldwide, covering not only Eastern Adriatic but also other sea areas all over the world. As the chart production and hydrographic survey are heading towards new technologies, the idea of a HHI museum has been devised in order to preserve its cartographic heritage and old methods of chart production. Layout of the museum will include historical charts, old instruments and aids, materials formerly used in the process of chart production from the hydrographic survey to the final product. The museum, to be situated in the HHI building, will give its visitors an insight into the past and present of nautical cartography.

2011

Seafarers Market

Galić, Stipe; Lušić, Zvonimir; **Pušić, Danijel**;

http://bib.irb.hr/prikazi-rad?&rad=582444

International Journal of New Trends in Arts, Sports & Science Education (IJTASE) / Teoman Kesercioğlu (ur.), New Trends on GLOBAL EDUCATION CONFERENCE - GEC-2011,

The education of seafarers is not the same everywhere in the world and accordingly the quality of future officers. This paper work displays the positive and negative aspects of study by faculty or through short courses. It will also show the number and percentage of active officers from various countries covering the maritime market. This work indicates that the nationality of seafarers has changed in the last few decades, and it also indicates the reason for decline of seafarers from developed countries. Also in this paper work we will analyze the quality of the education officer personnel through all kinds of short courses that meet a prescribed minimum standard which it's not on a par with the maritime colleges and academies. This analysis should indicate the main deficiencies in the existing education system, and the necessity of adopting new and more effective measures for better education, which leads to improved safety at sea.

Sedimentation in the Sea Area of the Poreč Harbour

Škaro, Krunoslav; Bogner, Danijela; **Gržetić, Zvonko**;

Proceedings of the Tehth International Conference on the Mediterranean Coastal Enviroment, MEDCOAST 11, E. Özhan (Editor), 25-29 October 2011, Rhodes, Grece, MEDCOAST, Mediterranean Costal Foundation, Dalyan, Muğla, Turkey, vol 2, 895 p.

The sea area of the Poreč harbour is semi-coastal area with the size of 383900m2. In his hinterland there is no surface water streams, but has continual anthropogenic influence from the Neolithic to the present. Due to the late Pleistocene-early Holocene transgression that led to the creation of todays Poreč harbour which probably occurred between 7500 to 6500 years BP, a semi-closed area was formed. Geophysical researches are carried out in October 2003, and sediment sampels were collected. Results of analyses imply Holocen sedimentation during which up to 8 m were deposited and coarsening of the sediments towards to coast. In the deepest layer of the core was deposited red soil (Terra Rossa) with the type of clayey silt sediments. Terra rossa soil is typical for the wider area. Her presence in the deepest layer of sediment may be autochthonous (not eroded) and was created in the ground phase, or the allochthonous that was caused due to erosion of the surrounding land, and then transported and deposited in the marine environment. It is assumed that the clayey silt (Terra Rosa) was found throughout the whole area, although its actual thickness was not determined. In the whole area sandy silt was deposited with variable thickness and above it is silty sand. Silty sand was deposited in the coastal area which is most likely due to input of coarse particles from the mainland, the presence of biogenic components and erosion of the central area due to the action of currents and the increased anthropogenic impact (dredging). The sea level rise led to coarsening of sediment particles.

Place of Refuge for Ships in Distress - Another Example of Successful Harmonization of Croatian Legislation with the EU in the Field of Maritime Safety

Bradarić, Željko;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 22 (2011)

Upon completion of the two-year project of Places of Refuge for Ships in Distress, this complex and sensitive issue has been resolved legally, organizationally and technologically. Thus the Republic of Croatia has fulfilled the obligation under the Maritime Code, 2004, and aligned its regulations as required by the Directives 59/2002 of the European Commission. This paper presents a methodological approach to the problem, concisely describing the concept of Croatian places of refuge for ships in distress, and giving an overview of the project results.

Information about the Croatian VTS on Official Nautical Charts and Publications

Bradarić, Željko;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 23 (2011)

Implementation of the Vessel Traffic Service (VTS) as a system designed for monitoring, management and organization of all maritime traffic in order to enhance safety of navigation, efficiency of maritime transport and protection of the marine environment, except to technical and organizational aspects, involves providing information about the system to all parties concerned and particularly to mariners. Preparation of relevant information about VTS for updating nautical charts and publications is the responsibility and obligation of national hydrographic offices, to be carried out autonomously, according to relevant standards of the International Hydrographic Organization (IHO). In the case of the Croatian VTS, which is currently in test operation, it is the responsibility of the Hydrographic Institute of Croatia. In this paper author, in the light of the upcoming obligation to disclose information about the Croatian VTS in official publications and on nautical charts, analyzes the relevant standards of the International Hydrographic Organization, and gives examples of the display of information about Croatian VTS on paper charts, ENCs and in nautical publications.

Ergonomic aspect of the use of colours on charts

Jeličić, Tonći;

http://bib.irb.hr/prikazi-rad?&rad=577767

IMSC 2011. Zbornik radova 3. međunarodne konferencije o pomorskoj znanosti ISSN 1847-1498 / Mulić, Rosanda ; Gržetić, Zvonko ; Jelić-Mrčela, Gorana (ur.). - Split : Hrvatski hidrografski institut , 2011. 73-88.

Ergonomics is an interdisciplinary science concerned with the study of optimum ways to harmonize the interactions between man and his workplace and work conditions, in order to make work more humane. Th is paper studies, from the perspective of the graphic technology, the ergonomic aspect of the use of colours on charts during marine navigation. In the theoretical introduction to the subject, the defi nition of the term ergonomics is given. Ergonomic aspects of lighting are examined, as well as the relation between lighting and human sight, and the infl uence of artifi cial lighting on the colour perception. Th e terms of colour or colourant are explained, as well as the perception of colour in the human eye. In the professional part, the terms such as colorimetry and metamery of colours are explained. Th e paper examines the problem of the use of colours on charts, with regard to diff erent lighting conditions during navigation. Th is is only applicable to the optimum selection and high-quality reproduction of colours, which facilitates readability of charts. In this respect, it is proposed to conduct a research, applying the optimum proposed combination of colours, in

accordance with the requirements of the specifi c conditions of the work environment. Th e optimum use of colours on charts will consequently contribute to the safety of navigation.

Croatian Maritime Story as an Opportunity for Development of Sustainable Cultural Tourism

Franjić, Romana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=569208

Croatian Maritime Story as an Opportunity for Development of Sustainable Cultural Tourism; International journal of cultural studiesture and Tourism Research (2005-6133) Vol 4 (2011)

Cultural tourism in Croatia is not a well explored topic. Non- material traditional heritage is a vital part of the cultural tourism offer, and it must be prperly interpreted. Non-material maritime heritage can help with the development of sustainable tourism along the Croatan coast and on the islands, and encourage full participation by local people in creating an authentic experience. This paper will point out a model that can popularize the maritime cultural treasure in an innovative way. The results of this paper will provide guidelines for including this heritage into a tourist destination product, realizing an income from tourism.

The Analysis of Small Charts Corrections

Vojković, Lea; **Pušić, Danijel**;

http://hrcak.srce.hr/file/111822

POMORSTVO Scientific Journal of Maritime Research 25/2(2011); Preliminary communication; pp. 227-238

This paper analyses corrections in Small Charts and the maintenance process of charts. In the process of maintaining, it can be observed that the accuracy is the most important feature of charts, and the concept of accuracy of Small Charts is analysed in relation to other types of charts. The authors have also analysed the lifetime of Small Charts because of their specific feature and the number and types of corrections in Small Charts in a year. The problem of a reduced safety in relation to the number of corrections has also been presented.

History of publication “Symbols and abbreviations used on charts”

Duplančić Leder, Tea; **Leder, Nenad**;

25th International Cartographic Conference - Enlightened View on Cartography and GIS, Paris

History of nautical cartography can be traced on the basis of recent editions of the publication “Symbols and Abbreviations Used on Charts”. This paper examines editions of that publication covering the area of Eastern coast of the Adriatic Sea, from its first issue in 1929 published on one sheet, until these days. Every new edition includes more and more symbols and abbreviations, and its contents are consistent with worldwide trends in nautical cartography. In this way, nautical charts like no other thematic charts have been standardized all over the world. Such standardization has been achieved as a result of recommendations of the International Hydrographic Organization, to

enable easier reading and interpreting of any nautical chart. The paper also refers to the IHO Symbols and Abbreviations for the production of electronic navigational charts and INT charts.

Delineation of coastline and marine SDI in Croatia

Leder, Nenad; **Duplančić Leder, Tea**;

25th International Cartographic Conference - Enlightened View on Cartography and GIS, Paris

One of major tasks of hydrographers is to delineate the coastline during the survey, and of marine cartographers to plot it to nautical charts and hydrographic survey sheets. This paper provides a definition of coastline adopted by the Hydrographic Institute of the Republic of Croatia on the basis of recommendations of the International Hydrographic Organization (IHO). The paper describes the coastlining geodetic methods used in the hydrographic practice. Factors that affect the variability of coastline are described. It has been pointed out that the mean sea-level increase recorded on the eastern Adriatic coast is still weak, but in the near future the new coastline should be calculated. The conclusion is that in the national spatial data infrastructure (NSDI) it is advisable to use one single coastline both on nautical charts and topographic maps, so that the users could easily and consistently refer their object in a coastal zone.

Selection of the location for nautical tourism ports in the area of Zadar County by applying Multi-Criteria analysis

Kovačić, Mirjana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=531913

4th Conference of the Adriatic forum, Zadar, Hrvatska, 16-18.09.2011 ISBN:978-953-7237-89-9

Nautical tourism is a part of general tourist phenomenon that has been significantly changing the structure and the character of tourist traffic for several years now. As a special form of recreation, nautical tourism denotes a wide area of activities. Except of satisfying its own needs, the nautical tourist often asks for a full service for its yachts. Besides this, the growing demand for permanent berths and the number of transit yachts pose new challenges to Croatia. The authors point out the importance of an even regional development as the basis for the economic development of Croatia. Underdeveloped areas, especially in Croatian islands are permanent factors that slow down the progress and the development of the community and the problem has to be solved by applying scientific bases. The authors are exploring possibilities for the development of nautical tourism in the area of Zadar County taking into consideration natural preconditions as well as other conditions for its development. A reached level of nautical tourism development in the area of the County is being analysed and new locations for construction of nautical tourism ports are being defined. Construction of nautical tourism port demands a complex analysis of location factors especially institutional restrictions and ecological demands of the area. The authors emphasise multi-criteria approach in selecting the location for nautical tourism ports as well as explain methods of multi-criteria analysis. They also define the criteria for the selection of the location and present the results of the survey.

Croatian maritime story as a opportunity for development of sustainable cultural tourism

Franjić, Romana; **Favro, Srećko**;

https://bib.irb.hr/prikazi-rad?&rad=531915

12th International Joint World Cultural Tourism Conference Istanbul, Turska 07-09.10.2011

Thanks to its natural and geographic characteristics, one of the most beautiful archipelagos in the world, indented deeply into the European continent, Croatia nurtures a centuries old experience of a tourist receptive country. The aristocratic experience of country-living during the rule of the Austrian-Hungarian Monarchy recognized a significant potential of the Croatian Adriatic region, and it based the affirmation of Croatia as a tourist destination primarily on the natural beauties of pristine environment, as well as a pleasant Mediterranean climate. Cultural tourism in Croatia is not a well explored topic, especially since its base is non-material cultural goods. Non-material traditional heritage is a vital part of the cultural tourism offer, and it must be properly interpreted in order to serve a purpose as an additional asset to the cultural tourism offer. Non-material maritime heritage can help with the development of sustainable tourism along the Croatian coast and on the islands, as well as encourage full participation by local people in creating an authentic experience and preservation of the unique aspects of tradition in coastal destinations. This paper will point out a model that can popularize the maritime cultural treasure, which would otherwise remain unused and familiar only to a handful of people, in an innovative way. In such a way, cultures are brought together, cultural anathemas are crushed, and people are united. Respecting the aforementioned, the execution, or implementation, has been recognized as a critical step in managing sustainable tourism, because sustainable cultural tourism will, in practice, only be as effective as the implementation itself (Go i dr. 1992). The results of this paper will provide guidelines for including this heritage into a tourist destination product, with a goal of realizing an income from tourism, whilst managing the sustainable development of tourism in which cultural goods are converted into economic goods without changing them significantly.

Picoplankton composition related to thermohaline circulation: The Albanian boundary zone (southern Adriatic) in late spring

Šilović, Tina; Ljubešić, Zrinka; **Mihanović, Hrvoje**; **Olujić, Goran**; Terzić, Senka; Jakšić, Željko; Viličić, Damir;

http://www.sciencedirect.com/science/article/pii/S0272771410004129

Estuarine, Coastal and Shelf Science. 91 (2011); 519-525

Picoplankton distribution at the boundary zone of the southern Adriatic in May 2009 on a 75 km long shelf-continental slope transect was assessed by combining epifluorescence microscopy, flow cytometry and high-performance liquid chromatography data with hydrographic observations. The picoplankton distribution was greatly influenced by the hydrographic conditions prevailing in the southern Adriatic because of the influence of the Levantine Intermediate Water (LIW) and East Adriatic Current (EAC) forcing. Heterotrophic bacteria numerically dominated the picoplankton community through the entire transect with no significant accumulation. By contrast, picophytoplankton accumulated in the 50–75 m layer, forming a pronounced deep chlorophyll maximum. Synechococcus dominated the photosynthetic picoplankton, whereas picoeukaryotes were the least abundant. The intrusion of warm LIW observed in the layer between 100 and 350 m

was followed by Prochlorococcus and Synechococcus peaks (10 × 103 cells mL−1 and 90 × 103 cells mL−1, respectively), as well as by the appearance of two Synechococcus ecotypes. Most picoeukaryotes were observed at the offshore stations, where geostrophic current calculation revealed the strongest EAC influence. A strong EAC spread over the central and eastern basin created a barrier for Prochlorococcus, whereas the picoeukaryote maxima coincided with the core of the EAC, suggesting its persistence to hydrological instabilities.

Phytoplankton distribution across the southeast Adriatic continental and shelf slope to the west of Albania (spring aspect)

Viličić, Damir; Šilović, Tina; Kuzmić, Milivoj; **Mihanović, Hrvoje**; Bosak, Sunčica; Tomažić, Igor; **Olujić, Goran**;

http://www.springerlink.com/content/q052j655p2784207/

Environmental Monitoring and Assessment Volume 177, Numbers 1-4, 593-607, DOI: 10.1007/s10661-010-1659-1

We present the first insight to the oceanography of the southeastern Adriatic Sea, where coastal water influenced by Albanian rivers comes into contact with the inflowing oligotrophic Eastern Adriatic Current (Ionian Surface Water and Levantine Intermediate Water). A distinct plankton distribution was observed on each side of the shelf break hydrographic boundary in May 2009, during gradual warming of the surface waters. The prochlorophytes accumulated along the nutricline above the shelf and continental slope. The phosphorus limited inshore waters were dominated by a small diatom Chaetoceros circinalis, dinoflagellates, cryptophytes, autotrophic picoplankton, and heterotrophic nanoplankton. The offshore surface layer was characterized by bigger nanoplankton (coccolithophorids, green flagellates). Low nutrient concentrations influence relatively low productivity not only above the Albanian shelf but also further to the north along the Montenegrine and Croatian coastal Adriatic Sea.

Using Self-Organising Maps to investigate long-term changes in deep Adriatic water patterns

Vilibić, Ivica; **Mihanović, Hrvoje**; Šepić, Jadranka; Matijević, Slavica;

http://www.sciencedirect.com/

Continental shelf research (0278-4343) 31 (2011); 695-711

The paper attempts to document long-term changes in deep Adriatic water patterns by applying the Self-Organising Maps (SOM) method to temperature, salinity, dissolved-oxygen content, orthophosphate and total inorganic nitrogen profiles sampled at a single deep station in the South Adriatic Pit (SAP) over a half century (1957–2009). Seasonality observed in upper layers has been removed by the least-squares fitting of the annual and semi-annual sinusoidal functions. The sensitivity of the SOM to various parameter combinations reveals the importance of temperature, salinity and dissolved oxygen for mapping different water patterns, while nutrients have less influence on quality and applicability of SOM solutions to the extraction of characteristic SAP water profiles. The quality of fit obtained for different combination of the measured parameters introduced to a SOM suggests that the incomplete combinations of input parameters increase an imperfection in the applicability of SOMs to the dataset. Two modes of long-term changes in the SAP obtained by the SOM analyses

are discussed with respect to the processes that drive the variability in the area, e.g., the Adriatic-Ionian Bimodal Oscillation: where the first mode is characterised by rapid changes in the transition of SAP water masses, observed before 1980s (less adoptable by the SOMs), and the second mode is characterised by steady transitions (better adoptable by the SOMs), observed in the 1990s and the 2000s. The SOM method is found to have certain advantages when compared to other methods that have previously been used to distinguish the Adriatic water masses, as it does not depend on predefinition of water mass sources and allows for gaps in series.

Diurnal upwelling resonantly driven by sea breezes around an Adriatic island

Orlić, Mirko; Beg Paklar, Gordana; Dadić, Vlado; **Leder, Nenad**; **Mihanović, Hrvoje**; Pasarić, Miroslava; Pasarić, Zoran;

http://www.agu.org/pubs/crossref/2011/2011JC006955.shtml

Journal of geophysical research. 116 (2011) ; C09025-1-C09025-10

Diurnal coastal upwelling was previously observed when sea breezes were exceptionally strong, or when the process occurred close to critical latitudes (30°N, 30°S) where local inertial oscillations may be resonantly excited. Our data collected in the Adriatic show that the pronounced diurnal upwelling is also possible under milder wind-forcing and outside critical latitudes. It is found that the thermocline recorded in the summer of 2006 at the south coast of the island of Lastovo was subject to diurnal variability with a maximum range of about 30 m, and that the corresponding currents measured off the west coast of the island pointed to internal waves propagating around the island in a clockwise direction. We suggest that the summertime stratification occasionally promotes coastal waves that revolve daily around the island, creating the conditions needed for resonant excitation by sea breezes. Numerical modeling reveals that the 24-h waves are trapped around the island due to the influence of both the Coriolis force and bottom slope, and that the 12- waves radiate away from the island. The biogeochemical data show that the diurnal upwelling may stimulate primary production in the area but may also adversely affect benthic organisms.

Surface current patterns in the northern Adriatic extracted from high-frequency radar data using self-organizing map analysis

Mihanović, Hrvoje; Cosoli, Simone; **Vilibić, Ivica**; Ivanković, Damir; Dadić, Vlado; Gačić, Miroslav;

http://www.agu.org/pubs/crossref/2011/2011JC007104.shtml

Journal of Geophysical Research. 116 (2011) ; C08033-1-C08033-14

A network of high-frequency (HF) radars was installed in the northern Adriatic in the second half of 2007, aimed to measure surface currents in the framework of the North Adriatic Surface Current Mapping (NASCUM) project. This study includes a detailed analysis of current measurements from February to August 2008, a period in which three radars were simultaneously operational. Current patterns and temporal evolutions of different physical processes were extracted by using self-organizing map (SOM) analysis. The analysis focused on subtidal frequency band and extracted 12 different circulation patterns on a 4 × 3 rectangular SOM grid. The SOM was also applied on a joint data set that included contemporaneous surface wind data obtained from the operational hydrostatic mesoscale meteorological model ALADIN/HR. The strongest currents were recorded during energetic bora episodes, being recognized by several current patterns and having the

characteristic downwind flow with magnitudes exceeding 35 cm/s at some grid points. Another characteristic wind, the sirocco, was represented by three current patterns, while the remaining current structures were attributed to weak winds and the residual thermohaline circulation. A strong resemblance has been found between SOM patterns extracted from HF radar data only and from combined HF radar and wind data sets, revealing the predominant wind influence to the surface circulation structures and their temporal changes in the northern Adriatic. These results show the SOM analysis being a valuable tool for extracting characteristic surface current patterns and forcing functions.

Proposal of implementation model of HP-Latex technology in the production of official charts

Jeličić, Tonći; **Strinić, Goran**; **Sarajlić, Emin**; **Pogančić, Milivoj**;

15th international conference on printing, design and graphic communications Blaž Baromić 2011, Senj, Proceedings, ISBN 978-953-56838-1-0, pages 340-352

Accelerated development of new technologies in recent years has established new quality standards in meeting the requirements of use of particular graphic products. Namely, the implementation of new technologies, besides its advantages, may lead to undesired incidents that may further cause various problems and consequences. For full implementation of digital instead of conventional printing in the production of charts it is necessary to test the quality of print in order to minimise the possibility of loss of maritime safety information, which consequently might affect the safety of navigation. Therefore, the Croatian Hydrographic Institute has conducted studies aimed at implementing the HP-latex printing technology using plotter (POD) in the production of charts. In this paper the results of the studies will be presented together with proposal of implementation model.

Usporedba simulacijskog modela sa stvarnim događajem izlijevanja nafte sa broda „Tin Ujević“ u gradskoj luci Split 22. ožujka 2010. godine

Pušić, Danijel; Popović, Ružica; Bićanić, Zlatimir;

Zbornik radova Ekologija i saobraćaj / Jusufranić, Ibrahim (ur.). Travnik (Vlašić) : Internacionalni univerzitet Travnik, 2011.

Sea pollution is direct or indirect release of substances or energy into the marine environment, which causes or may cause detrimental effects on living conditions in the sea, disturbance of maritime activities, deteriorating the quality of the sea water and reducing the attractiveness of marine areas. Computer prediction was performed using free software programs GNOME (General NOAA Oil Modeling Environment) and ADIOS 2 (Automated Data Inquiry for Oil Spills). These programs are used to predict the impact of meteorological (wind), oceanographic (currents) and other processes on the movement and spread of oil spills in the sea, as well as the time of occurrence of spill from container, the quantity of molten liquid, and other parameters. Actual event is the discharge of oil (diesel fuel) from f/b Tin Ujević, which occurred on 22 March 2010 in the ferry port of Split. This paper presents an analysis of simulation with all the parameters identical to those on the day of incident. The paper explains how to predict the movement of oil on the sea surface in case of accidental marine pollution, how chemical and physical changes of the spill can affect the environment, and how to take advance and timely actions to respond promptly to future events.

Pomorski promet i nezgode na hrvatskom dijelu Jadrana

Lušić, Zvonimir; **Pušić, Danijel**; Galić, Stipe;

This work will analyze maritime traffic and accidents on the Croatian Adriatic. Will show the traffic statistics, marine accidents, and their mutual relations during the past few years. In addition of maritime transport statistic, this work will also analyze measures aimed at increasing the level of security of marine traffic, i.e. the measures so far established, measures that can be expected in the near future, and other available measures that can generally increase the level of safety in maritime navigation. An analysis should indicate the main drawbacks of the existing security system, and the necessity of making new and more effective measures to reduce accidents of ships and their consequences.

Nautical Tourism in Fostering the Sustainable Development : A Case Study of Croatia's Coast and Island

Kovačić, Mirjana; **Gržetić, Zvonko**; Bošković, Desimir;

http://www.chios.aegean.gr/tourism/VOLUME_6_No1_art12.pdf

Tourismos. 6 (2011) , 1; 221-232

This paper presents a systematic and comprehensive analysis of the economic, social and environmental aspects of developing nautical tourism. It examines the problems of sitting and selecting the location of a nautical port, and it identifies economic and political, and socio-cultural factors. The paper brings out the importance of balanced development of a port of nautical tourism as a primary determinant of the integrated management of the marine domain. Due to its manifold multiplier effects, nautical tourism is a major branch of tourism that has great potential for development in Croatia. The paper points out the importance of systematically valorising the potential of nautical tourism on the principles of sustainable development, while encouraging and raising the nautical-tourism offering to a higher level. It underlines the need to enlarge the capacities of nautical-tourism ports, especially on Croatia's islands, thus helping to increase the standard of living of coastal residents. In doing so, the development process must take into account the principles of spatial organisation and the needs of people living and working within the territory of a nautical-tourism destination.

Standard For Encryption And Security Electronic Navigation Charts

Pušić, Danijel; Kos, Serđo;

Global Navigation Satellite Systems – GNSS is considered a basic component in the reliable operation of electronic navigational charts. The appropriate communication connections essential for security held encryption. For the protection of official electronic charts, accepted standards of data protection and security plan was adopted. This paper will clearly analyze the way to protect the official electronic charts analyzing standard S-63 e 1.1. adopted by the International Hydrographic Organization – IHO.

Danube Story of the Vučedol Orion - Transmodern Cultural Tourism and the Transformational Power of Myth

Franjić, Romana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=531910

Contemporary Trends in Tourism and Hospitality, 2011Stojkov, Novi Sad , 2011. 54-55 (ISBN: 978-86-7031-233-3)

The human need to travel is a fundamental need, we are all nomads at heart, but modernism and corporate culture have developed unnatural rules that separate us from ourselves. The deep rootedness of such a conquering approach is still visible today, because Europeans and European understanding of tourism is a dominant form ; eighty percent of all the world's travellers are from only a dozen countries, which we call highly developed. Therefore, tourism is an aspect of modernisation which is homogenising the world. It is therefore important that, on those journeys, tourists see opportunities to escape from everyday life and its imposed structures. Such tourism has great transformational power, as it truly brings together different cultures and worldviews, whilst offering possibilities of permeation as well as opening of the human heart and soul. Throughout history, the Podunavlje region has always been a crossroads as well as point of contact for a variety of different peoples who subsequently left behind a part of their rich cultural heritage. The cosmology of the Vučedols ancient people, which today, in the atmosphere of nearing 2012 and the prophecy of the Mayan energetic calendar, has an especially attractive place in the global offering of cultural tourism. This will be brought to mind through mythological stories and the symbolic language of the ancient calendar, the Vučedol Orion. Through cultural observation, this paper will show the model of interpretation, which views the calendar through the symbolic language of myth, as a result of a particular era, but also as a process of human creativity, which currently exists in a sense of its absolute or universal values. The Vučedol Orion and the riverbanks of the Danube has becomes an essential tourist attraction with a strong potential for the development of cultural tourism. Familiarity with the calendar retains a high degree of civilizational achievements, and the ability to calculate the passage of time which had a significant influence on the everyday life of the people.

Adriatic web service of the Croatian Hydrographic Institute as a contribution to the development of nautical tourism

Panžić, Tonći; **Strinić, Goran**;

3rd INTERNATIONAL MARINE SCIENCE CONFERENCE - IMSC 2011

Nautical tourism because of its importance and long-term growth (in order to maintain this trend) deserves further investment in the quality of information provided for sailors. Production of Web Service which would contain all important information for a tatgeted group of domestic and foreign sailors would contribute to improving the offer of the Croatian nautical tourism and indirectly, the safety of navigation. Croatian Hydrographic Institute is the most appropriate public institution to collect, publish and update information.

Tide Gauge Network of the Hydrographic Institute of the Republic of Croatia

Čupić, Srđan; **Strinić, Goran**; **Mihanović, Hrvoje**; **Domijan, Nenad**;

Mipro 2011 - GVS, Proceedings; Petar Biljanović, Karolj Skala – 2011, p. 339-341 ISSN 1847-3938 ISBN 978-953-233-060-1

Sea level measurements at the tide gauge stations on the eastern Adriatic coast have been conducted for many years. Hydrographic Institute of the Republic of Croatia has modernized its tide gauge network by installing Thalimedes digital instrument. Communication with tide gauge stations is performed through GSM network. Data are collected automatically on a daily basis, but there is a possibility of more frequent data collecting in special situations, such as possible flooding of the coastal area, emergency meteorological situations, assessment of risk to people and their property, as well as scientific and technical investigations. First check of the data integrity (communication availability of tide gauge stations, time gaps sequences…) is automatically performed. If a problem occurs, the system warns administrators about possible errors. The analysed data are prepared to be displayed on the HHI website. The website is currently being designed and developed for the display of predicted and measured sea level heights on the eastern Adriatic coast, and the first results are presented in this paper. Tide gauge measurements and the data obtained from such measurements are important for the safety of navigation, marine construction works, the development of oceanographic models, and for the international data exchange.

Distributed System for Remote Wave Data Collection and Visualization as a Part of Operational Oceanography in Croatia

Strinić, Goran; **Čupić, Srđan**; **Domijan, Nenad**; **Leder, Nenad**; **Mihanović, Hrvoje**;

http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=5967069

Mipro 2011 - GVS, Proceedings; Petar Biljanović, Karolj Skala - 2011 (znanstveni rad, međunarodna recenzija, predavanje); str. 335-338 ISSN 1847-3938 ISBN 978-953-233-060-1

Hydrographic Institute of the Republic of Croatia has modernized its oceanographic equipment by obtaining DATAWELL DWR MKIII waverider, 0.7 m in diameter, with possibilities of measuring the wave height, direction and period. Waverider is placed in the survey area by laying it into the sea and anchoring it to the sea bottom. An anchored waverider has a certain freedom of motion. Because of the risk of losing the equipment, the HHI has developed the SMS system of alarm and graphic representation of the buoy motion in Google Earth™ application, which facilitates the buoy tracking and searching for a potentially lost buoy. The paper also describes communication technologies and methods of remote data collection and production of safety copies. Sensor of the wind speed and direction is usually installed when conducting wave measurements. By simultaneous collection of the waverider data and the wind direction and speed data, the correlation equations between parameters can be established for each location. The measured and analysed waverider data are essential input parameters for numerical models, also being important for designing coastal and marine structures, as well as for the safety of navigation at sea.

2012

Transport of dangerous substances in specific terms specialized agencies

Tadić, Joško; Bićanić, Zlatimir; **Pušić, Danijel**;

http://bib.irb.hr/prikazi-rad?&rad=628732

IMSC 2012 - 4. Međunarodna konferencija o pomorskoj znanosti / Mulić, Rosanda ; Gržetić, Zvonko ; Vidan, Pero ; Kuzmanić, Ivica (ur.). - Split

Transportation of hazardous substances can be done with various forms of transportation and the quality is determined by appropriate legal regulations. However, the transportation of hazardous cargo specifically, is significantly different from other modes of transportation. This paper aims to present some features in the transport of dangerous goods for this particular specialized service which could be used for the military, police, scientific research institutions, energy and other economic activities. The military component of NATO and all the corresponding parameters, for example, has means of transport, types of hazardous materials (packaging, marking, labeling), safety requirements, organization and control procedures during transport across national borders and more. Similar modes are used in most militaries.

Challenges of ECDIS Implementation

Bradarić, Željko;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 24 (2012)

The carriage requirement for ECDIS, as essential aid to navigation, has been put into effect since 1 July 2012 for certain types and sizes of ships. The introduction of any new device or system onboard requires certain preparatory activities by the competent administrations, ship owners and ship's crew. The contribution of ECDIS to safe and efficient navigation of vessels was confirmed in the perennial approval period. ECDIS as part of an integrated bridge system represents a revolutionary turnaround in the conduct of navigation as compared to the old way. Given the safety importance and the fact that ECDIS is not just a simple installation of a new hardware in order to meet statutory requirements, this paper analyzes and presents the specific activities of competent authorities, which should be implemented with the aim of successful implementation and use of ECDIS.

Detection and Elimination of Possible ECDIS Deficiencies

Bradarić, Željko;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 25 (2012)

Fitting out of ships with ECDIS began long before its mandatory implementation as from 1 July 2012. Despite a prerequisite of full reliability before introducing the carriage requirements for new shipborne navigational equipment, certain anomalies have been discovered during the use of ECDIC. It has been observed that some ECDIS systems, particularly those installed earlier, do not display properly the contents of ENCs, even significant navigational safety data in some cases. The problem is associated with the need for occasional updates of ECDIS software that could display more recent versions of ENCs. Competent international organizations have taken specific measures which should ensure the detection and elimination of identified deficiencies. This paper provides an overview of these measures, with an emphasis on the possibility and method of testing proper functioning of ECDIS. It also presents the results of tests carried out using the IHO test ENC cells.

Potrebe i mogućnosti uspostavljanja stalnog sustava mjerenja valova u Hrvatskoj

Mlinar, Marko; **Lakoš, Miro**; **Čupić, Srđan**; **Strinić, Goran**; **Domijan, Nenad**; **Leder, Nenad**; **Gržetić, Zvonko**;

http://www.duzs.hr/download.aspx?f=dokumenti/Clanci/Radovi_IV_Konferencija_HP.pdf

Četvrta konferencija Hrvatske platforme za smanjenje rizika od katastrofa, MMPI, Zagreb, prosinac 2012

Sea waves characteristics (height, direction, period, power ...) in the present time is measured around the world. Number of potential users of this information grows every day. Sometimes they need information about the wave climate (for the design of coastal structures, power plants, shipyards, etc.), or about the size of the wave at a certain location, and sometimes forecast wave heights (due to dangerous during extreme events, for example, estimates of banning navigation, closing port, rescue or daily planning of commercial navigation routes, passenger and tourist boats). Hydrographic Institute of the Republic of Croatia owns most of the necessary equipment (directional waveriders), has experience with measurements of waves over 30 years, and has experience on how to organize, maintain and manage a possible buoy network that would be established in the territorial waters of the Republic of Croatia and the international waters of the Adriatic Sea. The data obtained would be used for verification and calibration of wave forecasting models to improve safety of navigation at sea.

Development of graphic technology and advancement of publishing-and-printing activities of hydrographic organizations

Jeličić, Tonći; **Kasum, Josip**; **Pogančić, Milivoj**;

http://bib.irb.hr/prikazi-rad?&rad=602549

Zbornik sažetaka 16. medjunarodne konferencije tiskarstva, dizajna i grafičkih komunikacija / Mikota, Miroslav (ur.). Zagreb : Hrvatsko drustvo grafičara, 2012. 319-336

The publishing-and-printing is one of the basic activities of hydrographic organizations. To contribute towards the development and advancement, a number of professional and scientific papers have been published. The development of pre-press and reproduction technologies in the production of nautical charts and publications, as well as the consequent upgrading of publications in publishing terms, is a significant contribution towards enhancing the safety of navigation.

Accuracy of coordinate transformations in GIS and AIS systems - Example of the Adriatic Sea

Duplančić Leder, Tea; **Leder, Nenad**;

http://bib.irb.hr/prikazi-rad?&rad=584070

4th International Maritime Science Conference, Book of Proceedings / Rosanda Mulić, Gržetić, Zvonko, Pero Vidan, Ivica Kuzmanić (ur.). Split, Croatia : Faculty of Maritime Studies Split,, 2012. 174-178

Modern GPS equipment for geodetic coordinates position fixing is based upon worldwide used satellite positioning methods and it gives position on the global WGS datum. In the Republic of

Croatia topographic maps and nautical charts have been produced on the local Helmannskoegel datum and Bessel rotational ellipsoid. The world market offers a large number of software packages which calculate transformations from the local to the global datum, some of them being free and available on the internet. Reference geodetic coordinates shown on different datums may result in a position error of some hundred metres. Mathematical conversion of a geodetic position from one datum to another is called transformation. Among several models of transformation between the two datums, the following ones are usually used: seven-parameter also called Helmert transformation and three-parameter or Molodensky transformation. All available GIS and AIS systems mainly used two programs for coordinate transformation: PCTrans developed by Netherlands Hydrographic Service, and Geotrans - Geographic Translator, developed by the US Army Topographic Centre and National Geospatial Intelligence Agency. In this article we would estimate accuracy and usability of the programs for transformation of geodetic coordinates between local and global datums, used in GIS and AIS systems.

Integration of land and marine spatial data on the Croatian coastline

Leder, Nenad; **Duplančić Leder, Tea**;

http://bib.irb.hr/prikazi-rad?&rad=584068

4th International Maritime Science Conference, Book of Proceedings / Rosanda Mulić, Gržetić, Zvonko, Pero Vidan, Ivica Kuzmanić (ur.). Split : Faculty of Maritime Studies Split, 2012. 179-185

Every maritime country has its coastal zone, which is differently defined in terms of different professions. As a physical-geographical term, coast is a part of the land in occasional contact with the sea. Coast is therefore not a line but a belt, either wider or narrower, depending on the slope of the land and the range of sea level oscillations. Because of the sea-land interaction in the coastal belt, the spatial data in that area are interconnected, usually being examined, represented or used together. Boundary between the sea and land, as shown on nautical charts and topographic maps, is not the coast but the coastline. Land data (State Geodetic Administration) and marine data (Hydrographic offices) are usually represented by means of different coordinate systems, different projections, different datums (horizontal and vertical) and differents scales, to show different contents. As a result, users are not able to refer to the required object in the coastal area in a simple and consistent way. The national spatial data infrastructure (NSDI) should therefore (like in other countries) integrate land data with marine data, defining the marine spatial data infrastructure (MSDI). Integration of the land and marine data is becoming a serious problem for many countries, and just a few of them have solved it , each in its own way. This paper presents the activities of the Hydrographic Institute of the Republic of Croatia on the integration of the land and marine spatial informations and the possibilities of its implementation in Croatia.

Characterization and distribution of organic matter using specific physico-chemical methods: a case study of the southeast Adriatic continental and shelf slope (Albania)

Plavšić, Marta; Strmečki, Slađana; Dautović, Jelena; Vojvodić, Vjeročka; **Olujić, Goran**; Ćosović, Božena;

http://bib.irb.hr/prikazi-rad?&rad=575781

Continental shelf research. 39-40 (2012) ; 41-48

In May 2009, we characterized the organic matter in the area where Albanian shelf riverine plume waters enter the Southern Adriatic Pit region. Due to stable weather and hydrological conditions at the time of sampling a longitudinal termal front was present around the Albanian shelf break. Our measurements point to the imput of inorganic nutrients, including phosphorus (average P-PO4 concentration was 0.71 µg/L) and nitrogen (average as total inorganic nitrogen (TIN) concentration was 25.33 µg/L) due to the intrusion of Levantine Intermediate Water (LIW) through the Otranto Strait. The input of LIW brings high salinity (~38.7) water that is poor in organic matter content. Low concentrations of dissolved organic carbon (DOC) (0.7mgC/L) and particulate organic carbon (POC) (0.06mgC/L), surface active substances (SAS) (in the range from 0.025 to 0.078 mg/L eq. Triton-X-100) and copper complexing capacity (CuCC) (24 nmolCu2+/L) were measured in the area. All the values for DOC, POC, SAS and CuCC were significantly lower in the Albanian coastal waters than in the North Adriatic. The measurable influence of the inflowing Albanian rivers was observed from the inverse dependance of the DOC concentrations and salinity data. The Albanian rivers contribute to the elevated nutrient concentrations especially those of silicate, which displayed concentrations up to 380 µg/L in the shallowest coastal station.

Numerical modelling of an oil spill in the northern Adriatic

Lončar, Goran; **Leder, Nenad**; Paladin, Marin;

http://www.iopan.gda.pl/oceanologia/54_2.html#A2

Oceanologia 2012, no. 54(2), pp. 143-173 doi: http://dx.doi.org/10.5697/oc.54-2.143

Hypothetical cases of oil spills, caused by ship failure in the northern Adriatic, are analysed with the aim of producing three-dimensional models of sea circulation and oil contaminant transport. Sea surface elevations, sea temperature and salinity fields are applied as a forcing argument on the model's open boundaries. The Aladin-HR model with a spatial resolution of 8 km and a time interval of 3 hours is used for atmospheric forcing. River discharges along the coastline in question are introduced as point source terms and are assumed to have zero salinity at their respective locations. The results of the numerical modelling of physical oceanography parameters are validated by measurements carried out in the "Adriatic Sea monitoring programme" in a series of current meter and CTD stations in the period from 1 January 2008 to 15 November 2008.

The oil spill model uses the current field obtained from a circulation model. Besides the convective dispersive transport of oil pollution (Lagrangian model of discrete particles), the model takes into account a number of reactive processes such as emulsification, dissolution, evaporation and heat balance between the oil, sea and atmosphere. An actual event took place on 6 February 2008, when the ship "Und Adriyatik" caught fire in the vicinity of the town of Rovinj (Croatia) en route from Istanbul (Turkey) to Trieste (Italy). At the time the fire broke out, the ship was carrying around 800 tons of oil. Thanks to the rapid intervention of the fire department, the fire was extinguished during the following 12 hours, preventing possible catastrophic environmental consequences. Based on this occurrence, five hypothetical scenarios of ship failure with a consequent spill of 800 tons of oil over 12 hours were analysed. The main distinction between the simulated scenarios is the time of the start of the oil spill, corresponding to the times when stronger winds were blowing (> 7 m/s) with a minimum duration of 24 h within the timeframe. Each scenario includes a simulation of oil transport for a period of two months after the beginning of the oil spill. The results show that the coastal belt between the towns of Porec and Rovinj is seriously exposed to an oil pollution load, especially a few days after a strong and persistent bora (NE wind).

Complementary facilities of nautical tourism port - what Nautical Tourism expects?

Kovačić, Mirjana; **Favro, Srećko**;

http://bib.irb.hr/prikazi-rad?&rad=575106

Complementary facilities of Nautical Tourism port - what Nautical Tourism expect?; 1st Belgrade International Tourism Conference; Belgrade, Serbia,2012; ISBN:978-86-82371-35-9

Nautical tourism is one of the selective forms of tourism that rise in the last thirty years on the foreign market as well as on domestic market. There are more and more advocates of this form of tourism mostly coming from developed countries as this form of tourism is mostly used by people having medium and high standard. In favour of that thesis is the fact that a boater during one entering the port with the yacht spends as much as 30 “ordinary” tourists. Due to that fact many countries are starting to develop nautical tourism, especially the one on rivers. Croatia, as one of maritime countries with great number of islands, has great possibilities for further development of that form of tourism. Nautical tourists nowadays has more and more demands, they expect clean see, the best organisation in nautical tourism port, but also the best food and drink, and many different activities and other special facilities for their pleasure. Authors in this paper research basic and complementary facilities that nautical tourism ports offer, define which of them the important ones are and which one are the additional ones. They also research the level of quality that has to be satisfied to attract yachters out of season as well. The purpose of this paper is to analyse the offer made by three marinas: Croatian, Italian and Spanish marina and present received results. The aim of the research is to define the role and quality of facilities of business operations of a nautical tourism port, and as a holder of the development of nautical tourism and element of integral management of maritime domain.

2013

Protection and Risks of ENC Data regarding Safety of Navigation

Kos, Serđo; **Pušić, Danijel**; Brčić, David;

http://bib.irb.hr/prikazi-rad?&rad=633676

Advances in Marine Navigation, 2013, Marine Navigation and Safety of Sea Transportation, 165-170, znanstveni

In accordance with SOLAS Convention amendments concerning navigational equipment (Chapter V: Safety of Navigation ; Regulation 19: Carriage Requirements for Shipborne Navigational Systems and Equipment), ECDIS (Electronic Chart Display and Information System) and ENCs (Electronic Navigational Chart) should be implemented on existing and new built cargo and passenger vessels. This process started with 1st of July 2012. In accordance with amendments, the number of vessels which should and/or must carry ECDIS equipment onboard increases significantly. It applies both on national and world fleet vessels, depending from their size and type. With the objective to protect the official electronic navigational charts, the International Hydrographic Organization adopted the security plan and standards of data protection have been accepted (IHO Data Protection Scheme: Standard S- 63, edition 1.1.1). With present, increasing expansion of internet-based communications, computer users (that could be unqualified and, even more important, unauthorized persons) are allowed to access ENC software and official electronic charts in various ways, thereby opening the possibility/opportunity of abusive actions. The proposed paper structurally analyzes the usage and security implications of mentioned, illegal software. Illegal ENC security issues are discussed in the context of safety-of-navigation related possible – real scenarios using unproven and non-validated electronic navigational charts.

Quality testing of navigational charts reproduced in Ink-Jet technology

Pogančić, Milivoj; **Mušura, Igor**; **Sarajlić, Emin**;

Zbornik radova 17. međunarodne konferefncija tiskarstva, dizajna i grafičkih komunikacija "Blaž Baromić 2013." / Mikota, Miroslav (ur.). Zagreb, Senj : Hrvatsko društvo grafičara, 2013. 421-433

The development of graphics technology enabled hydrographic organisations to apply new reproduction techniques in their publishing and printing activities. Thus, besides offset printing, ink-jet technology has also been recently used in the production of official navigational charts. The use of ink-jet technology started after the researches in meeting the specific publishing requirements and conditions of use of navigational charts. However, when series production started, a number of technical deficiencies were observed that throw into doubt further use of such technology for the purpose. In this paper, the authors study the observed technical flaws. After studying the quality and stability of the print, measurements of chart dimensions were also completed. The authors also analyse the impact of printing technology and cartographic paper, application software used in cartographic processing of the charts, the impact of printing files format and the impact of resolution to the quality of printing. As a conclusion, a comparison with offset charts has been made and the obtained results discussed.

Development of publishing activities of hydrographic organizations

Jeličić, Tonći; **Gržetić, Zvonko**; **Kasum, Josip**;

http://bib.irb.hr/datoteka/666151.Jelicic_et_al._2013.docx

Zbornik radova 17. međunarodne konferefncija tiskarstva, dizajna i grafičkih komunikacija "Blaž Baromić 2013." / Mikota, Miroslav (ur.). Zagreb, Senj : Hrvatsko društvo grafičara, 2013. 136-145

Hydrographic organizations print and publish official nautical publications, basically classified as nautical charts and navigational handbooks. The development of printing technology has enabled “Print On Demand“ method in publishing activity, “Chart On Demand” in the production of nautical charts and “Book On Demand” in the production of navigational handbooks. Electronic charts - ENC have been in common use recently for SOLAS (Safety of Life at Sea) ships which use ECDIS ship systems. The development of electronic navigational handbooks or “e- handbooks” is expected for NON-SOLAS ships . In addition to reviewing the past methods of production, this paper also gives a concept of the development of the publishing activity of hydrographic organisations.

Spatial distribution of lead in surface and deep sediments of the semi-enclosed bay influenced by the anthropogenic activity (Kastela Bay, Croatia)

Lovrenčić Mikelić, Ivanka; **Škaro, Krunoslav**;

29th International Conference of the Society for Environmental Geochemistry and Health

The area around the Kastela Bay is heavily exposed to anthropogenic activities representing the sources of contaminants to the bay. We studied the spatial distribution of lead in the sediments at three depths (0–5 cm, 5–10 cm, 40–50 cm), to determine i) whether lead disperses in the bay or it accumulates on the localized sites and ii) to establish the sediment condition regarding pollution. Samples were collected on 95 sampling stations disposed in a regular grid covering the bay. Lead concentrations were measured by the energy dispersive X-ray fluorescence technique. Enrichment factors were calculated to differentiate natural and anthropogenic origin of lead. The reference element was aluminium and the reference material was the unpolluted, preindustrial sediment from the Kastela Bay. The degree of sediment pollution was also assessed using geoaccumulation indices and comparing lead concentrations with recommended values of the sediment quality guidelines. Maps of lead concentrations, enrichment factors, and geoaccumulation indices were presented. Lead concentrations were in the range <1.6–142 mg/kg. Maximum content was higher than the upper limit of guidelines recommended values (30.2 mg/kg or 50 mg/kg). Mean values of enrichment factors were in the range 3.5–6.9 and the maxima in the range 23–68, suggesting the presence of lead from anthropogenic sources. Mean values of the geoaccumulation indices were in the range -0.065–1.6 and maxima in the range 3.9–5.4. This points to very polluted to extremely polluted sediment levels. The east part of the bay is the most polluted one. The area of polluted sediments increases with decreasing sediment depth. Lead distribution was found to depend on sediment grain size, sampling depth, and location of point pollution sources. Lead is generally dispersed in the Kastela Bay but accumulates only on a few sites.

Assessing meteotsunami potential of high-frequency air pressure oscillations observed in the middle Adriatic

Vilibić, Ivica; **Mihanović, Hrvoje**; Charrayre, Francois;

http://link.springer.com/article/10.1007/s11069-013-0865-x

High-resolution air pressure series collected from a triangle of middle Adriatic microbarograph stations between April 2009 and March 2011 have been analysed to extract the rapid pressure changes normally found during meteotsunamis. Five-minute air pressure tendencies were used to

detect an event. Wavelet and cross-wavelet analysis showed that the energies of high-frequency pressure changes that occurred during the warm part of the year were an order of magnitude higher than those that occurred during the cold part of the year. Coherence between stations was normally found at periods longer than 1 h, while air pressure disturbances were dispersive and not coherent at shorter periods. This implies that the disturbances had little to no potential to generate meteotsunamis in the middle Adriatic area, as the eigenoscillations in bays and harbours of the region are over timescales of minutes up to a few tens of minutes.

Impact of the global warming on ship navigation in polar area

Galić, Stipe; Lušić, Zvonimir; **Pušić, Danijel**;

http://bib.irb.hr/datoteka/628779.IMSC_2013_Book_of_Proceedings_Rad.pdf

5th International Maritime Science Conference-Book of Proceedings / Vidan, Pero ; Gržetić, Zvonko ; Skočibušić Bukljašić, Mihaela (ur.). Split : Faculty of maritime Studies Split, 2013. 140-154 (predavanje,međunarodna recenzija,objavljeni rad,znanstveni).

Generally, navigating in polar areas has always been one of the most dangerous voyages. The main reason for the increased risk derives from ice, but also from the other unfavorable navigation conditions that occurs in the high northern and southern latitudes, for example: very low temperatures, ice-covered coastlines, sparse population, inability to escape from danger, difficult communication and positioning etc. So far, maritime traffic in area of high latitudes has been relatively small, and the main reason for this can be found in the absence of major ports in this region, and in the inability to use certain routes because of ice. However, significant changes are happening in the last few years, and those changes have announced a brand new role of polar areas in terms of new main routes for merchant ships, especially in Arctic area. These changes have occurred as a result of the increasing exploitation of mineral resources in the polar areas, the exploiting of fish stocks, development of tourism, military and political objectives, etc., including the development of modern technologies that enables us to use, and the people that are living and working in extreme polar conditions. All this is further encouraged by global warming and consequent melting of ice. Precisely, the melting of ice has opened the possibility of using new routes for ships, which today represents completely new challenges for the global shipping industry. This article handles the basic geographical and climatological characteristics of polar areas, maritime transport, and the impact of global warming on the possibility of opening new routes, including existing and upcoming changes in legal regulations for maritime navigation in this area. Special emphasis will be given to the new demands which are being placed in front of crew that are sailing in area of high latitudes.

Exceptional dense water formation on the Adriatic shelf in the winter of 2012.

Mihanović, Hrvoje; **Vilibić, Ivica**; Carniel, Sandro; Tudor, Martina; Russo, Aniello; Bergamasco, Andrea; Bubić, Nikola; Ljubešić, Zrinka; Viličić, Damir; Boldrin, Alfredo; Malačić, Vlado; Celio, Massimo; Comici, Cinzia; Raicich, Fabio;

http://dx.doi.org/10.5194/os-9-561-2013

Ocean science. 9 (2013) ; 561-572

In this paper we document dense water formation throughout the Adriatic shelf and coastal area in January/February 2012, resulting in record- breaking densities observed during and after the event. The unprecedented dense water generation was preconditioned by a dry and warm year which resulted in a significant reduction of coastal freshwaters, superimposed on a long-term basin- wide salinity increase. The final event that triggered the dense water formation was an extended period of cold weather with strong and severe winds. Record-breaking potential density anomalies (above 30 kg m−3) were measured at several formation sites. Accumulated surface net heat and water losses in some coastal regions exceeded 1.5 GJ m−2 and 250 kg m−2 over 21 days, respectively. Excessiveness, importance of shelf- type dense water formation and effects on the thermohaline circulation and deep aquatic systems are discussed.

Observing the bottom density current over a shelf using an Argo profiling float

Vilibić, Ivica; **Mihanović, Hrvoje**;

http://dx.doi.org/doi:10.1002/grl.50215

Geophysical research letters. 40 (2013) ; 910-915

Pressure, temperature, and salinity data collected during the winter of 2011/2012 by an Argo profiling float over the Adriatic shelf were used to document the dense water formation and subsequent bottom density current (BDC) normally occurring along the shelf slope. The float was advected to the Jabuka Pit and neighboring shallow area (<275 m) after October 2010. The parking depth was set to approximately 150m, enabling the float to mostly follow the seabed between December 2011 and July 2012. The profiler measured strong spatial-temporal changes in the BDC thickness (from a few to about 50 m) and the bottom density (between 29.46 and 29.88 kg/m3). These observations show that an Argo float has the capability to observe a bottom density current and suggest that it would be possible to systematically use such floats to investigate these processes on coastal shelves.

The Objectives, Content, and Regulatory Framework of the Hydrographic Service

Bradarić, Željko; **Radić, Emil**;

Kapetanov glasnik, stručni časopis Udruge pomorskih kapetana Split, br. 26 (2013)

Hydrographic service is a set of activities that are systematically and continuously carried out by national hydrographic offices or other government authorized institutions. The main objective of the hydrographic service is to ensure the availability of hydro-navigational information, which is directly related to safety of navigation, to its end users, i.e. mariners. Hydrographic service is organized and operates as an ongoing activity 24/7/365. With regard to the safety aspect of service, the existence of an appropriate regulatory framework is important for its establishment and operation. Since the times of crisis imposes review of the need for existence of various agencies, institutions and departments, including those whose work ensures the functioning of the hydrographic service, this paper presents the objectives, content and regulatory framework of the hydrographic service in order to argue for the need for its existence and improvement.

Mapping the underwater sound noise and assessing its sources by using a Self-Organizing Maps method

Rako, Nikolina; **Vilibić, Ivica**; **Mihanović, Hrvoje**;

http://dx.doi.org/10.1121/1.4789003

The Journal of the Acoustical Society of America. 133 (2013) , 3; 1368-1376

The study aims to provide an objective mapping of the underwater noise and its sources over an Adriatic coastal marine habitat by applying the Self–Organizing Maps (SOM) method. Systematic sampling of Sea Ambient Noise (SAN) was carried out at ten predefined acoustic stations between 2007 and 2009. Analyses of noise levels were performed for 1/3 octave band standard centered frequencies in terms of instantaneous Sound Pressure Levels averaged over 300 s to calculate the equivalent continuous Sound Pressure Levels. Data on vessels' presence, type and distance from the monitoring stations were also collected at each acoustic station during the acoustic sampling. Altogether 69 noise surveys were introduced to the SOM predefined 2×2 array. The overall results of the analysis distinguished two dominant underwater soundscapes, associating them mainly to the seasonal changes in the nautical tourism and fishing activities within the study area and to the wind and wave action. The analysis identified recreational vessels as the dominant anthropogenic source of underwater noise, particularly during the tourist season. The method demonstrated to be an efficient tool in predicting the SAN levels based on the vessel distribution, indicating also the possibility of its wider implication for marine conservation.

2014

Highlights from the fifth Extraordinary of the IHO Conference

Bradarić, Željko;

http://upks.hr/glasnik_br29.pdf

“Captain's Herald”, Professional Journal of the Master Mariners Association – Split, No. 29/201, (professional paper)

Fifth Extraordinary Conference of the International Hydrographic Organization took place in Monaco from 6 to 11 October this year. Extraordinary, because it was held between two five-year cycles of ordinary IHO Conferences to discuss and decide on issues which cannot wait to be addressed at the next ordinary 2017 Conference. This Conference will be remembered for the greatest number of participants so far, especially representatives of other partner organizations, particularly for the number and activities of the private hydrographic sector representatives and end users. This paper gives an overview of the most important topics on the agenda of the 5th Extraordinary IHO Conference, with special reference to the prominent appearance and actions of the private hydrographic sector representatives. It also presents the positions of Croatia on the most important official Conference proposals.

Overview of Standards for Electronic Navigational Charts

Lovrinčević, Dejan; Kljajić, Ivka;

http://bib.irb.hr/prikazi-rad?&rad=713563

Naše more : znanstveni časopis za more i pomorstvo. 61 (2014) , 3-4; 52-59

In the early 1980s, with the rapid development of geospatial technologies the development of Electronic Navigational Charts – ENC began. With a heavy emphasis on data security, because of its navigational purpose, the implementation of ENC was approached very cautiously. One of the key features of every product, which enables easier global use, is its standardization. The paper provides basic information related to the ENC and by studying all editions of publications for ENC, the reports of the Working groups of the International Hydrographic Organization – IHO and articles that followed the implementation process of ENC standards an overview of ENC standards is given, with the focus on two basic standards published in S-57 and S 52 publications. Also described is a new, currently under construction, standard for ENC (S-100) and the prediction of the future development guidelines with the concept of e-Navigation in mind.

Cryptophyte bloom in a Mediterranean estuary: High abundance of Plagioselmis cf. prolonga in the Krka River estuary (eastern Adriatic Sea)

Šupraha, Luka; Bosak, Sunčica; Ljubešić, Zrinka; **Mihanović, Hrvoje**; **Olujić, Goran**; Mikac, Iva; Viličić, Damir;

https://bib.irb.hr/prikazi-rad?&rad=716763

Scientia marina. 78 (2014) , 3; 329-338

During the June 2010 survey of phytoplankton and physicochemical parameters in the Krka River estuary (eastern Adriatic Sea), a cryptophyte bloom was observed. High abundance of cryptophytes (maximum 7.9×106 cells l–1) and high concentrations of the class-specific biomarker pigment

alloxanthine (maximum 2312 ng l–1) were detected in the surface layer and at the halocline in the lower reach of the estuary. Taxonomical analysis revealed that the blooming species was Plagioselmis cf. prolonga. Analysis of the environmental parameters in the estuary suggested that the bloom was supported by the slower river flow as well as the increased orthophosphate and ammonium concentrations. The first record of a cryptophyte bloom in the Krka River estuary may indicate that large-scale changes are taking place in the phytoplankton community. Such changes could have a major impact on the natural ecosystem dynamics and the mariculture production in the area.

Cartographic Boundary and a Zigzag Charting Concept

Bradarić, Željko;

http://www.upks.hr/glasnik_br28.pdf

“Captain's Herald”, Professional Journal of the Master Mariners Association – Split, No. 28/2014

International Hydrographic Organization (IHO), being faced with a slow resolving of the problem of overlap between electronic navigational charts (ENC), proposes certain amendments to some of its documents. One of them is to introduce the term and definition of the cartographic boundary and a zigzag concept in the defining and plotting of that boundary. This paper gives a brief description of the ENC overlap problem and lists the measures taken to resolve the problem, with special reference to the IHO proposal. The paper also presents arguments and proposes alternative solutions to the IHO proposal of establishing a cartographic boundary.

Fishing Ports in Croatia - Public or Private Ports

Vojković, Goran; Grubišić, Neven; **Vojković, Lea**;

http://hrcak.srce.hr/file/178146

Pomorski zbornik (0554-6397) 47-48 (2013), 1; 205-213;

This paper deals with fishing ports in the Republic of Croatia, which are usually categorized as ports of special assignment. The paper shows that the actual, long established division of ports into those open to public transportation and ports of special assignment does not suit the level and the requirements of economic development of the Republic of Croatia any more ; particularly after Croatia's integration to the European Union. By bringing the public service offered by a port into the same line with its assignment (general assignment - port open for public transportation ; special assignment - port not open for public transportation), port's economical development becomes limited and the implementation of basic market principles of the European Union difficult. Using fishing ports as an example, the paper suggests modernization of the basic port division within the Croatian legal frame. Basically, port categorization should differentiate between public and private ports, in dependence on the service they provide.

Geospatial data in Marine SDI service

Duplančić Leder, Tea; **Leder, Nenad**; Tavra, Marina;

http://bib.irb.hr/prikazi-rad?&rad=695412

6th International Maritime Science Conference / Vidan, Pero ; Twrdy, Elen ; Leder, Nenad ; Mulić, Rosanda (ur.). - Split : FACULTY OF MARITIME STUDIES SPLIT , 2014. 465-469.

The knowledge of spatial data is necessary for a large number of human activities. A Spatial Data Infrastructure (SDI) is a data infrastructure implementing a framework of geographic data, metadata, users and tools that are interactively connected. In Croatia much has already been written about SDI, but primarily from land-based perspective. In this paper marine dimension of SDI (MSDI) that encompasses marine geographic and business information in its widest sense is described. It is pointed out that hydrography, as modern applied science, plays very important role in measurements and description of oceans and seas. Hydrographic spatial data forms the key base reference layer for the sea space in MSDI data. There are a large number of MSDI stakeholders. MSDI should be established according global, regional and national conventions and policies.

Resonant excitation of island-trapped waves in a shallow, seasonally stratified sea

Mihanović, Hrvoje; Beg Paklar, Gordana; Orlić, Mirko;

http://www.sciencedirect.com/science/article/pii/S0278434314000272

Continental shelf research. 77 (2014) ; 24-37

Analysis of oceanographic data collected during 2006 in the eastern Adriatic Sea indicated the presence of large internal waves (with a maximum range of about 30 m) at the diurnal frequency around the island of Lastovo. The amplitude ratio and phase difference between diurnal surface tides and diurnal isotherm fluctuations changed considerably between pronounced internal wave episodes, depending on stratification properties, thus suggesting possible resonant excitation of internal oscillations. On the contrary, no significant diurnal thermocline fluctuations were observed at two other islands (Biševo and Sušac). Theoretical analysis presented here focused on the trapping of long-period internal waves around a circular island corresponding to Lastovo and confirmed that stratification properties during the summer of 2006 around the island were close to resonant ones. The analysis also showed that Biševo and Sušac are too small to support diurnal near-resonant excitation. Application of a numerical model for the current flow around equivalent circular and elliptical islands in the stratified sea provided more details on resonant excitation. Theoretical and numerical modeling results particularly emphasized the importance of island dimensions, stratification properties (pyconocline depth and density defect) and the periodicity of the forcing. Furthermore, idealized numerical simulations demonstrated that the waves trapped at Lastovo behave as the gravest azimuthal mode of internal Kelvin-like waves, revolving in a clockwise direction around the island, and that the eccentricity of the island has almost no effect on the resonant period.

2015

Nautical tourism and analysis of marinas, boat and yacht traffic in Split - Dalmatia County

Galić, Stipe; Lušić, Zvonimir; **Pušić, Danijel**;

17th International Conference on Transport Science – ICTS 2015, Conference proceedings / Marina Zanne, Patricija Bajec, Pero Vidan (ur.). Portorož : Fakulteta za pomorstvo in promet, Portorož, 2015. 62-73 (predavanje, međunarodna recenzija, objavljeni rad, znanstveni).

Nautical tourism is one of the most competitive Croatian products. The development of nautical tourism ports in terms of macro-economic strategic plans are of significant national interest for Croatia. The nautical tourism in Croatia is becoming increasingly important, but it still does not achieve an adequate material profit considering its potential. The problem is that the current development does not have a clear concept, which leads to non-selectivity in the development and has negative environmental impacts. This article deals with statistical data referring to the selected area and the marina management in Split-Dalmatia County. Also, the analysis of boat and yacht traffic in nautical tourism within the specified area along the main and local navigation routes within Split- Dalmatia County will be presented. This article provides an overview on security measures, guidelines for listed nautical marinas as well as the implementation of the Blue Flag marina criteria.

Spectrophotometric determination and multivariate analysis of nutrients in the Zrmanja estuary

Buljac, Maša; **Olujić, Goran**; Bralić, Marija; Periš, Nenad; Čurlin, Mirjana;

http://bib.irb.hr/prikazi-rad?&rad=763023

In this work are presents, for the first time, spectrophotometric determination and detailed analysis of spatial and seasonal distribution of nutrients in the Zrmanja estuary. For the study period were obtained the average concentrations of nutrients: for orthosilicate from 7.98-12.35 mmol/m3, for nitrites 0.11-0.12 mmol/m3, for nitrates 5.81-11.27 mmol/m3, for ammonia 0.75-1.57 mmol/m3 and for orthophosphate 0.03-0.07 mmol/m3. The highest concentrations of orthosilicate and nitrate were recorded during the increased river flow. Phosphorous was the limiting element in the Zrmanja estuary, while the concentrations of orthophosphate through all four seasons were lower than 0.1 mmol/m3. The relationship between determined parameters was established using the multivariate analysis (Spearman's correlation coefficient and Cluster analysis). The purpose of this study is to demonstrate the influence of the sea on the distribution of the determined parameters and their impact on the ecosystem in oligotrophic estuary.

2016

ECOLOGICAL QUALIFICATION OF ISLAND VIS COASTAL WATERS ACCORDING TO THE TROPHICAL TRIX INDEX

Buljac, Maša; **Olujić, Goran**; Bralić, Marija; Buzuk, Marijo; Vladislavić, Nives; Čurlin, Mirjana;

4th International Symposium of Environmental Management-Towards Circular Economy / Katančić zvonimir, Koprivanac Natalija, Lončarić Božić Ana, Kušić Hrvoje and Hrnjak-Murgić Zlata (ur.). Zagreb: Universitiy of Zagreb, Faculty of Chemical Engineering and Technology, 2016. str. 46-46

The eutrophication of coastal waters is considered to be one of the greatest threats to the health of marine ecosystems. It is described as a change in the marine food web connected to the seawater enrichment by nutrients, which can modify the carbon pathways and excessive oxygen consumption [1]. Eutrophication can happen in natural mechanisms, but also in anthropogenic influences. Natural eutrophication happens because of the increase in biological resources in an ecosystems, which is a positive appearance. Anthropogenic eutrofication is caused by irregular outcome of urban waste waters that can affect negatively on the natural balance of the ecosystem. In this investigation trophic index (TRIX) has been used to assess the ecological status of the island Vis coastal waters. The trophic index TRIX was developed by Vollenweider in 1998 for the coastal area of Emilia-Romagna (northern Adriatic Sea), and was exploited by Italian legislation to characterize the trophic state of coastal waters [1]. The TRIX index is an logarithmic formula of four state variables, which are directly related to productivity: chlorophyll-a (Chl, μg/L), oxygen as the absolute percentage deviation from oxygen saturation (DO, %), and nutritious compounds such as dissolved inorganic nitrogen (DIN, μg/L) and total phosphorous (TP, μg/L). The sea water samples were collected for four seasons of 2015 year, at standard depths (5, 10, 20, 30, 50, 75, 100 m) using a Nensen sampler. Trix calculated value based on the data obtained at the investigation station, range from 1.76 to 3.23. According to obtained TRIX values (< 4) sea water at investigation station is generally oligotrophic.
[1] E. Fiori et al., Nat. Hazards Earth Syst. Sci. doi:10.5194/nhess-2016-69, 2016.

Public and Private Ports in Croatian Law

Vojković, Goran; Grubišić, Neven; **Vojković, Lea**;

http://www.fpz.unizg.hr/traffic/index.php/PROMTT/article/view/1819/1447

Public and Private Ports in Croatian Law. // Promet - Traffic & Transportation. 28 (2016) , 3; 215-224

Existing classification of the Croatian seaports does not fit the level and meet the needs of the economic development of the Republic of Croatia, particularly after the Republic of Croatia joined the European Union. Equalizing public service offered by a port with the purpose of the port itself (general purpose – port open for public traffic, special purpose – port not open for public traffic) limits the economic development and aggravates the implementation of the basic market policies of the EU. Therefore, modernisation of the basic classification of ports in the Croatian legislation is suggested. Basic categorization of ports should be as follows: public service ports, private service ports and private ports for private needs of an entrepreneur.

2017

Trophic index (TRIX) at selected stations of Central and South Adriatic

Jerončić, Ana; Buljac, Maša; **Olujić, Goran**; Bralić, Marija; Buzuk, Marijo; Čurlin, Mirjana;

http://25hskiki.org

25. HRVATSKI SKUP KEMIČARA I KEMIJSKIH INŽENJERA s međunarodnim sudjelovanjem / Ana Šantić, Marijana Đaković (ur.). Zagreb : HKD, 2017. 233-233

As one of the indicators related to the marine ecosystem condition in the National list of indicators, trophic index (TRIX) is included [1]. The TRIX index is a logarithmic formula of four state variables, which are directly related to productivity: chlorophyll-a (Chl, mg/L), oxygen as the absolute percentage deviation from oxygen saturation (DO, %), and nutrient salts such as dissolved inorganic nitrogen (DIN, mg/L) and total phosphorous (TP, mg/L). The trophic index TRIX was developed by Vollenweider in 1998 for the coastal area of Emilia-Romagna (northern Adriatic Sea) [2] and it has been used in this research. Accordingly, sea water can be classified on a scale from 0 to 8, based on degree of eutrophication as: oligotrophic (0-4) ; mesotrophic (4-5) ; eutrophic (5-6) and extremely eutrophic (6-8). In this research trophic index (TRIX) has been used to assess the ecological status of coastal area of Southern and Central Adriatic. Data were obtained from two coastal stations (Dubrovnik-station A1 and Kaštela Bay-station A2) characterized by large loadings on the ecosystem (excessive of nutrient intake through wastewater, agriculture, industrial water etc.) and from another two coastal stations with less loadings on ecosystem (Podstrana-station A3 and Pelješac peninsula station A4). As reference stations, those located at the open sea (R1, R2 i R3). TRIX calculated value based on the data obtained at the research station, range from 2.80 to 3.60. According to obtained TRIX values (< 4) sea water at research station can be classified as oligotrophic.

Multigene phylogeny and morphology of newly isolated strain of Pseudo-nitzschia mannii Amato & Montresor (Adriatic Sea)

Marušić, Eli; Grbin, Dorotea; Pfannkuhen, Martin; Babić, Ivana; Mejdandžić, Maja; **Mihanović, Hrvoje**; Marić Pfannkuchen, Daniela; Godrijan, Jelena; Peharec Štefanić, Petra; **Olujić, Goran**; Ljubešić, Zrinka;

Diatom research. 32 (2017) , 1; 127-131

An increasing number of cryptic and pseudo-cryptic species have been found within many newly described diatom species. To resolve the phylogenetic relationships of the genus Pseudo-nitzschia, molecular markers are being widely used in combination (or separately) with different morphological characters. Sequence analysis of ribosomal DNA markers (18S, ITS and 28S) and morphological analyses of Pseudo-nitzschia mannii strain (CIM_D-4), isolated from the Telaš´cica Bay (Adriatic Sea), differentiate it from all other currently reported strains of this species.

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