

MARINE RESEARCH IN MODERN LAW OF THE SEA LOSC and Reality

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Abstract

Marine Research has proved to be one of the most controversial legal topics in terms of practice. While Law of the Sea Convention (LOSC) contains a special Part (XIII) on Marine Scientific Research, it fails to regulate topics of dual, ambiguous and/or evolving content. The current paper makes an inquiry into those topics (e.g. Military Surveys, Marine Archaeology, Remote Sensing) and tries to identify problems or gaps. These activities can have an extremely large footprint as they are connected with State and financial interests. The consequences of allowing marine research activities to proceed without solid rules could be grave. It is of extreme importance that each of the activities mentioned in this paper should have a clear set of rules of conduct.



Résumé

La recherche marine s'est révélée comme l'une des questions juridiques les plus controversées dans la pratique. Tandis que la Convention sur le droit de la mer contient une partie spéciale (XIII) sur la recherche scientifique marine, elle ne parvient pas à régler des questions dont le contenu est double, ambigu et/ou en évolution. Le présent article expose une investigation de ces sujets (par exemple les levés militaires, l'archéologie marine, la télédétection) et essaie d'identifier les problèmes ou les lacunes. Ces activités peuvent avoir des répercussions très importantes étant donné qu'elles sont liées à des intérêts nationaux et financiers. Le fait de permettre la poursuite des activités de recherche marine sans règles solides pourrait entraîner des conséquences graves. Il est extrêmement important que chacune des activités mentionnées dans le présent article devrait posséder un ensemble de règles de conduite claires.



Resumen

La Investigación Marina ha demostrado ser uno de los tópicos legales más polémicos en la práctica. Aunque la Convención de las Naciones Unidas sobre el Derecho del Mar (LOSC) contiene una Parte especial (la XIIIª) sobre Investigación Científica Marina, deja de regular tópicos relativos a un contenido doble, ambiguo y/o que evoluciona. El presente documento hace averiguaciones sobre estos temas (pe. Sondeos Militares, Arqueología Marina, Teledetección) e intenta identificar problemas o carencias. Estas actividades pueden tener un impacto extremadamente grande ya que están vinculadas a intereses estatales y financieros. Las consecuencias de permitir que las actividades de investigación marina avancen sin reglas sólidas podrían ser graves. Sería sumamente importante que cada una de las actividades mencionadas en este documento tuviese un conjunto de reglas de conducta.

A. Introductory Remarks

In the mid 19th century, mankind turned its scientific view on the marine environment. The first research activities were ocean observations, depth measurements, surveys for navigational purposes and placing submarine telegraphic cables and finally marine resources exploitation research (Wegelein, 2005). These main activities of marine research, despite technological advancements, largely remain unchanged even today.

As a result of State practice, by the period up to World War II, hydrographic surveying was considered as part of the freedom of navigation in the high seas, due to its importance for navigational safety. In this same period and due to the lack of State sovereignty beyond the territorial sea, scientists enjoyed the freedom to conduct marine research almost everywhere. Non living marine resources exploitation activities were, due to technical limitations, usually conducted in coastal areas inside the States' territorial seas, which despite the lack of a common rule on their breadth, usually did not exceed a 3 nautical mile zone (Tsaltas & Kladi Efstathopoulou, 2003). Technological advancement and the mounting wartime needs for hydrocarbon fuel, eventually led to the creation of the concept of the continental shelf. This legitimized access to areas beyond the territorial sea (Roukounas, 2005)¹.

The customary regime for marine research was depicted in the four Geneva Conventions on the Law of the Sea, most importantly on the Continental Shelf Convention and the Territorial Sea Convention². One major characteristic of the marine research regime codified in the 1958 Geneva Conventions, was (and still is) the distinction between basic and applied marine research ("*pure marine research*" and "*natural resources exploitation regime*")³. Based on this distinction, coastal State's consent for scientific purposes research would be granted easier than in the case of research for economic purposes (Tsaltas, 2003). As mentioned earlier, hydrographic surveys by that time were regarded as a part of the freedom of navigation and this was confirmed in the High Seas Convention. The same Convention affirmed the right of scientific research for all States in the high seas (United Nations Convention on the Continental Shelf, 1958, Art. 5.1 and 5.8 for the non interference with fundamental research activities).

However, the aforementioned right was misused and over-exploited during the following years (the two most famous cases being the *Pueblo* and the *Glomar Explorer* incidents⁴). The aforementioned conditions placed all types of marine research in focus, initially of the Sea Bed Committee (1970-1972) and later of the 3rd Conference on Law of the Sea (1973-1982, from now on UNCLOS). The Sea Bed Committee recognized the need to provide a distinction between basic and applied marine research but also noted the difficulty to do so (Soons, 1982; Wegelein, 2005). It was only after a very long and tenuous negotiation, that an agreement was finally met on the various marine research regimes. The final Law of the Sea Convention text provides 3 distinct regimes on marine research (Soons, 1982):

1. Marine Scientific Research Regime (MSR). LOSC Part XIII. Research regarding marine environment or other non commercial purposes.
2. Prospecting, Exploration and Exploitation Regime. LOSC Part XI and Agreement relating to Part XI of the Convention. Research regarding the exploitation of non living marine resources.
3. Hydrographic Surveys Regime. LOSC Arts. 19(2)(j), 21(1)(g), 40, 54. Surveys and mapping of sea and ocean floor for safety of navigation purposes.

B. Marine Research in LOSC

The main characteristic of LOSC regulated marine research is the variation of status depending on the scope of the activity and the maritime zone. The consent regime for research has crept in ocean areas previously open to unconditional research, mainly through the adoption of Exclusive Economic Zones (EEZ)⁵. The following table

Research Activity	Content and Specifications	Regulation
Marine Scientific Research	Research regarding marine environment or other non commercial purposes / Consent Regime	Part XIII and specific articles dealing with maritime zones regulation
Exploration and Exploitation	Research regarding the exploitation of non living marine resources / Consent Regime	Part XI and Implementation Agreement relating to Part XI of the Convention and specific articles dealing with maritime zones regulation
Hydrographic Surveys	Surveys and mapping of sea and ocean floor for safety of navigation purposes	Articles 19(2)(j), 21(1)(g), 40 and 54

Table 1 – Marine Research Regimes according to LOSC

¹ See the Caracas Treaty between UK and Venezuela of 1942 for the Delimitation of the Continental Shelf in the Gulf of Paria and the Truman Declaration of September 28 1945 on the continental shelf, regarding the exclusive jurisdiction of the USA as to fishing and research exploitation activities up to the depth of 100 fathoms.

² See the Caracas Treaty between UK and Venezuela of 1942 for the Delimitation of the Continental Shelf in the Gulf of Paria and the Truman Declaration of September 28 1945 on the continental shelf, regarding the exclusive jurisdiction of the USA as to fishing and research exploitation activities up to the depth of 100 fathoms.

³ As "pure marine research" was understood the study of the marine environment for non commercial scientific purposes, whereas commercially targeted research would come under the GCCS regulation as "natural resources exploitation regime".

⁴ In the first case (which took place in 1968), USS *Pueblo* was boarded and captured by North Korean authorities under the accusation of spying while on North Korean territorial sea, whereas the crew claimed that the ship conducted routine research activities outside the North Korean territorial sea. In the second case (which took place in 1974), USNS *Glomar Explorer* while claiming to conduct research for mineral deposits, was actually proved to be searching for the Soviet submarine K-129 (sunk in 1968).

As a general rule, conduct of Marine Scientific Research (MSR) activities is subject to less strict regulation than the more economically crucial Exploration and Exploitation research. Hydrographic Surveys have contextually been dealt, as in previous codifications, as a non separate part, of the navigational freedom (Churchill & Lowe, 1999; Guilfoyle, 2009; Rothwell & Stephens, 2010), though it is true that State practice can often contest this approach, especially in the case of EEZ where LOSC is silent. The following table shows the regulatory jurisdiction of the three marine research regimes in each maritime zone.

	Marine Scientific Research	Exploration and Exploitation	Hydrographic Surveys
Territorial Sea	Coastal State	Coastal State	Coastal State
Continental Shelf / Exclusive Economic Zone	Coastal State	Coastal State	LOSC: no reference / Varying State Practice
High Seas	Flag State	Flag State	Flag State
International Seabed	Flag State / International Seabed Authority (responsibility to promote and encourage marine scientific research)	International Seabed Authority	Flag State
Archipelagic Waters / International Straits	Archipelagic / Littoral State	Archipelagic / Littoral State	Archipelagic / Littoral State

Table 2 – Marine Research Jurisdiction in Different Maritime Zones according to LOSC

It should be clear that in comparison to the 1958 Geneva Conventions, LOSC applies much stricter rules for marine research. Coastal States control research activities in very large areas created by EEZs and Extended Continental Shelves (which under conditions can stretch up to 350 nautical miles from baselines). In the beginning, these limitations caused much concern to scientists as to the disappearing right of research, but the up to date practice showed no serious hindrance. Generally, LOSC provisions are regarded as a genuine codification of customary rules, regarding the various research regimes and limitations within national jurisdiction maritime areas.

Certain disputes can be identified as to the exact nature of State rights in the EEZ regarding research. This is mainly due to the fact that the EEZ has not been a traditional maritime zone, leading to different interpretation theories as will be examined below. Especially difficult has been the adoption and implementation of LOSC articles on the International Seabed (or *the Area*). Developed States would not readily accept the sole right of International Seabed Authority to regulate the exploration and exploitation of non living resources of *the Area*. An objection

strong enough to halt the entry into force of LOSC, until the signing of the 1994 Implementation Agreement.

Another serious issue that rose up during the UNCLOS negotiation was the difficulty to agree on definitions for the various research activities described. In the end a decision was made; the context of research activities would derive from the various regulatory articles (Soons, 1982). While this proved a useful decision at the time, it has started to cause problems as advancements on marine technology and contemporary international relations lead to possible abuse of the Convention regulations through ambiguous interpretations.

C. The Practical Application of LOSC on Marine Research Issues

It is quite clear that on the issue of marine research activities, LOSC tried to compromise two different trends. Traditional maritime powers, opting for the maximum possible freedom in world oceans, found themselves against the developing countries' hopes for ocean resource fueled development. Not surprisingly, the majority of developing coastal, island and archipelagic States immediately declared their will to establish Exclusive Economic Zones, soon after the Convention's adoption (Koh, 1987; Pardo, 1987). It's also hardly surprising that the EEZ, as a newly inducted institution of the Law of the Sea and covering large parts of the ocean, causes the most problems relating to marine research.

Undeniably, the reality of marine research can be quite different from legal provisions. Two issues act as the major differing factors between the LOSC and State practice: the different approach and interpretation of LOSC regulation and the ambiguous regime of certain research activities, especially since these activities are a result of recent technological advancement.

a) Different Interpretation of Rules. The Liberal and Restrictive Approach.

Due to the ambiguous regulation on some fields of research activities, it is quite common to face contradicting interpretations. It must be noted here, that the LOSC regulation is generally accepted, even in cases of States that originally voted against it, such as the USA (Kotsina, 2008; Scott, 2004)⁶. The problem usually lies in the interpretation of articles. These are usually viewed through the national interest lens, differing from the actual content of regulation and aiming at greater coastal State control or in other cases greater freedom of action.

⁵ See also the related Exclusive Fisheries Zone, as codified in 1958. United Nations Convention on Fishing and Conservation of the Living Resources of the High Seas, 1958.

⁶ For the USA stance regarding LOSC see Former Legal Adviser's Letter on Accession to the Law of the Sea Convention, American Journal of International Law, Vol. 98, 2004, p. 307.

The most usual problem is found in the sphere of national legislation, particularly in the distinction between various research regimes. For example, in many countries the legislation regarding marine research, does not distinguish between MSR, Exploration for Ocean Resources and Hydrographic Surveys and in addition is older than the Convention (Churchill & Lowe, 1988; Gorina-Ysern, 2003). This can create dubious situations on the application of rules, especially in the EEZ's and in changing international and regional conditions⁷.

Closely connected to the above, one can identify the issue of interpretation of LOSC by the various States. The two major tendencies can be identified as the restrictive and the liberal approach of LOSC. These tendencies are not very different from the stance that various States had during the UNCLOS negotiations, maritime powers being in support of the liberal stance and the developing countries supporting the restrictive one.

At this point, it is quite interesting to note that the liberal stance supporters, regard any activity not namely mentioned in LOSC as "free for all", whereas the restrictive stance supporters regard it forbidden. This ambiguity will become clear in the cases that follow⁸.

b) Contentious Research Regimes and Marine Research Technological Developments

Military Surveys

Military Surveys (or Military Data Gathering) are rightfully regarded as one of the most contentious issues in marine research and lately a source of tension, particularly between USA and China (Bateman, 2005). The major problem lies with the Convention's total silence on warship activities and, in our case, with their conduct of marine research. This research can take the form of oceanographic research (focusing on the marine environment, similar in content to MSR) or hydrographic surveys (focusing on water properties and depth measurements similar to the LOSC era hydrography).

The main areas of concern, regarding military research, are the Continental Shelf and EEZ, where the coastal State exercises jurisdictional rights but has no sovereignty. The liberal / restrictive debate has strong impact on military surveys and the concern these activities cause. USA and

UK, as major maritime powers with strong blue water military fleets, champion the liberal approach on the subject, insisting that the lack of mentioning in LOSC places military surveying out of regulation. This viewpoint is strongly opposed in practice by China, Canada and Australia (Bateman, 2005)⁹. The main argument in favour of free military surveying is, according to its supporters, the clear distinction between MSR and Hydrographic Surveys in LOSC articles 19, 21, 40, 54. By using these arguments, liberal supporters place military surveys under the freedom of navigation, on the same terms as hydrography, based on flag State sovereignty and warship immunities in areas beyond the Coastal State's Territorial Sea. Based on this and on the fact that LOSC Part XIII doesn't mention the term "survey", their claim is that Marine Scientific Research consent regime cannot be applied in such cases.

The US Naval Commander's Handbook defines military surveys as "... the collecting of marine data for military purposes and, whether classified or not, is generally not made publicly available. A military survey may include collection of oceanographic, hydrographic, marine geological, geophysical, chemical, biological, acoustic, and related data" (Department of the Navy, 2007). The UK Navy terminology is similar to the above, with the exception of using the term "military data gathering" instead of "military survey" (Bateman, 2005). It is thus clear that military surveys can have any content, normally regulated under different regimes (Bateman, 2005; Valencia, 2004).

An important aspect of differentiation between MSR and Military Surveys, accepted in academic literature, is that of research outcomes dissemination. Whereas dissemination of research results is a clear obligation of scientists conducting Marine Scientific Research under Part XIII, it clearly contradicts the classified nature of military surveys despite the obvious relation of results. This final argument seems to provide a basis for the non inclusion of military surveys in MSR and the coastal State consent regime.

Operational Oceanography¹⁰

Operational Oceanography is another case of marine research with dubious status. LOSC doesn't include a solid remark of research conducted via floaters or other similar automated instruments¹¹.

⁷ A clear example can be found in the increasingly restrictive stance of China in research related issues in its zones of jurisdiction and the problems created especially with the USA, strong supporter of the LOSC liberal approach. See below.

⁸ See the State Department's opinion on the absence of control over research issues in USA EEZ at <http://www.state.gov/g/oes/ocns/opa/rvc/> (last accessed November 16 2010), while regarding China's strict control stance see Zou Keyuan, *China's Marine Legal System and the Law of the Sea*, Martinus Nijhoff Publishers, Leiden/Boston, 2005.

⁹ See the incident in China's EEZ near Hainan Island, between Chinese ships and the USNS "Impeccable" in March 2009 at http://articles.cnn.com/2009-03-09/politics/us.navy.china_1_chinese-ships-chinese-vessels-chinese-media?_s=PM:POLITICS (last accessed November 16 2010) και <http://news.bbc.co.uk/2/hi/7933171.stm> (last accessed November 16 2010).

¹⁰ Operational Oceanography is defined as the activity of longtime systematic data recording regarding seas and oceans and their rapid interpretation and dissemination. See <http://www.eurogoos.org> (last accessed November 16 2010).

¹¹ Part XIII, Section 4, articles 258 – 262 refer to Marine Scientific Research conducted via installations or similar equipment, not to the real time data transmission provided by floaters.

The negotiation procedures in UNCLOS III, provide for clues that show States had accepted and supported the need for unhampered data flow¹² (Bork, Karstensen, Visbeck, & Zimmermann, 2008; Roach, 2007). It is true that at the time of UNCLOS negotiation and the Convention's signature, data from similar instruments (fixed or free floating) were mostly of meteorological use, which was connected with the safety of navigation (Roach, 2007).

The number of internationally sponsored research programs that use a wide variety of equipment for measurements (including the "ships of opportunity" Program) (Bork et al., 2008; Roach, 2007; Soons, 2007) grows daily and so does the amount and quality of data provided. In addition the data provided are far more inclusive and contain many results usually provided by Marine Scientific Research and are not anymore of purely meteorological use.

In 2003, IOC ordered the IOC/ABELOS committee to examine the issue of oceanographic data collection on the high seas (which for the purposes of the activity include EEZ waters). The result was the adoption of the 2008 Resolution EC.XLI.4 (Guidelines for the Implementation of Resolution XX-6 of the IOC Assembly Regarding the Deployment of Profiling Floats in the High Seas within the Framework of the Argo Programme) concerning the ARGO data collection Programme¹³. The guidelines suggested prior information of coastal States for the placement of floaters, which could eventually drift into their EEZs. This resolution wasn't easily accepted and many found its legal basis controversial. Concluding, both liberal and restrictive viewpoints provide arguments for the defense of their position, and based on today's evidence, the precise regime seems unclear.

"Modern" Hydrography¹⁴

The LOSC text, as in the case of Marine Scientific Research, doesn't include a definition on what constitutes Hydrographic Survey and its precise content. As a result, many countries (most notably the USA) and competent organizations such as the International Hydrographic Organization, have developed their own definitions in order to clarify the issue (Bateman, 2005; Wegelein, 2005).

Marine Scientific Research and Hydrographic Surveys regime differences have been mentioned in previous parts of this paper. These differences depicted the needs at the time of UNCLOS negotiations. An example on that, is that since hydrographic surveys tended to be conducted by government vessels enjoying sovereign immunity (and even more often by military vessels), it wouldn't make much sense to try to strictly regulate them.

However, one cannot fail to notice today's elements that create new conditions. Firstly and most importantly, in practice States don't seem to differentiate between MSR and Hydrographic Surveys in their legal provisions (Bateman, 2005). The applicable legislation for MSR (most importantly the application of the consent regime) is usually applied to Hydrographic Surveys too. On an academic level, discussion as to the validity of variation between the two research types has taken place and objections have been expressed, most notably in the 2003 Tokyo Meeting on the Regime of the EEZ¹⁵. In that meeting, it was noted that the Hydrographic Surveys regime¹⁶ as mentioned and codified in LOSC, referred to its use in straits and the territorial sea for navigational safety reasons. Contemporary technological conditions and means for conducting surveys differ greatly and can provide data comparable to those provided by MSR (Bateman, 2005; Valencia, 2004, 2005; Valencia & Akimoto, 2005).

It's true that the freedom to conduct hydrographic surveys in parts of the high seas under coastal State jurisdiction is currently, according to State practice, debatable. Once again, one can clearly see the two aforementioned stances (liberal and restrictive) being present in this debate. Concluding, "Modern" Hydrography is often viewed suspiciously in the prospect of the dual application of results and is thus many times treated similarly to MSR as to the obligation for previous notification and consent (Bateman, 2005; Xiaofeng & Colonel Cheng Xizhong, 2005).

Maritime (or Marine) Archaeology

Another marine research regime, which remains doubtful, mainly due to the vague reference in LOSC, is the Maritime Archaeology regime. The main references can be found in Art. 149 ("Antiquities in the Area") and 303

¹² The statement of UNCLOS Third Committee President Dr. Yankov for the necessity not to hamper operational oceanography, is one of these clues thought it is not generally accepted as recognition of the Convention's drafters purpose to exempt it from MSR provisions.

¹³ For the full text see http://ioc3.unesco.org/abelos/index.php?option=com_content&task=view&id=41&Itemid=54 and regarding the ARGO program <http://www.argo.net/> (last accessed November 16 2010).

¹⁴ According to IHO "Hydrography is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and rivers, as well as with the prediction of their evolution, for the primary purpose of safety of navigation and all other marine purposes and activities, including economic development, security and defence, scientific research, and environmental protection." at http://www.iho.int/srv1/index.php?option=com_content&view=article&id=299&Itemid=289 (last accessed November 16 2010).

¹⁵ Organized in 2003 by the East West Center and the Ship and Ocean Foundation (SOF) - Institute for Ocean Policy, with the participation of many distinguished scholars on the subject.

¹⁶ Hydrographic Surveys do not have a special "regime" or Part devoted as MSR, but references as in the articles shown on Table 1.

(“Antiquities in Contiguous Zone”). This was a result of the open disagreement in UNCLOS for the creation of a regime. What remains certain is the rejection of the proposal to extend coastal States’ rights beyond the territorial sea. Based on the Convention’s provisions, in areas beyond the contiguous zone applies the freedom to conduct research for antiquities, while in the Area (international seabed) research is also free, but must be conducted for the benefit of mankind, while recognizing preferential rights to the State of origin (Hayashi, 1996; Strati, 2006).

Hardly surprising, State practice is quite different. Deviant practices include both coastal State efforts to claim exclusive jurisdiction on antiquities found in their EEZ (e.g. Malaysia) (Nayati, 1998) and researchers’ efforts to grant their activities MSR status, in order to gain faster and easier consent. Such practices are regarded commonplace behavior for modern treasure hunters. The 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage, tried to answer to the exploited LOSC gaps, by enforcing the role of coastal States in the EEZ and the Continental Shelf. The UNESCO Convention has only recently (January 2009) entered into force and its efficiency remains to be seen¹⁷, but the fact that it was required to create a new legal instrument to enforce underwater antiquities protection shows the inadequacy of LOS Convention to regulate maritime archaeology research.

	Regime Uncertainties	UNCLOS Negotiations	Contemporary Practice
Military Surveys	LOSC lack of mentioning of warships and their research activities	Maritime Powers effort to prevent regulation of activity	Differentiation between liberal and restrictive approach. Subject of occasional tension
“Modern Hydrography	Change of technological capabilities and use	-	Open academic debate for the current regime. Restrictive approach States ask for the incorporation of hydrographic surveys to MSR regime
Operational Oceanography	No mentioning in LOSC	Under discussion. Recognition of need for non impairment of activity	Subject of examination by IOC. Development of Guidelines for ARGO program.
Maritime or Marine Archaeology	Vague mentioning in LOSC. Art. 149 for International Seabed and 303 for Contiguous Zone	Inability to reach agreement. Rejection of coastal states’ jurisdiction beyond territorial sea.	Disagreement over applying regime. 2001 UNESCO Convention in force, adding new terms for EEZ, Continental Shelf and International Seabed.

Table 3 – Contentious Regime Research Activities

¹⁷ The 2001 UNESCO Convention expanded the regime by defining the objects of protection and by strengthening the role of coastal and archipelagic states role in EEZ and Continental Shelf. See Convention on the Protection of the Underwater Cultural Heritage 2001, at http://portal.unesco.org/culture/en/ev.php-URL_ID=34114&URL_DO=DO_TOPIC&URL_SECTION=201.html (last accessed November 16 2010).

ii. Marine Research Technological Developments

In addition to research activities with contentious regime connected with LOSC, there are a number of research activities completely out of the Convention's context, these being results of technological advancements of post-UNCLOS era. These research activities are usually conducted under various regimes, connected with LOSC, such as the 1992 United Nations Convention for Biological Diversity (CBD 1992) and others.

Bioprospecting

Technological advancement in recent years, have created the capability to conduct marine research in the ocean abyss and especially on the ocean floor areas, where lithospheric plates meet. The discovery of unique life forms proved to be financial beneficial in many fields and the consequent result was a rise in research activity connected with the deep ocean floor biodiversity.

What makes this type of research special is that it is conducted almost exclusively on the international ocean floor and LOSC doesn't include any provisions for it. In 2003, the Subsidiary Body on Scientific, Technical and Technological Advice of CBD defined bioprospecting as "...the exploration of biodiversity for commercially valuable genetic and biochemical resources" or "...the process of gathering information from the biosphere on the molecular composition of genetic resources for the development of new commercial products". These definitions include scientific and economic aspects of bioprospecting (Leary, Vierros, Hamon, Arico, & Monagle, 2009; Scovazzi, 2004)¹⁸.

Bioprospecting has created disputes both on academic and State levels. The discussions for a possible regime take place simultaneously in the United Nations (through the

United Nations Informal Consultative Process on Oceans and the Law of the Sea – ICP), the International Seabed Authority (through the Legal and Technical Commission) and the Convention on the Biological Diversity (through the Subsidiary Body on Scientific, Technical and Technological Advice) (Scovazzi, 2004; UNU-IAS, 2005). Indicative of the variety of views on the subject is, that in the 2004 ICP discussions, when the subject of bioprospecting was set on the table, the participating States' opinions varied between those that regarded that living resources of the international seabed are part of the Common Heritage of Mankind regime, those who regarded bioprospecting as a form of MSR and those who regarded it, as a new research activity without present legal regulation (UNGA, 2004; UNU-IAS, 2005)¹⁹.

Remote Sensing²⁰

The last form of marine research examined in this paper is the method of remote sensing. Remote Sensing is a very special method of research in marine environment, because it doesn't include any physical contact with water mass. The importance of Remote Sensing is very high, especially in the cases of electronic charting of large marine areas. This is proved by the number of national, regional and international programs on the subject (Wegelein, 2005). If one would try to identify similarities of Remote Sensing with other research activities, the closer match is Operational Oceanography, as to the ability to collect and transmit data in real or near real time (Ryder, 2003).

Depending on the altitude, research can be conducted from air space or outer space. Air space research is usually conducted by airplanes and other flying platforms, which are subject to established rules while flying over maritime zones²¹. The important and problematic legal

¹⁸ Study of the relationship between the Convention on Biological Diversity and the United Nations Convention on the Law of the Sea with regard to the conservation and sustainable use of genetic resources on the deep seabed (decision II/10 of the Conference of the Parties to the Convention on Biological Diversity) UNEP/CBD/SBSTTA/8/INF/3/Rev.1.

¹⁹ See UNU-IAS Report, op.cit. pp. 36-37 and Report on the work of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea at its fifth meeting, UNGA/A/59/122.

²⁰ As "remote sensing" is defined "...the sensing of the Earth's surface from space by making use of the properties of electromagnetic waves emitted, reflected or diffracted by the sensed objects, for the purpose of improving natural resources management, land use and the protection of the environment...". See principle I, UNGA/41/65 "Principles Relating to Remote Sensing of the Earth from Outer Space" of 3/12/1986.

²¹ Law of the Sea as well as Air Law make no reference to Marine Research conducted through aerial means. The rights, mainly, of third states are implied by various clauses of the Law of the Sea Convention and the Chicago Convention on International Civil Aviation, 1944 (which applies to all but-the-military aircrafts, those conducting research included. See art. 3). Furthermore, there exist no relevant international regulations on law enforcement in case a violation occurs. Verification of research activity conduct, along with law enforcement are practically impossible when we are referring to aerial means of Marine Research; thus overflight ban seems to be the most effective measure.

In the airspace over Territory, Internal Waters and Territorial Sea (National Airspace) the coastal state has the right to ban overflight and/ or regulate third states' activities. Contrarily, the Freedom of Overflight and Marine Research applies in the airspace superjacent to the High Seas (see LOSC art 87§1). Things get more complicated in the EEZ, where conduct of MSR and Exploration – Exploitation requires prior consent by the coastal state, no matter what technique or method is applied. Despite the fact that this Zone is a part of the High Seas (esp. under an Air Law viewpoint) a research activity without the coastal state's consent would, actually, be a violation of its sovereign rights (LOSC art. 56). Of course this assumption remains on a theoretical level, since no such jurisdiction over the EEZ has been explicitly attached.

To conclude, two clauses included in the Chicago Convention are of relevant interest to our issue, since they could also apply to marine research activity: a) article 36 states that "Each contracting State may prohibit or regulate the use of photographic apparatus in aircraft over its territory" and b) article 8 "No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization".

vacuum lies with the use of satellites for observation, which by being outside the atmosphere are not subject to similar restrictions²².

Technological advancements in satellite observations mean that a large spectrum of information can be collected and by all probability more will be collectable in the years to come. Bearing in mind today's legal ambiguity in LOS terms, it is essential to find a form of effective consensus on coordination, for the type of data transmitted.

	Bioprospecting	Remote Sensing
Content	Prospecting of deep seabed biological resources	Use of air and outer space platforms for long range data collection
Maritime Zone affected	International Seabed (mainly)	Potentially all zones
Related Regimes	Convention on Biological Diversity (CBD)	-
Discussion	State disagreement: 3 trends: <ul style="list-style-type: none"> • Part of Common Heritage of Mankind • Part of MSR • Legal Vacuum 	Connected with Operational Oceanography. Legal Vacuum on the use of space objects, operating outside national jurisdiction

Table 4 – Technological Developments and Marine Research

D. Conclusions

Research activities and their respective regimes in LOSC seem at first notice clearly distinguished, on the rule of different scopes. 30 years after UNCLOS and the Convention's signing this image seems to be fading. Marine Scientific Research, Exploration and Exploitation and Hydrographic Surveys regimes seem to overlap, allowing the use of the various research regimes for ambiguous activities. Whereas other research activities, such as those presented in part C.b, are often conducted under ambiguous regimes, and are open to interpretation and exploitation. These vacuums and unregulated research activities can have an extremely large footprint as they are connected directly or indirectly not only with State interests but also with major financial interests. The consequences of allowing marine research activities to proceed without a solid rule set, whether this was provided by LOSC or not, could be grave. This does not imply that Coastal States regulation authority should go beyond the LOSC scope, especially in cases of common benefit (most obvious examples would be environmental monitoring and common resources management).

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If we oversee the issue of vertical airspace delimitation, state practice has shown its tolerance concerning space objects' overflight through consecutive National Airspaces (during their launch) as well as to the conduct of various activities over them (always in accordance with International Law and the United Nations Charter). Additionally, Hard Law regulations not only permit, but also encourage scientific research of Outer Space and the Earth. There are no specific rules dealing with Marine Research, thus the most relevant clauses are met in UNGA/41/65 "Principles Relating to Remote Sensing of the Earth from Outer Space" (12/3/1986). Shortly, Remote Sensing, that can be used in MSR, is permitted over all maritime zones, under the following terms: a) It should be conducted for the benefit of the Mankind (Principle II), b) state sovereignty should be well respected (Principle IV), c) access to data should be guaranteed for States whose territory is sensed (Principle XII). For the Intellectual Property Rights stemming from Remote Sensing see See Doldirina, C., A rightly balanced intellectual property rights regime as a mechanism to enhance commercial earth observation activities, *Acta Astronautica*, Vol. 67, 2010, pp. 639-647.

In modern maritime environment, where the State's role as sole actor is retreating constantly and new or renewed issues such as maritime security, marine environment and intellectual rights of research products play an important role in ocean governance, it is more than certain that research activities will increase, especially on the high seas. It is of extreme importance that each of the research activities mentioned in this paper should have a clear set of rules of conduct, in order not become a sort of *Trojan horse* for destabilizing the world's oceans. Any rules should have at their heart the relative LOSC provisions, with a view on the needs for update of a major but, aging text.

As part for the need for modernization or updating of the Law of the Sea and considering the difficulties of doing so via the official amendment procedures of LOSC, it is very important to strengthen the role of competent international organizations in keeping Law of the Sea up to date with contemporary demands. The competent international organizations can provide a much more flexible platform for modernization and rules of conduct on the various aspects of ocean policies in the new century.

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