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The significance of Acta Adriatica in scientific communication in the field of marine biology, fisheries and oceanography

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In scientific common communication, a journal represents the key communication channel. The aim of this research is to assess the significance and role of the Acta Adriatica journal in scientific communication in the field of marine biology, fisheries and oceanography for the broader scientific community. Lead by this intention, we analyzed the representation of papers from this journal in relevant international secondary sources as well as their citation index in the Science Citation Index (SCI). Established was the distribution of papers within ten years, from 1987-1996, by fields and the representation of authors outside Croatia.

According to the results achieved, Acta Adriatica belongs to the group of Croatian journals that are available to the interested scientific community, by being represented in 12 secondary electronic sources of information - databases. Evident is the interest of scientists abroad Croatia to publish results of their research in this journal. As to achieve more intensive communication among scientists involved in marine biology, fisheries and oceanography, at an international level, the quality of the journal could be improved by introducing an international Board of reviewers, and by greater financial means that would enable its regular publishing, at least twice a year.

Key words: Acta Adriatica, significance, role

INTRODUCTION

Scientific communication is the basis of the open exchange of knowledge worldwide. The system of scientific communication is also closely related to the reward system of scientists; more specifically, to the process of social and professional recognition. A fundamental element in these intertwined worlds of communication and reward is the publication of research results. In particular, the scientific journal here plays a central role. It embodies the main functions of scientific communication, with quality control as a major element (van RAAN, 1997). This means that a journal with a strict selection policy based on quality, mostly with the help of a referee system, and with that, we are already at the heart of the quality assurance problem. Also, citation of this work by other scientists, but, again, made in papers that appear in reputable journals. Citation behaviour also brings us immediately to the core problem of quality assurance (ZIMAN, 1984).

A cited reference search in the ISI (Institute for Scientific Information) database is run against source journal coverage and therefore is restricted to citations found in approximately 7,000 highly influential research journals indexed. If the author is cited in works outside of this group, those citations will not be retrieved.

However, it is often forgotten that citation analyses are done not only for the purpose of scientometry, but with a cited reference search, it is possible to perform more comprehensive searches of the journal literature, and retrieve all the data relevant to the subject, regardless of how limited initial information may be: cited reference searches yield results that traditional search methods and indexing services cannot easily uncover; discovering who is referencing certain research and how it is being used to support current research; tracking the research activities of colleagues and competitors; following the history or methodology of an idea from its first communication into the present day; uncovering the early unpublished stages of research activity; locating current research based on earlier patents, reports, published works or findings, etc. (http://www.isinet.com).

Which journals would be reputable because they cite Acta Adriatica?

Scientists involved in scientometry would mostly answer by saying that those are journals dealing with problems of marine biology, oceanography and fisheries and are represented in the ISI database, SCI to be more precise, and according to some, in the Current Contents as well.

The SCI treats contents of 122 journals (Table 1) that deal with the mentioned field, which amounts to less than 10% of the total

Table 1. Distribution of biological journals and their impact factors published in JCR (1993)

FIELD	JOURNAL VOLUME	IMPACT FACTOR
biochemistry&molecular biology	173	37.885
cytology&histology	75	37.192
immunology	92	37.036
genetics & heredity	75	19.844
biology	59	16.634
plant sciences	121	16.130
microbiology	61	15.712
developmental biology	21	15.449
physiology	55	14.016
toxicology	53	10.224
oncology	86	8.923
zoology	96	6.786
virology	17	5.647
entomology	58	5.074
biotechnology&microbiology	53	4.400
ecology	71	4.310
mycology	12	4.000
marine&freshwater biology	61	3.188
oceanography	39	3.188
environmental science	96	2.692
biology, miscellaneous	21	2.444
limnology	11	2.345
agriculture	102	1.840
veterinary science	90	1.787
fisheries	22	1.439
forestry	25	1.221
agriculture, soil science	24	1.120
ornithology	10	0.941
anthropology	1	0.774

number of journals in the world that deal with this field. According to ULRICH'S International Periodicals Directory (including more than 200 countries) there are 186 journals from the field of marine biology, 643 for the field of oceanography, and 1046 for the field of fisheries. For all three fields this base has 1724 registered titles (some of the titles e.g. Acta Adriatica deal with all three fields and the sum is therefore not mathematically correct).

The Institute for Scientific Information (ISI) publishes the Journal Citation Reports (JCR), which provide a systematic and objective means of determining the relative importance of science and social sciences journals within their subject categories. By means of citation analysis, the JCR can answer questions such as: how frequently has a journal been cited, by which journals, in its own field or in other fields, has a journal been cited, how soon after publication, and for how long has a journal been cited, which journals are cited by a particular journal?

Based on the aforementioned facts we must decide whether to focus only on the corpus of the journal treated by SCI or to expand the criteria and based on peer reviews, decide which journals should be considered as reputable ones for the field of interest of the Acta Adriatica journal?

Assessments of competent scientists (peer review) are considered as quality and less objective methods, but in such cases, when the ISI indexes of citation are the only indexes of citation available to international scientists, they are one of the ways in assessing the quality of a journal. To consider a journal less valuable or unvaluable, only because it is not represented in the SCI database, is not a serious way of assessing its value, especially if known that ISI has its own editing policy.

The aim of this research is to establish the role and significance of the Acta Adriatica in scientific communication in the field of marine biology, fisheries and oceanography for a broader scientific community. According to the results achieved we could suggest what is to be done in order to improve the quality of this journal and possibly enter the ISI databases.

METHODOLOGY

In order to have a more complete picture of the status of the Acta Adriatica journal within scientific communications, a greater number of analyses have been carried out among which are: the ratio of volumes of journals for certain fields within biology and their impact factors were measured in SCI and JCR, representation of Acta Adriatica in secondary sources of information, citation rate of the Acta Adriatica journal in the SCI, analysis of papers by scientific fields from 1987-1996, representation of authors by countries in the same period and comparison with Mediterranean journals dealing with similar problems as Acta Adriatica.

The facts were obtained by searching online databases, Dialog Journal Name Finder and SciSearch (Science Citation Index), The Dialog Corporation Information Service (Palo Alto, CA, USA), CD-ROM databases SCI and ULRICH'S International Periodicals Directory, and by analyzing papers from Acta Adriatica from 1987-1996.

Online database Dialog Journal Name Finder covers journals in all subject disciplines. ULRICH's International Periodicals Directory Database is a source of information on over 200,000 periodicals and serials from 80,000 publishers in 200 countries (Bluesheet Dialog Information Corporation, 1997).

RESULTS AND DISCUSSION

The status of Marine Biology, Fisheries and Oceanography within the framework of biological journals represented in SCI and their average impact factors published in JCR

It is evident from Table 1 that ISI divides biology into 29 specific scientific fields, of which at least 4 lie within the scope of interest of our journal. The fields are sorted by a decreasing impact factor of the journal. The impact factor's meaning has not been definitely analyzed in literature. However, most

researchers using impact factor explicitely state, or implicitely assume, that it is a measure of journal quality. Many scholars also assume that the impact factor measures a journal's contribution to scholarship or they use impact factor as an indicator of "international visibility" (HARTER and NISONGER, 1997).

If the importance of impact factor is accepted as cited above, then the fields that Acta Adriatica deals with are in the lower part of the table meaning that our journal has smaller chances for being represented in the SCI corpus compared to journals dealing with e.g. problems of mollecular biology. Having compared facts from the chart, the field of marine and fresh-water biology and oceanography, with the average factor of 3.188, are 18th, and 19th, respectively, which, in comparison to the field with the greatest impact factor, is nearly 12 time less.

Representation of Acta Adriatica in secondary sources of information

Acta Adriatica is available to the international scientific community through the most significant secondary sources that index papers from the field of marine research: BIOSIS PREVIEWS (Biological Abstracts), AQUATIC SCIENCE *and* FISHERIES ABSTRACTS, CAB ABSTRACTS, GEOREF (AMERICAN GEOLOGICAL INSTITUTE), WATER RESOURCES ABSTRACTS, OCEANIC ABSTRACTS, POLLUTION ABSTRACTS GEOBASE, AGRICOLA, TOXLINE, LIFE SCIENCE COLLECTION *and* CHEMICAL ABSTRACTS (Dialog Journal Name Finder, file 414). There are 12 databases that, depending on their editing policy and interests, selectively index and comprise in their corpus all papers or only certain ones. Some of these secondary sources such as Aquatic Science *and* Fisheries Abstracts, treat all papers from Acta Adriatica, while Toxline or Chemical Abstracts, selectively include papers from different volumes.

Representation of a journal in secondary publications is one of the indicators of the significance of the journal for the broader scientific community. If the papers published in a certain journal are not represented in relevant secondary sources of information, or electronic databases, in fact they do not exist for the broader scientific community. Their importance is limited only to a smaller group of people who are familiar with this journal. However, the representation of papers from a certain journal in secondary publication, i.e. database, means a potential avaliability to interested scientists. Whether scientists will cite a certain paper and refer to the results or methodology or another aspect of the cited paper, depends on a greater number of factors.

For an easier determination of the status of Acta Adriatica in relation to other Croatian journals, we submit the results of the research lead by JOKIĆ and GRETIĆ (1991). The authors analyzed the representation of Croatian journals on a model of 439 titles treated by the Croatian National Bibliography, from all fields of science and activities, in the most relevant secondary sources of information, databases. Acta Adriatica is among the first seven, represented in 11 databases. Before it are Periodicum biologorum and Liječnički vjesnik (represented in 18 secondary sources), then Croatica Chemica Acta, Acta Pharmaceutica Jugoslavica and Arhiv za higijenu rada i toksikologiju (in 16 databases) and Strojarstvo whose papers are contained in 15 databases.

The information that should be proved is whether Acta Adriatica is still among the first ten most represented Croatian journals in secondary sources. The analysis of its citation rate is a fact that proves the supposition that its position did not greatly change.

Citation rate of Acta Adriatica journal

The citation rate of a journal, number of citations and the publications in which it is cited is nowadays possible to determine only by means of citation indexes produced by ISI. If a journal is within the corpus of ISI citation indexes and is continuously cited by a growing number of SCI index journals, its impact factor becomes measurable. If this impact factor grows or is cosistent in a certain period of time, and meets the

propositions set forth by ISI's editing policy, then such journal can enter the corpus of citation indexes. We are referring to citation indexes and not exclusively SCI, because ISI presently offers the scientific community a larger number of that type of publications, namely, Multidisciplinary Citation Indexes: Science Citation Index, Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index and Specialty Citation Indexes: Biochemistry & Biophysics Citation Index, Biotechnology Citation Index, Chemistry Citation Index, CompuMath Citation Index, Materials Science Citation Index and Neuroscience Citation Index (http://www.isinet.com).

The above mentioned citation indexes are published by ISI in printed form, on magnetic tapes, floppy discs, CD-ROM as well as online databases. However, the contents of citation indexes is not equal in all media. If, for instance, the citiation rate of a journal is searched in SCI online, then this figure will possibly be greater than in the case should SCI be searched on CD-ROM. The answer lies in the fact that SCI online database comprises also special citation indexes and not only the SCI database corpus, i.e. the Science Citation Index covers approximately 3,300 of the world's leading scientific and technical journals in a broad range of disciplines, and the Science Citation Index Expanded, which includes the magnetic tape, SciSearch and the Web of Science formats cover more than 5,300 journals (http://www.isinet.com/prodserv).

From Fig. 1 it is evident that within a period of ten years the most cited papers are those

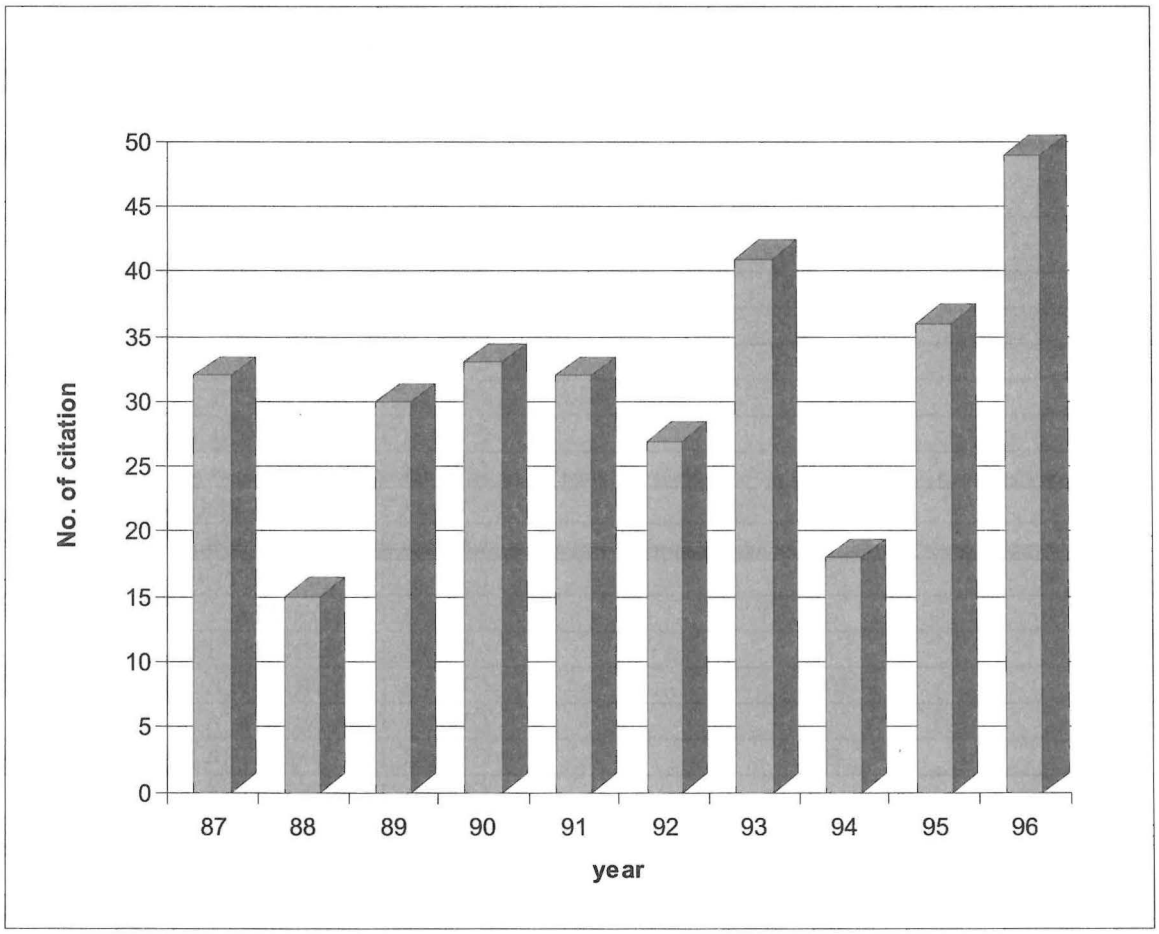

Fig. 1. Distribution of the Acta Adriatica citations

in 1996 (analyses carried out in online SCI Extended database). There is still a possibility that papers from the five last years be cited since those are rather recent facts and the area covering the citation rate of Acta Adriatica includes at least five years.

What does a high citation rate mean?

A high number of citations can indicate that an author or document has had a major impact on the field, or that a work has high utility. However, other factors need to be considered in assessing the significance of high citation counts. A high citation rate is only part of the picture. To assess an individual fairly, some idea of the comparative performance of his or her peers is needed. Since publication and citation rates vary widely from field to field, you will need to know what is typical in the candidate's area, as well as for persons of similar experience.

Other aspects to consider include: the extent and nature of self-citation; the chronological distribution of the citations; whether citations are concentrated around a few papers (especially those on methods) or dispersed among many; the extent to which the citations are cross-disciplinary or international; the quality and impact of journals from which the citations derive; and ISI's coverage of the individual's field.

Without consideration of these factors applied, a high citation rate is a number with no meaning (STRONG, 1987).

We have not studied who the authors citing Acta Adriatica are. It would certainly be interesting to differentiate Croatian scientists from others, and to determine the extent of self-citations. If they are mostly self-citations then the figure of Acta Adriatica citation can have a somewhat different meaning.

Research on Acta Adriatica journal citation was carried out by PRAVDIĆ and PENAVA (1991), from 1973-1980. Foreign journals

Table 2. Forms of citing Acta Adriatica in SCI

NUMBER OF CITATIONS	FORM OF CITATION
6	CW=ACTA ADR
1	CW=ACTA ADRAIT
1	CW=ACTA ADRIA
1	CW=ACTA ADRIACTICA
1	CW=ACTA ADRIANTICA
138	CW=ACTA ADRIAT
1	CW=ACTA ADRIAT I OCEANO
1	CW=ACTA ADRIAT SPLIT
6	CW=ACTA ADRIAT YUG
2	CW=ACTA ADRIATIC
1	CW=ACTA ADRIATIC I OCEA
400	CW=ACTA ADRIATICA
1	CW=ACTA ADRIATICA I ZA
10	CW=ACTA ADRIATICA SPLIT
1	CW=ACTA ADRIATICA
1	CW=ACTA ADRIATRICA
1	CW=ACTA ADRIET
1	CW=ACTA ADRITICA
1	CW=ACTA ADIRATICA
555	E3-E20 OR E1

which give citations to Acta Adriatica were identified; the linkage with a number of these citing journals were shown to be stable over time. They also determined citations per subject fields which as a result shows that marine and fresh-water biology is the most cited field.

Table 2 shows different ways in which authors who publish papers in SCI cite Acta Adriatica journal. The table also shows how many times a certain form of the journal has been cited. The uniformity of citation in the most relevant international journals, if the corpus of the journal that treats and indexes SCI is considered such, needs no comment. At the end of the table the figure 555 tells how many times the Acta Adriatica was cited in SCI since 1974-1997. This period of time is important becuase SCI in online form is available only for this period.

Analysis of papers by fields

Acta Adriatica is a journal that publishes results of research carried out in the Mediterranean aquatorium including marine biology, oceanography, fisheries and limnology. According to our analysis throughout ten years, 1987-1996, most of the papers was from the field of marine biology (57), oceanography (38), fisheries (33) and limnology (7), while other similar disciplines are represented with 2 papers (figure 2). Citation facts on certain fields achieved by PRAVDIĆ and PENAVA (1991) are in accordance with the number of papers for certain fields represented in this journal.

Analysis of authors by countries

Papers written by authors from countries abroad which the journal is published certainly contribute to the significance of the journal within international scientific communication. Table 3 clearly shows that authors from 8 countries, except countries of former Yugoslavia (a model of ten years has been considered), publish their papers in our journal. The first by number of papers is Egypt with 12.4% papers, followed by Italy and Turkey with 4.3% and Greece with 3.6%. An interesting fact is that scientists from our model communicate among

Table 3. Representation of authors by countries

COUNTRY	NUMBER OF PAPERS
Croatia	77 (5.2%)
Egypt	17 (12.4%)
Montenegro & France	9 (6.6%)
Italy	6 (4.3%)
Turkey	6 (4.3%)
Greece	5 (3.6%)
Croatia & Slovenia	2 (1.45%)
Montenegro	2 (1.45%)
Montenegro & Italy	2 (1.45%)
Slovenia	2 (1.45%)
Bosnia and Herzegovina	2 (1.45%)
Croatia & Israel	1 (0.7%)
Croatia & Bosnia and Herzegovina	1 (0.7%)
Saudi Arabia	1 (0.7%)
Craoatia & Poland	1 (0.7%)
Macedonia	1 (0.7%)
Sweden	1 (0.7%)
Total	137 (100%)

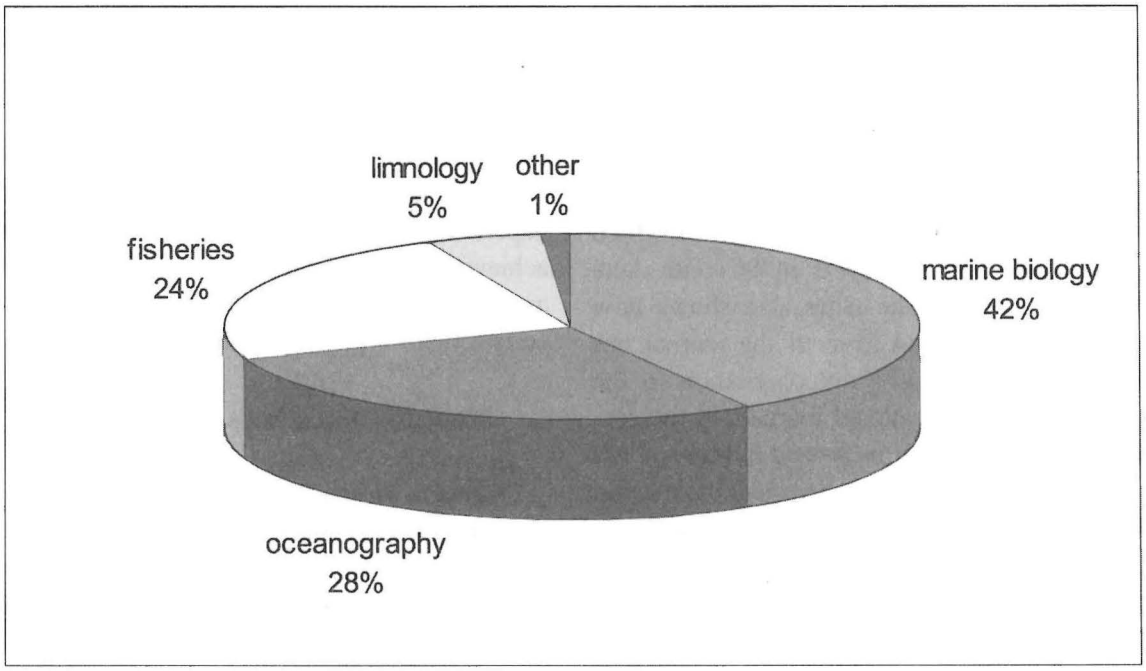

Fig. 2. Papers distribution by subject fields

Table 4. Mediterranean journals on marine biology, fisheries and oceanography and their representation in relevant secondary sources

COUNTRY	NUMBER OF JOURNALS	NUMBER OF JOURNALS REPRESENTED IN SECONDARY SOURCES ACCORDING TO URLICH'S PERIODICALS DIRECTORY	NUMBER OF JOURNALS REPRESENTED IN ISI DATABASES
France	27	16	3
Italy	11	5	0
Spain	9	5	1
Israel	3	2	1
Greece	1	0	0
Croatia	1	1	0
Tunis	1	1	0
Alger	1	1	0
Turkey	0	0	0
Slovenia	0	0	0
Egypt	0	0	0
Total	54	31	5

Table 5. Distribution of journals by databases in which they are represented

JOURNAL	NUMBER OF DATABASES	COUNTRY
Cahiers de Biologie Marine	20	France
Oceanologica Acta: revue européenne d océánologie	20	France
Scientia Marina	16	Spain
Revue Internationale d Océánographie Médicale	15	France
Centre de Recherches et d'Etudes Océánographiques. Travaux	12	France
Institut Océánographique. Annales	12	France
Oceanis: série de documents océánographiques	12	France
Israeli Journal of Aquaculture-Bamidgeh	11	Israel
Cybium: Revue européenne d'ichthyologie	10	France
Instituto Espanol de Oceanografia. Boletin	10	Spain
France.IFREMER.Centre de Brest.	9	France
Acta Adriatica	8	Croatia
Equinoxe: The magazine on living resources of the sea	8	France
Reperes Ocean	8	France
Rivista Italiana di Piscicoltura e Ittiopatologia	6	Italy
Bollettino di Oceanologia teorica ed applicata	5	Italy
Archivio di Oceanografia e Limonologia	4	Italy
Informes Tecnicos de Scientia Marina	4	Spain
Instituto Espanol de Oceanografia. Publicaciones Espesiales	4	Spain

themselves by publishing joint papers, e.g Croatia and Israel, Croatia and Slovenia, Croatia and Poland, Croatia and Italy. The given facts indicate that by publishing their papers in Acta Adriatica journal, scientists from the Mediterranean wish to communicate with their colleagues dealing with similar problems regarding their common aquatorium.

A better understanding of the status of Acta Adriatica could be made by comparative analyses of journals from other countries dealing with similar problems that are represented in ISI publications (SCI, Current Contents).

The fact that the Board of Editors of Acta Adriatica is formed only of scientists from Croatia is indicative. It is noted in the journal that there is an Advisory Committee formed of representatives of most Mediterranean countries but it does not have the same significance as the Board of Editors. One of the ways for this journal to become a truly international one is to have a Board of Editors that would be formed of competent international experts.

The status of journals of Mediterranean countries dealing with similar problems as Acta Adriatica

Of the 54 journals that are current, according to ULRICH's International Peridoicals Directory, including 11 Mediterranean countries (3 of which do not have their own scientific and professional publication on marine biology, oceanography and fisheries) (Table 4), by its representation in secondary sources, either printed or in the form of electronic databases, Acta Adriatica is 12th (Table 5). Ahead of it are the most significant journals dealing with research in the Mediterranean: 8 from France, 2 from Spain, and one from Israel. All five journals from the model that are represented in ISI databases, are ahead of our journal (Table 5). If comparing Croatia to similar Mediterranean countries by the number of journals dealing with marine research, it is evident that Acta Adriatica, significantly stands out. Italy, with 9 registered journals from this field of science does not have a journal that is indexed in more secondary sources than the Acta Adriatica.

CONCLUSIONS

Analyzing the representation of Acta Adriatica journal in the most relevant secondary publications, i.e. databases, it has been determined that this journal is fully or selectively represented in several electronical sources, databases, meaning that it is potentially available to the international scientific community.

Compared with the other 54 journals of Mediterranean countries, it is evident that Acta Adriatica is 12th by its representation in relevant secondary sources. Ahead of it are the most significant journals dealing with research of the Mediterranean Sea from France (8), Spain (2), and Israel (1). Of all the 54 journals dealing with problems of marine biology, fisheries and oceanography in the Mediterranean, only 5 of them are found in ISI databases

There are several factors that determine whether Acta Adriatica would be represented in ISI databases (Institute for Scientific Information), the core of world science. One of the indicators is the fact that for example, the field of marine and fresh-water biology and oceanography, with an average impact factor of 3.188 are 18th and 19th respectively, which, in comparison to the field with the greatest impact factor, is nearly 12 times less. In the period of ten years, 27.4% of papers were written by authors abroad Croatia, while there were 12.3% cases of cooperation between scientists from different countries.

Establishing a Board of Editors that would be formed of internationally reputable scientists would greatly contribute to the status of Acta Adriatica. An additional contribution for increasing the quality of this journal at an international level, could be by the Ministry of Science and Technology of the Republic of Croatia, that could provide greater financial means and thus enable its more regular printing. This could encourage Croatian scientists to publish quality papers in this national journal. One of the factors that reduces the quality of this journal is the evaluation policy of papers published in Acta Adriatica by the Ministry of Science and Technology of the Republic of Croatia.

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Značaj časopisa Acta Adriatica u znanstvenom komuniciranju za područja biologije mora, ribarstva i oceanografije

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Sažetak

Cilj je ovog istraživanja da se utvrdi značaj i uloga časopisa Acta Adriatica u znanstvenom komuniciranju za područje biologije mora, ribarstva i oceanografije za širu znanstvenu zajednicu. S tom namjerom je analizirana zastupljenost članaka iz ovog časopisa u relevantnim svjetskim sekundarnim izvorima kao i njihova citiranost u Science Citation Index (SCI). Utvrđena je distribucija radova u desetgodišnjem razdoblju, 1987-1996, po pojedinim područjima kao i zastupljenost radova autora izvan Hrvatske.

Prema analizi Acta Adriatica pripada skupini hrvatskih časopisa koji su dostupni zainteresiranoj znanstvenoj zajednici, zastupljenošću u 12 sekundarnih elektroničkih izvora informacija, baza podataka. Zainteresiranost znanstvenika izvan Hrvatske za objavljivanje rezultata svojih istraživanja u ovom časopisu vidljiva je. Kvaliteta časopisa u smislu intenzivnije komunikacije znanstvenika na međunarodnoj razini, koji se bave problematikom biologije mora, oceanografijom i ribarstvom, mogla bi se poboljšati uvođenjem međunarodnog recenzentskog odbora i uz pomoć većih financijskih sredstava za redovito izlaženje, s dinamikom od barem dva puta godišnje.