

# The correlations between certain features of the journal *Neotropical Ichthyology* and its impact factor: a comparative analysis at the thematic and national levels

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The present article analyzes the relationship between characteristics of the journal *Neotropical Ichthyology* and its impact factor (IF) between 2006 and 2011 using bibliometric descriptive quantitative methods. To perform this analysis, two samples of journals included in *Journal Citation Reports* (JCR) were studied. One sample was composed of journals classified within the subject of zoology, and the other contained journals from different areas published in Brazil. The instrument used for data collection was a database created in Microsoft Excel 2007 and the Statistical Package for the Social Sciences (SPSS) version 18. The results show that despite its short history, *Neotropical Ichthyology* has exhibited a distinctive impact, as manifested in a significant progression in the IF of this journal in the field of zoology during the investigated period.

Este trabalho analisa as características do periódico *Neotropical Ichthyology* e de seu Fator de Impacto no período entre 2006 e 2011, utilizando métodos quantitativos descritivos do tipo bibliométrico. Duas amostras de periódicos indexados no JCR foram estudadas para a realização das análises: uma constituída pelos periódicos categorizados como sendo da área de Zoologia e a outra formada por títulos de diferentes áreas publicados no Brasil. O instrumento de coleta de dados foi um banco de dados criado no programa Excel versão 2007 e no SPSS versão 18. Os resultados encontrados nas análises mostram que o *Neotropical Ichthyology* é um periódico que, apesar de sua história recente de publicação vem apresentando uma evolução de impacto distintiva. Esse aspecto é demonstrado por mudanças significativas na classificação por IF na área de Zoologia no período analisado.

**Key words:** Bibliometric methods, Self-cited rate, Self-citing rate, Uncitedness rate, Zoology.

## Introduction

The scientific culture has an acknowledged conservative nature, it can also be seen in relation to the specialized publications. Kuhn (1978) employs the term “normal science” to designate research that is grounded in past scientific accomplishments. This notion stresses the importance of recognizing past accomplishments as the basis for future research.

A similar phenomenon is observed when a new journal is launched. Before it becomes a reliable resource for disseminating scientific results, a journal must exhibit a record of publishing high-quality research subject to assessment by a group of proven experts, who must also ensure that the editorial standards of the field are met. Despite the fact that it may publish high-quality articles, a newly launched journal

still lacks sufficient history for the scientific community to judge the relevance of its published articles.

In addition to the publication quality and record, the relevance of a specific journal to the international scientific community is variable and is related to at least two additional factors: the journal’s country of publication and the subjects that it examines.

Considering journal origin, an established hierarchy ranks countries that produce scientific knowledge as either central or peripheral. Central countries are those that define the value system that guides the activities of the general scientific community. These countries are acknowledged as the most active in scientific knowledge production; they also define the criteria used to assess studies and control the main sources of research funding. Peripheral countries seek to bridge the gap with the central countries by adopting their norms and values (Mueller & Oliveira, 2003; Mueller, 2008).

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For the specific Brazilian case, data on the productivity and impact of the country's scientific contribution indicate a peripheral status in the power structures of science at the international level. According to the scientific performance classification elaborated by Scimago (2011), Brazil ranks 15<sup>th</sup> in scientific article production and 120<sup>th</sup> in high-impact article production, as indicated by the numerical data.

The topics published by different journals also affect their legitimacy in the international scientific community. Whereas exogenous research characteristically addresses subjects of interest to international readers, endogenous research focuses mainly on regional or national research topics (Forattini, 1996). Although both study types are important for scientific development in any country, exogenous research naturally attracts a wider readership, contributing to its international visibility and legitimacy.

The abovementioned features have particular importance for analyzing the quantitative indicators used to measure the performance of scientific agents. Facing the vast universe of publications, agencies that oversee scientific activities increasingly tend to use quantitative techniques to assess research.

These assessments are conducted by adopting productivity and publication impact indicators related to several categories, including authors, institutions, and journals (Mueller, 2008). As a function of the above-described factors, the results of such indicators must be interpreted within their specific contexts, due to potential differences in recognition at the international level.

In the specific case of impact indicators, the validity of their application is based on the assumption that important studies are frequently cited. One of the best-known impact indicators is the two-year Impact Factor (IF) published every year by Thomson Reuters' *Journal Citation Reports*. This indicator is used as a parameter to infer the merit recognition status of a given journal in the international scientific community as a function of the number of citations it has in the literature indexed by the *Science Citation Index* (SCI) and *Social Sciences Citation Index* (SSCI) databases.

The two-year IF is calculated using a simple equation: the average number of citations of articles published by a given journal. The numerator represents the number of times the journal has been cited in the current year for any item it published over the two previous years. The denominator represents the total number of articles that Thomson Reuters considers citable in those same two years (Garfield, 2000). Abstracts for event presentations, editorials, obituaries, and letters to editors are excluded from the IF calculation because their scientific content is limited and their citation potential is low (Pendlebury, 1991).

Within this context, the present article aims to analyze the correlation among features exhibited by the journal *Neotropical Ichthyology* and its IF. A bibliometric comparative analysis was thus performed at the thematic and national levels, examining the patterns exhibited by this journal compared to other journals included in the JCR.

The present article aims to investigate the characteristics of *Neotropical Ichthyology* by measuring some of main features that the international literature considers relevant to understanding the impact values calculated for specific journals. These factors include the following:

- a) evolution of the two-year IF,
- b) self-cited rate,
- c) self-citing rate, and
- d) uncitedness.

*Neotropical Ichthyology* is a journal published by the Sociedade Brasileira de Ictiologia since 2003. Despite its short history, the journal was quickly included in databases that apply strict quality assessment criteria, including the Scientific Electronic Library (SciELO). JCR calculated its first IF in 2006.

Such rapid inclusion in these two databases makes *Neotropical Ichthyology* a counterexample of the usual pattern for Brazilian journals, whose prolonged publication time represents the average time required for scientific and editorial maturation.

This unusual acknowledgment of the broad relevance of *Neotropical Ichthyology* is the reason it was chosen as the subject of the present study. Despite its short publication history, to what extent do the citations of and made by the articles published in *Neotropical Ichthyology* exhibit similar characteristics to those of foreign journals in the same field, as well as other Brazilian journals included in JCR?

## Material and Methods

The journals analyzed in the present study were clustered into two intentional samples to include all journals that exhibited measurements of the variables investigated during the examined period. The only exception is the *Revista Brasileira de Zootecnia*, which was not included in the 2011 edition of JCR. However, because most of the relevant citation and IF data for the period under consideration were available, this journal was included in the sample. One sample included the journals classified by JCR within the subject zoology, and the other contained the journals from different areas published in Brazil. Of the 129 zoology journals, 100 were included in Sample 1, and 16 of the 65 Brazilian journals were included in Sample 2. These samples were intended to analyze the IF of *Neotropical Ichthyology* within two well-defined and different contexts: thematic and national.

The IF, self-cited, and self-citing data were collected from the JCR issues published between 2006 and 2011. To collect uncitedness data, the research articles, review articles, and proceedings papers published by the journals included in the samples and indexed in Web of Science between 2006 and the first semester of 2010 were used. Web of Science is the web interface of all citation indexes published by Thomson Reuters, including Science Citation Index (SCI) and Social Sciences Citation Index (SSCI).

Microsoft Excel 2007 and SPSS version 18 were used to organize, analyze, and interpret the data.

## Results

### Two-year IF evolution

Based on the logic of interpreting IF values consolidated in the bibliometric literature, analyzing the evolution of a journal's IF sheds light on the journal's recognition by the international community over time. From this perspective, an increase in the number of a journal's citations might be interpreted as an increase in its legitimacy level and vice versa.

Analyses of a journal's IF evolution are more accurate when measured using its rankings in IF-based classifications, e.g., by analyzing its rankings in quartile distributions.

#### Thematic context of *Neotropical Ichthyology*.

The quartile-based ranking analysis of the zoology journals included in Sample 1 showed little variation on a per-year basis. As shown in Table 1, most journals remained within the same quartile. However, a percentage analysis of the journals' ranks over the entire investigated period (2006 - 2011) showed that only 38% of the journals did not shift quartiles in the years studied.

*Neotropical Ichthyology* ranked differently in Sample 1. In 2007, this journal exhibited a significant progression from the fourth to the second quartile, although it dropped to the third quartile in 2008, where it remained in 2009. The journal dropped again in 2010 and then returned to the third quartile in 2011.

In addition to self-citations, the journals that most often cited *Neotropical Ichthyology* were the Australian journal *Zootaxa* and the Brazilian journal *Iheringia Serie Zoologia*.

#### The national context of *Neotropical Ichthyology*.

The IF evolution of *Neotropical Ichthyology* was also compared to the IF progression of the other Brazilian journals included in Sample 2 using their IF classification rankings in their respective fields (Table 2).

Only four Brazilian journals ranked in the last quartile each year, and two journals remained in the third quartile. The best-ranked Brazilian journals according to quartile in their respective fields were *Anais da Academia Brasileira de Ciências* (Annals of the Brazilian Academy of Sciences), *Journal of The Brazilian Chemical Society*, *Memórias do Instituto Oswaldo Cruz* (Memoirs of Oswaldo Cruz Institute), and *Pesquisa Agropecuária Brasileira* (Brazilian Agricultural Research).

In addition to the two above-mentioned journals, which are highly ranked in their corresponding fields, only

*Neotropical Ichthyology* and the *Brazilian Journal of Physics* improved their quartile ranking over the entire investigated period.

### Self-cited rate

The self-cited rate is a measure that identifies the ratio of a journal's self-citations to the number of times it is cited by all journals (Rousseau, 1999). Notably high self-cited rates, i.e., above 20% (Thomson Reuters, 2002), are usually interpreted as suggesting low journal visibility within the scientific literature.

Conversely, as Rousseau (1999) explained, the main journals in every field exhibit low self-cited rates. Rousseau also observed that most journals exhibit higher self-cited rates during their first years of existence because authors and readers are almost always the researchers themselves. As a rule, journals become known and recognized by the scientific community only over time.

#### The thematic context of *Neotropical Ichthyology*.

To analyze the contribution of the self-cited rate to the impact of journals in Sample 1, the self-cited rate of each journal was measured for the investigated period (Table 3). Most journals in Zoology exhibited self-cited rates below 10% almost every year.

In contrast, during the investigated period, the self-cited rate of *Neotropical Ichthyology* was over 20% every year. According to Rousseau's (1999) logic, such high rates might be explained by the short publication history of *Neotropical Ichthyology*.

The most controversial aspect of the self-cited rate concerns its influence on IF. The editors' recommendation that authors cite articles carried by the journal in which they intend to publish to increase the journal's IF is a constant discussion topic in the literature.

The present study thus investigated the possibility of quartile ranking shifts in the zoology journals included in Sample 1 when their IF is calculated without the self-cited component. Table 4 shows the percentage of journals whose quartile ranking did not change when IF did not include the self-cited component.

The present study found that ranking journals using their IF-based classifications is hardly affected when the self-cited component is excluded from IF calculation; the self-cited component significantly improved the ranking of *Neotropical Ichthyology* only in 2007 and 2011.

**Table 1.** Percentages of zoology journals in Sample 1 according to changes in quartile ranking of the IF.

Ranking of journals	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011
Did not shift quartile	77%	69%	76%	68%	76%
1 quartile up	11%	16%	11%	16%	12%
1 quartile down	9%	14%	11%	16%	12%
2 quartiles up	1%	0%	1%	0%	0%
2 quartiles down	2%	1%	1%	0%	0%
Total	100%	100%	100%	100%	100%

**Table 2.** Quartile ranking of the IF of Brazilian journals in their corresponding fields and publication language.

Journal title	Publication language	Sub-field	Quartile 2006	Quartile 2007	Quartile 2008	Quartile 2009	Quartile 2010	Quartile 2011
Anais da Academia Brasileira de Ciências	E	Multidisciplinary science	2	2	2	2	2	2
Arquivo Brasileiro de Medicina Veterinária e Zootecnia	P, E	Veterinary Science	4	4	3	3	4	4
Arquivos de Neuro-psiquiatria	E	Neuroscience	4	4	4	4	4	4
Brazilian Archives of Biology and Technology	E	Biology	4	4	4	4	4	4
Brazilian Journal of Chemical Engineering	E	Chemical engineering	3	3	4	3	3	3
Brazilian Journal of Medical and Biological Research	E	Experimental medicine	3	4	3	4	3	3
Brazilian Journal of Microbiology	E	Microbiology	4	4	4	4	4	4
Brazilian Journal of Physics	E	Physics	4	4	4	4	3	3
Genetics and Molecular Biology	E	Biochemistry and Molecular biology	4	4	4	4	4	4
Journal of The Brazilian Chemical Society	E	Chemistry	3	2	2	2	2	2
Memórias do Instituto Oswaldo Cruz	P, E	Parasitology	3	3	3	2	2	2
<i>Neotropical Ichthyology</i>	E	Zoology	4	2	3	3	3	3
Pesquisa Agropecuária Brasileira	P, E, S	Agriculture	3	3	2	2	2	2
Pesquisa Veterinária Brasileira	P, E	Veterinary Science	3	3	3	3	3	3
Química Nova	P, E, S	Chemistry	3	3	3	3	3	3
Revista Brasileira de Zootecnia	P, E	Veterinary Science	3	3	3	3	3	-

Archambault & Lariviere (2009) observed that, by including the self-cited component in IF calculations, Garfield and Sher (1963) provided journals' editors a powerful tool to manipulate this indicator. However, Thomson Reuters (2002) stressed that removing the self-cited component would have little proportional effect on journals' IF rankings, and the results found by the present study in Sample 1 substantiate that assertion.

The national context of *Neotropical Ichthyology*.

Analyzing the self-cited rates exhibited by the Brazilian journals included in Sample 2 showed different values among them (Fig. 1). Half of the journals included in Sample 2 exhibited high self-cited rates, *i.e.*, over 20% in almost every year of the investigated period.

### Self-citing rate

With the exception of extremely high-impact journals, including *Nature* and *Science*, the universe of references made by any one journal is much higher than the citations it receives. In certain areas, the number of references included in articles is notably high, especially in literature reviews.

The self-citing rate is a measure that correlates the number of times a journal cites its own articles with the number of

times it cites other publications (Rousseau, 1999). High self-citing rates might indicate the isolation of a journal when publishing articles in its field. Because no other publications are dedicated to the topics addressed by such a journal, the authors writing in the field are restricted to consulting and citing the articles published in the journal to which they submit their own papers.

The thematic context of *Neotropical Ichthyology*.

Table 5 describes the percentage of zoology journals included in Sample 1 according to self-citing rates. Most journals exhibit self-citing rates below 10% every year. Neither *Neotropical Ichthyology* nor other zoology journals are isolated within their scientific field, but they communicate with other scientific journals using references.

The national context of *Neotropical Ichthyology*.

Fig. 2 shows the self-citing rate per year of the Brazilian journals included in Sample 2. Like the zoology journals included in Sample 1, most Brazilian journals included in Sample 2 exhibited self-citing rates below 10% during the investigated period. Although no journal in Sample 1 exhibited rates over 30%, Sample 2 contained journals with self-citing rates over 40% in 2007, 2008, and 2010. The journals that

**Table 3.** Percentage of zoology journals in Sample 1 per self-cited rate intervals.

Rate/year	2006	2007	2008	2009	2010	2011
Equal to or higher than 30%	12%	10%	5%	5%	7%	8%
Between 20 and 29.99%	15%	6%	18%	13%	12%	12%
Between 10 and 19.99%	33%	41%	32%	42%	30%	30%
Below 10%	40%	43%	45%	40%	51%	50%
Total	100%	100%	100%	100%	100%	100%

**Table 4.** Percentage of zoology journals in Sample 1 that did not shift quartiles in the IF-based classification without the self-cited component.

Journals' quartile distribution	2006	2007	2008	2009	2010	2011
Do not shift quartile	88%	88%	86%	86%	88%	84%

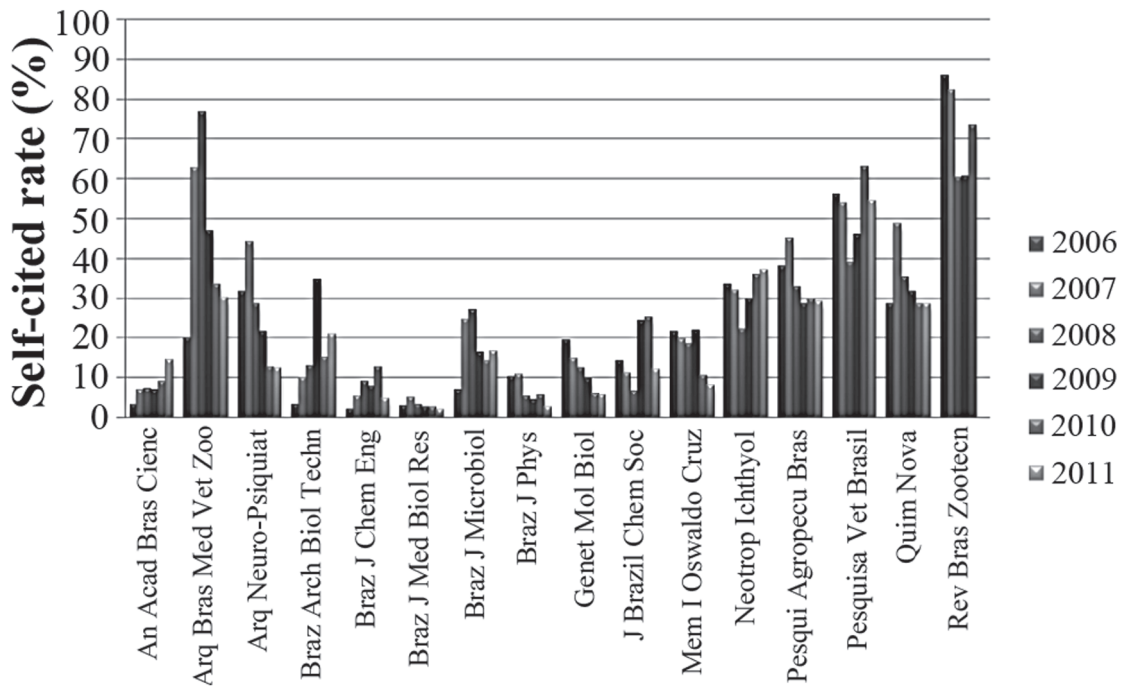


Fig. 1. Brazilian journals and their corresponding self-cited rates between 2006 and 2011.

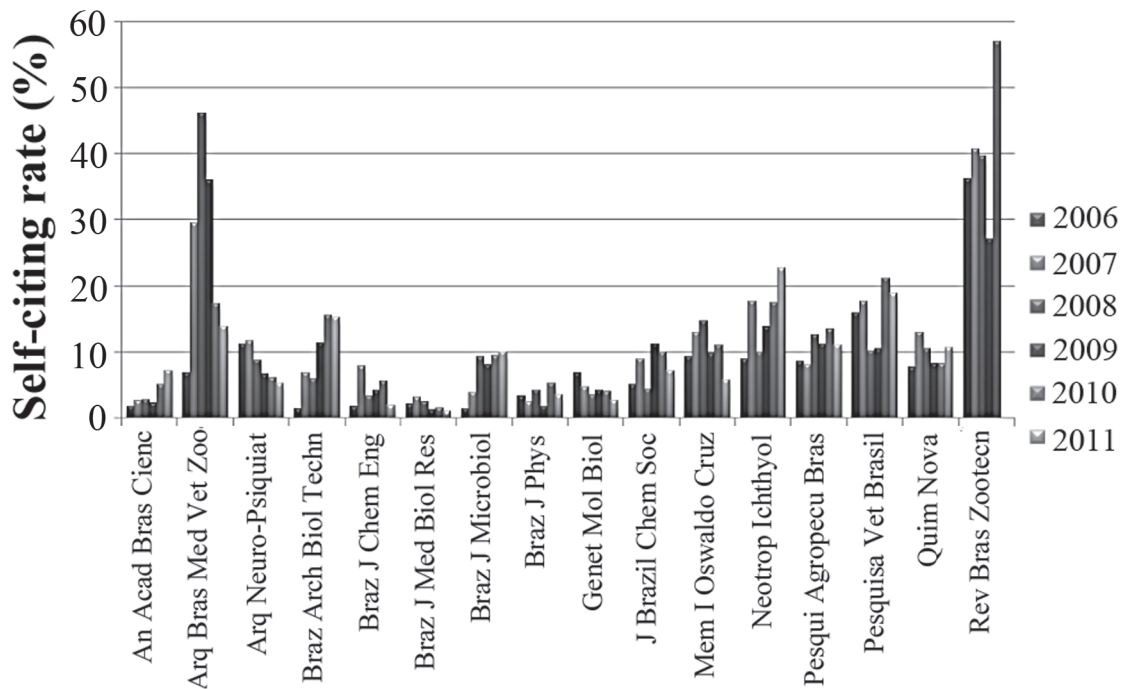


Fig. 2. Brazilian journals and their corresponding self-citing rates between 2006 and 2011.

Table 5. Percentage of zoology journals in Sample 1 according to self-citing rate intervals.

Rate/Year	2006	2007	2008	2009	2010	2011
Equal to or higher than 20%	3%	2%	2%	5%	4%	5%
Between 10 and 19.9%	31%	30%	29%	22%	20%	25%
Below 10%	66%	68%	69%	73%	76%	70%
Total	100%	100%	100%	100%	100%	100%

Table 6. Percentage of zoology journals in Sample 1 according to uncited article rate intervals.

Rate of uncited articles	2006-2010
Over 40%	40%
Between 20 and 39.9%	54%
Below 20%	6%
Total	100%

revealed some degree of isolation from the literature included in SCI were *Arquivo Brasileiro de Medicina Veterinária e Zootecnia* (Brazilian Archive of Veterinary Medicine and Animal Science) (2008) and *Revista Brasileira de Zootecnia* (Brazilian Journal of Animal Science) (2007 and 2010).

### Uncited articles rate

The rate of a journal's uncited articles is calculated as the ratio of the articles cited at least once to those that are never cited. Measuring uncitedness allows the most prestigious journals in each field (lower uncited article rate) to be distinguished from those considered second tier (higher uncited article rate), thus indicating the journal's quality as a whole rather than the quality of specific articles.

The thematic context of *Neotropical Ichthyology*.

The zoology journals included in Sample 1 were analyzed using the uncited article rate intervals shown in Table 6. In most journals, fewer than half of the published articles were uncited.

The journal that exhibited the highest uncited rate (80.79%) was *Zoologicheskyy Zhurnal*. Conversely, the review journal *Wildlife Monographs* was the only one with an uncited rate under 10%. The uncited rate of *Neotropical Ichthyology* was 48.62%.

The present study also sought to establish whether there was a correlation between the average IF values exhibited by the investigated journals between 2006 and 2009 and the uncited rates corresponding to the period between 2006 and 2010 (Fig. 3).

The zoology journals with the highest uncited rates exhibited the lowest average IF values, whereas journals with uncited rates under 20% showed high average IF values. Half of the articles published in *Neotropical Ichthyology* were uncited, and its average IF was below 1.

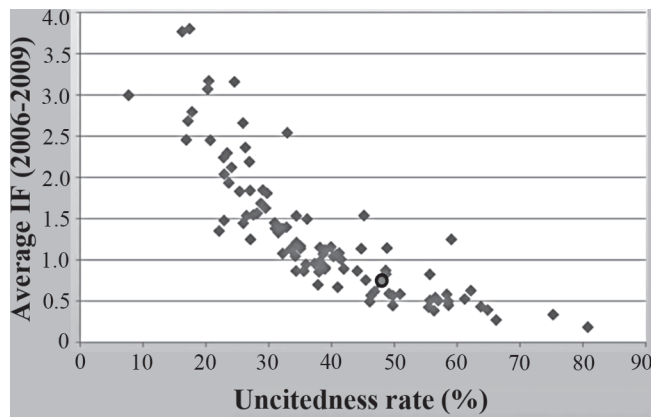
These results corroborate the assertion of Van Leeuwen & Moed (2005) of the existence of a negative correlation between IF and the uncited article rate.

The national context of *Neotropical Ichthyology*.

Analyzing Sample 2 identified the uncited rates of Brazilian journals, as in Fig. 4. An overall analysis showed that many journals exhibited high uncited articles rates. In contrast to the journals included in Sample 1, no Brazilian journal included in Sample 2 exhibited uncited articles rates above 70% or below 35%.

The highest uncited rate corresponded to *Pesquisa Veterinária Brasileira* (Brazilian Veterinary Research) (69.73%) followed by *Brazilian Archives of Biology and Technology* (68.47%). *Neotropical Ichthyology* and *Anais da Academia Brasileira de Ciências* exhibited similar uncited article rates of approximately 48%. *Memórias do Instituto Oswaldo Cruz* exhibited the lowest uncited article rate (36.16%).

The IF values of journals in different fields cannot be compared, as each field has distinctive characteristics that



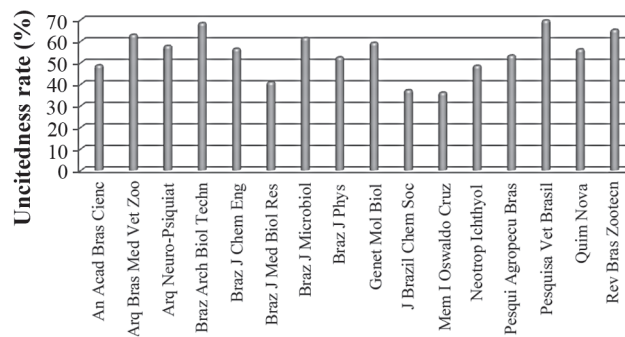
**Fig. 3.** Correlation between average IF and uncitedness rate of journals on zoology in Sample 1 between 2006 and 2010. The highlighted represents the data for *Neotropical Ichthyology*.

reflect researchers' citation habits. The present study thus chose to correlate the uncited article rates with the quartile ranking of journals in their corresponding fields (Table 7).

The journals that exhibited the lowest uncited article rates ranked better in the impact-based classification of their corresponding sub-fields. Some such journals include *Memórias do Instituto Oswaldo Cruz*, *Journal of the Brazilian Chemical Society*, and *Anais da Academia Brasileira de Ciências*. *Neotropical Ichthyology* was included among these journals despite being ranked in the fourth quartile in the first year that JCR indexed it. The journals ranked in the fourth quartile exhibited uncited rates over 50% in each investigated year.

## Discussion

Seeking to analyze the correlation of certain features of *Neotropical Ichthyology* with its IF, the results described above were obtained using the thematic and national patterns corresponding to the IF progression, as well as the self-cited,



**Fig. 4.** Uncitedness rate of articles published in the Brazilian journals in Sample 2.

**Table 7.** Correlation between uncitedness rates and quartile ranking of the IF of journals in Sample 2.

Journal	Quartile 2006	Quartile 2007	Quartile 2008	Quartile 2009	Uncitedness rate
Pesquisa Veterinária Brasileira	3	3	3	3	69.73%
Brazilian Archives of Biology and Technology	4	4	4	4	68.47%
Revista Brasileira de Zootecnia	3	3	3	3	65.37%
Arquivo Brasileiro de Medicina Veterinária e Zootecnia	4	4	3	3	63.07%
Brazilian Journal of Microbiology	4	4	4	4	61.60%
Genetics and Molecular Biology	4	4	4	4	59.28%
Arquivos de Neuro-psiquiatria	4	4	4	4	57.85%
Brazilian Journal of Chemical Engineering	3	3	4	3	56.54%
Química Nova	3	3	3	3	56.25%
Pesquisa Agropecuária Brasileira	3	3	2	2	53.35%
Brazilian Journal Of Physics	4	4	4	4	52.53%
Anais da Academia Brasileira de Ciências	2	2	2	2	48.84%
<i>Neotropical Ichthyology</i>	4	2	3	3	48.62%
Brazilian Journal of Medical and Biological Research	3	4	3	4	40.98%
Journal of The Brazilian Chemical Society	3	2	2	2	37.28%
Memórias do Instituto Oswaldo Cruz	3	3	3	2	36.16%

self-citing, and uncitedness rates.

Analyzing the IF progression of *Neotropical Ichthyology* demonstrated a distinct increase in this journal's impact, considering that improving a ranking in the impact classification quartiles is not a common phenomenon. Even when IF values vary each year, journal rankings tend to remain stable. That *Neotropical Ichthyology* improved its ranking might be considered a sign of progress in this journal's legitimacy in the scientific community over the investigated period.

For self-citations, *Neotropical Ichthyology* exhibited high self-cited rates during the investigated period compared to other zoology journals. Compared to Brazilian journals, however, such rates are similar to the values observed for national publications. High self-cited rates are also expected from new journals (Rousseau, 1999). Initially, the readers of a journal are essentially the authors who publish in it. Further studies should thus be performed to reassess the self-cited rate of *Neotropical Ichthyology* when it has a more extensive publishing record.

With regard to the ongoing discussion on whether editors manipulate journals' impacts through self-citation, excluding the self-cited components from the IF calculation for the zoology journals exhibited almost no effect on their impact-based ranking. This finding revealed the minimal effect of the different self-cited rates on interpreting IF as a measurement of journal visibility.

The self-citing rate values for *Neotropical Ichthyology* were very low. Similarly low results were also found for the remaining investigated zoology and Brazilian journals. Such journals are thus not isolated in treating their corresponding research subjects, but they communicate with the other journals that constitute the scientific literature universe. Only two exceptions were found among Brazilian journals.

Finally, the uncitedness analysis for *Neotropical Ichthyology* showed that it is similar in this regard to the zoology journals with the lowest impact. Compared to

Brazilian journals, *Neotropical Ichthyology* exhibited one of the lowest uncitedness rates. Calculating a journal's impact based on the average number of citations of individual articles has been criticized by those who maintain that this measure of journal visibility can be overly influenced a few highly cited articles. However, the present study showed that the highest-impact journals are those that seldom publish articles that are not cited at least once.

Journals that are usually assigned a high IF are those that consider subjects of interest for the international scientific community indiscriminately. The term "neotropical" in the title of the journal studied reveals a possible readership restriction, and a restricted readership translates into restricted citation potential. Evidence for the geographic locations of *Neotropical Ichthyology* readers is presented by the interest manifested by *Zootaxa*. The latter journal is also published in the Southern Hemisphere, and it is the main source of citations of articles published by *Neotropical Ichthyology*.

Further bibliometric studies should be performed on the IF of *Neotropical Ichthyology* in relation to other variables considered significant for understanding journal impact, including literature obsolescence rate, article density, and published article type. Investigating several features might result in a wider understanding of journals' impact characteristics within their own contexts.

The impact of other Brazilian journals still needs to be determined, especially of those revealed by the present study to be particularly low impact due to their high self-cited, self-citing, and uncitedness rates. New studies addressing such publications might contribute to understanding the citation patterns of specific thematic contexts among Brazilian journals.

The results obtained by the approach applied in the present study indicate the possibility of applying these methods to analyses of other journals, thereby providing preliminary knowledge on the impact characteristics of specific journals in the scientific community.

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