



Revista de Biología Tropical

ISSN: 0034-7744

rbt@cariari.ucr.ac.cr

Universidad de Costa Rica

Costa Rica

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BINABITROP, a comprehensive database about Costa Rican biology
Revista de Biología Tropical, vol. 61, núm. 2, junio, 2013, pp. 493-500
Universidad de Costa Rica
San Pedro de Montes de Oca, Costa Rica

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Subject and authorship of records related to the Organization for Tropical Studies (OTS) in BINABITROP, a comprehensive database about Costa Rican biology

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Received 02-XII-2012. Corrected 29-I-2013. Accepted 07-II-2013.

Abstract: BINABITROP is a bibliographical database of more than 38 000 records about the ecosystems and organisms of Costa Rica. In contrast with commercial databases, such as Web of Knowledge and Scopus, which exclude most of the scientific journals published in tropical countries, BINABITROP is a comprehensive record of knowledge on the tropical ecosystems and organisms of Costa Rica. We analyzed its contents in three sites (La Selva, Palo Verde and Las Cruces) and recorded scientific field, taxonomic group and authorship. We found that most records dealt with ecology and systematics, and that most authors published only one article in the study period (1963-2011). Most research was published in four journals: *Biotropica*, *Revista de Biología Tropical/International Journal of Tropical Biology and Conservation*, *Zootaxa* and *Brenesia*. This may be the first study of a such a comprehensive database for any case of tropical biology literature. *Rev. Biol. Trop.* 61 (2): 493-500. Epub 2013 June 01.

Key words: tropical field research, publications, articles per researcher, study subjects.

BINABITROP (*Bibliografía Nacional en Biología Tropical*) is a bibliographical database about the biology of Costa Rica. In contrast with commercial databases like the American Thompson Reuter's *Web of Knowledge* and the European *Scopus*, which exclude most of the scientific journals published in tropical countries (Monge-Nájera & Ho 2012), BINABITROP is a practically comprehensive record of all knowledge on the tropical ecosystems and organisms of the area it covers: Costa Rica.

BINABITROP was developed by the Organization for Tropical Studies (OTS), an organization that has been the subject of publications about its relationship with Costa Rica (Dauphin 1994, Monge-Nájera 1994a,b, Villalobos 1994, Burlingame 2002), ecology (Smith 1978), botany (Chazdon 1985, Clark 1988), education (Denslow 1990) and other subjects (Wyman

et al. 2009, Michener *et al.* 2009) including "impact" (Gómez & Savage 1983, McDade *et al.* 1994, Monge-Nájera & Ho 2012).

Despite the relatively good coverage of other aspects of the OTS and the unique value of a database that covers most of the literature on Costa Rican ecosystems, there are no published studies about the contents of BINABITROP. The purpose of this article is to fill that gap by quantitatively analyzing the records of publications and grey literature, as well as the distribution of taxonomic groups, scientific fields and authorship in BINABITROP.

MATERIAL AND METHODS

BINABITROP has more than 38 000 records of literature on the biology of Costa Rican organisms and ecosystems. For our

analysis we extracted only those records that dealt with three areas where the OTS has field stations (5 610 records): La Selva (3 930), Palo Verde (859) and Las Cruces (821) and that were published from 1963 to 2011 but in the figures we only present data until 2007.

This was our “population” and includes records of reference to the areas not only as a study site but also mention some of the OTS Biological Stations; this may overestimate some metrics.

There might be publications conducted at OTS stations that do not include the name of the station and these would underestimate the metrics. However, we do not have concrete data of any such cases and from our experience with BINABITROP we believe that overestimation and underestimation are minimal and do not affect general trends.

For title relevance we used the Bradford index and for authors we used productivity based on Lotka (IP logarithm of the number of original articles that identify the authors in productivity levels, small: with 1 item and a PI equal to zero, medium: 2 to 9 items with IP zero and less than 1, and large producers: 10 or more with IP contributions greater than 1).

IC: number of authors per item/total articles, i.e. mean authors per item. We identified prolific authors (total output) and visibility by considering which journals were preferred by authors.

We also wanted to study the distribution of records by taxonomic group and biological field. It was not possible to do it for the whole “population” so we used a computer-generated random sample of 5 610 records (www.random.org). The recommended minimal size for the random sample was 76 records (for an expected effect size 0.15, statistical desired power level 0.8, number of predictors 3 and probability level 0.05; Sample size Statistics Calculators V3.0, www.danielsoper.com, University of California). However, to be even more confident of the results we used far more than the minimal recommended sample and analyzed in detail the triple (229 random records).

RESULTS

Taxonomic groups and biological fields:

The three geographic areas differed in the taxonomic groups that were more common in the BINABITROP records. Records that referenced La Selva dealt mostly with plants, followed by invertebrates and vertebrates. Most Las Cruces records were about invertebrates, followed by plants and vertebrates. Palo Verde records mostly dealt with invertebrates, followed by vertebrates and plants (Fig. 1).

Most work related with La Selva analyzed ecological aspects, followed by records about systematics and, in a distant third place, natural history. Systematics dominated in Las Cruces, followed by ecology and - as in La Selva - natural history was a distant third. Palo Verde had the same pattern as Las Cruces, but behavior was in third place instead of natural history (Fig. 2).

Journals and authorship: Articles associated with La Selva have appeared in 615 journals. The most important according to the Bradford distribution (Table 1) were *Biotropica* (an American journal about terrestrial ecosystems), *Zootaxa* (a taxonomy journal published in New Zealand) and *Revista de Biología Tropical/International Journal of Tropical Biology and Conservation* (a Costa Rican journal with a strong presence of aquatic biology).

TABLE 1
Journals that include most articles related with
La Selva Field Station

Journal	Number of articles	Country of publication
Biotropica	203	USA
Zootaxa	99	New Zealand
Revista de Biología Tropical	96	Costa Rica
Ecology	91	USA
Oecologia	75	Germany
American Journal of Botany	68	USA
Brenesia	66	Costa Rica
Journal of Tropical Ecology	61	Great Britain

These journals have 33% of all articles from the period. Only journals with more than 50 articles are shown.

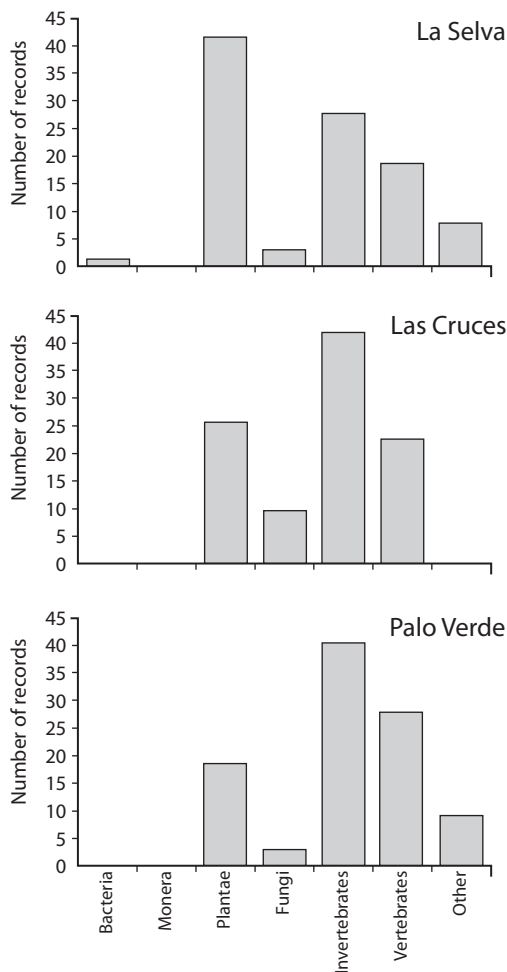


Fig. 1. Records by taxonomic group in BINABITROP.

Las Cruces were referenced in 239 articles, of which *Revista de Biología Tropical* published 44, *Zootaxa* 39, *Biotropica* 19, *Brenesia* 17, *Principes* 16, *Annals of the Missouri Botanical Garden* 12 and *Novon* 10. These journals are published in the USA (4), Costa Rica (2) and New Zealand (1).

Palo Verde had a similar pattern: *Brenesia* with 28 articles, *Biotropica* 26, *Zootaxa* 23 and *Revista de Biología Tropical* 22.

La Selva was referenced by 2,814 authors. Of these, 74 registered more than 10 articles and 803 authors at least two. The top authors were David B. Clark with 72 articles, Deborah A. Clark with 68 and Robin L. Chazdon with 59.

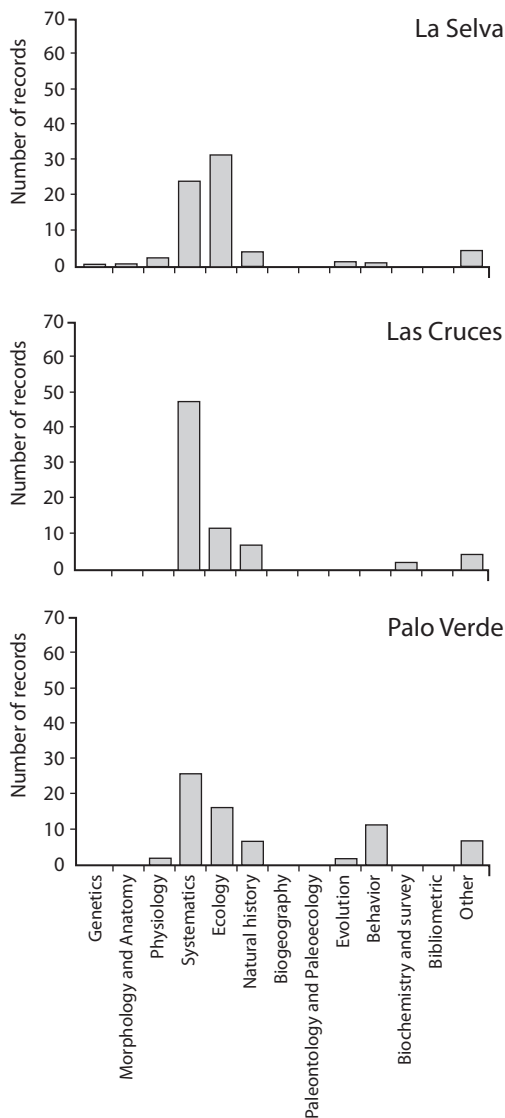


Fig. 2. Records by biological field in BINABITROP.

Las Cruces was referenced by 874 authors of whom the top authors were Gretchen C. Daily with 29 records, Luis Diego Gómez with 20, Paul R. Ehrlich with 18, Robert Lücking with 15, C. Hugh, F. Rowell, Jay M. Savage and Rakan A. Zahawi (each with 11) and Donald R. Hodel with ten. There were 237 authors that registered at least two articles for Las Cruces.

Palo Verde was referenced by 1029 authors; the top authors were Daniel H. Janzen with 13 records, Joanna Burger with 11 and, with ten each, Eugenio González Jiménez, Michael B. MacCoy and José Manuel Mora Benavides. There were 257 authors that referenced at least two articles of Palo Verde.

In all cases the typical authorship was composed of one author and one coauthor: La Selva had a mean of 2.07 authors per article (Las Cruces 1.88 and Palo Verde 1.94 authors per article).

Most records referenced La Selva, followed by Las Cruces and Palo Verde. The number of records generally increased during the period presented here (Figs. 3-7).

DISCUSSION

The rapid ecological change that is affecting tropical ecosystems has increased the urgency and importance of understanding them, and in the case of Costa Rican ecosystems, BINABITROP provides a valuable

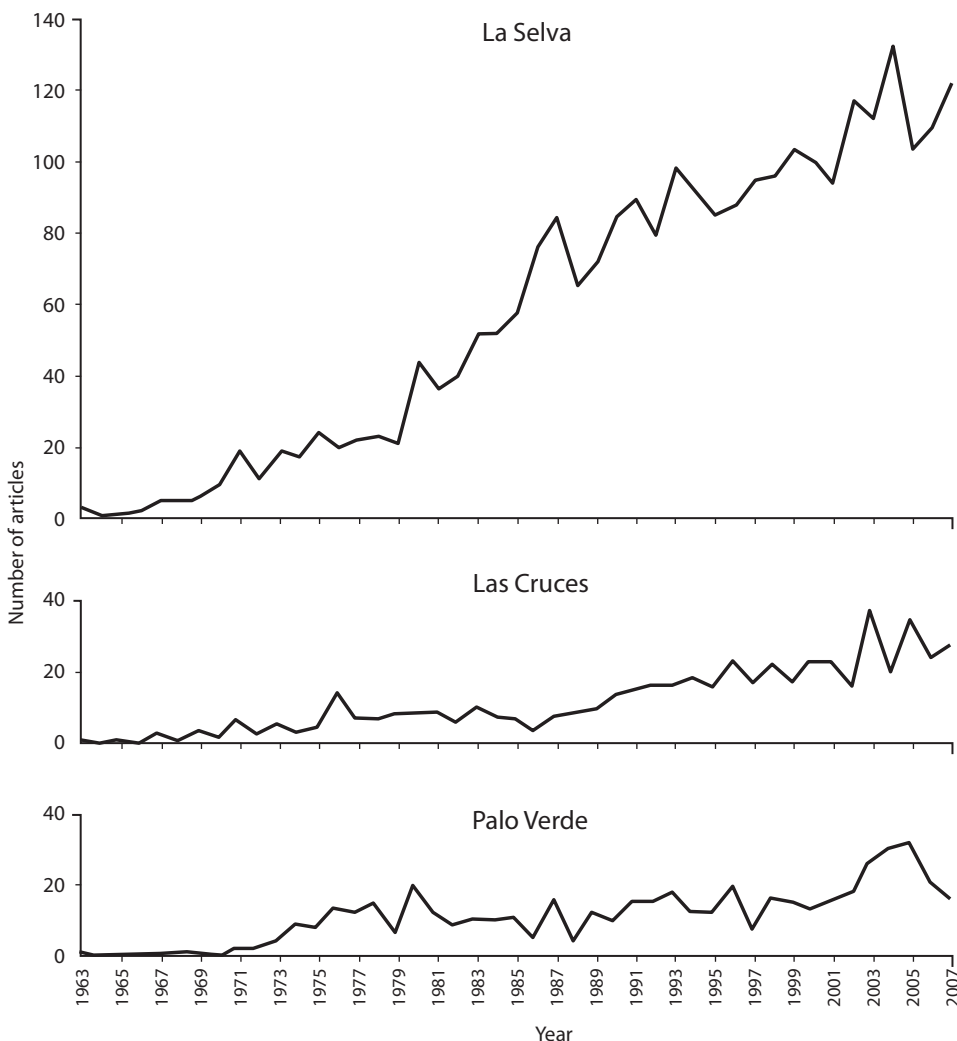


Fig. 3. Records of articles associated with OTS field stations.

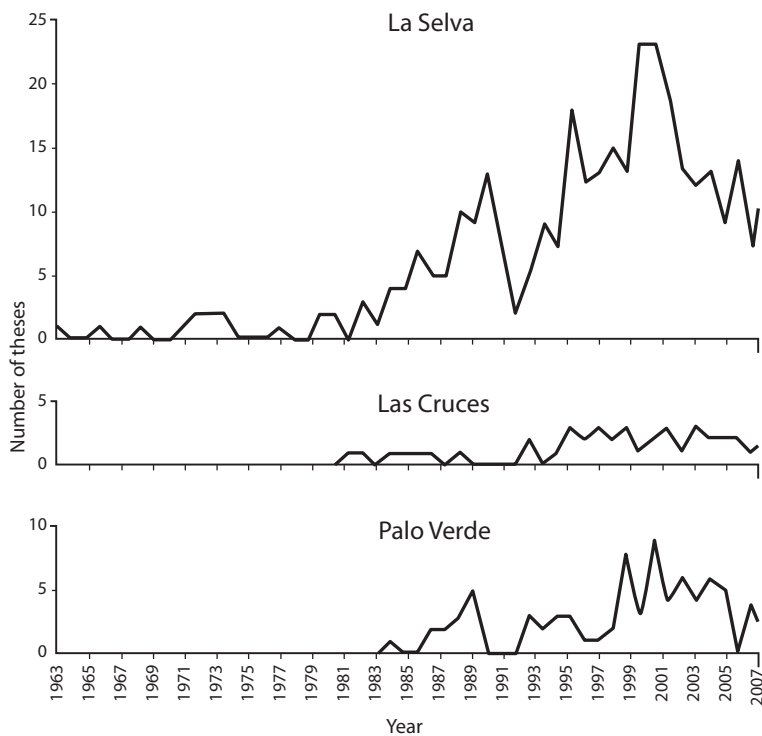


Fig. 4. Records of theses associated with OTS field stations.

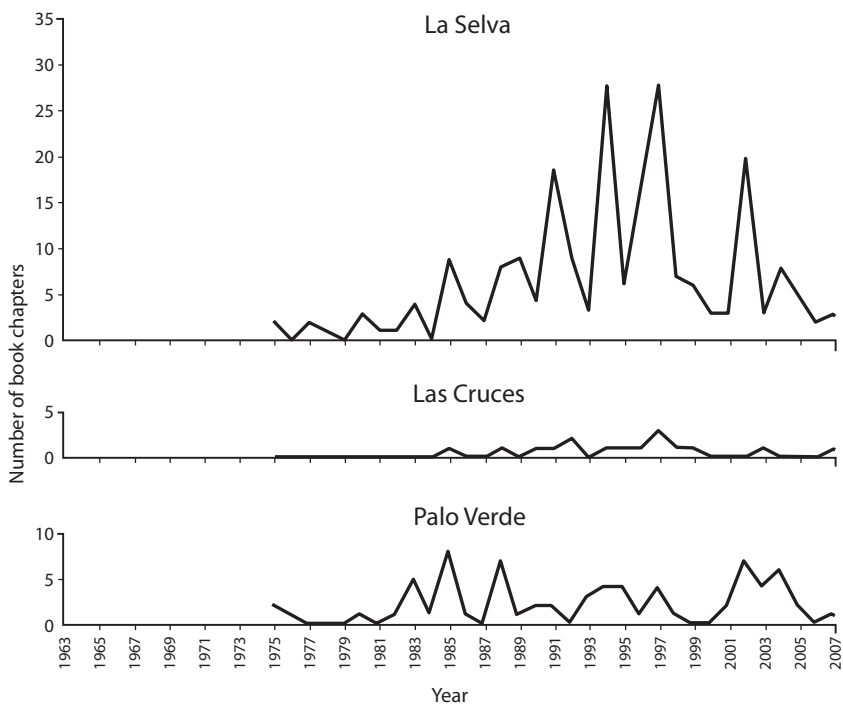


Fig. 5. Records of book chapters associated with OTS field stations.

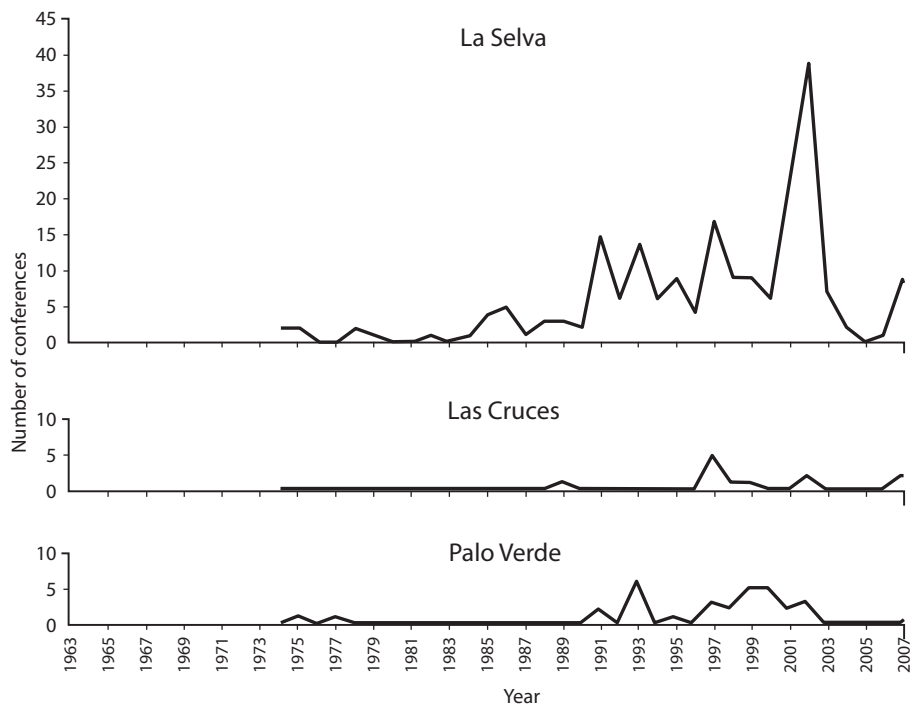


Fig. 6. Records of presentations in professional meetings associated with OTS field stations.

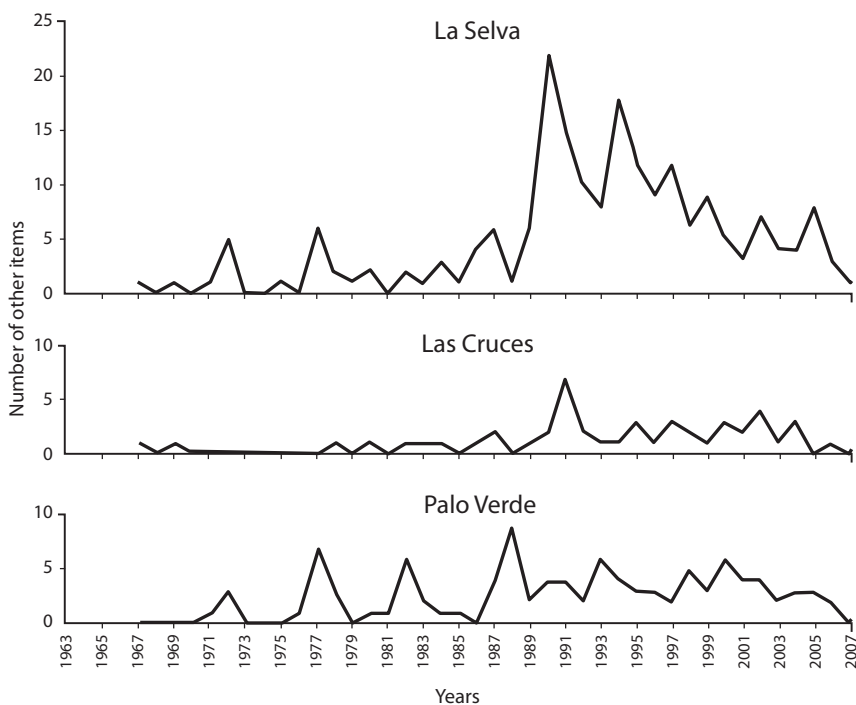


Fig. 7. Records of other literature items associated with OTS field stations.

source of information not only because of its large coverage in number of years and records, but because it is freely available (<http://www.ots.ac.cr>; 2013). Furthermore, the only study about the database was done when it was in its early stages, covered only the standard bibliometric indices and was not formally published (Aguirre, Céspedes & Vargas 1988). Ours is the first published study of BINABITROP.

When we analyzed the dominating subjects in BINABITROP, we expected botany to dominate the records especially considering that Las Cruces includes the Wilson Botanical Garden. However, this was not the case. One hypothesis, which we leave to future researchers, is that the organisms and themes studied result from complex factors that include the personal interest of scientists working at the station and the funding priorities of agencies and foundations at any particular time.

Most authors only have one record related to work in these field stations and the reasons remain open for future research, but this is a common pattern in science and often results from thesis work (Monge-Nájera, Nielsen-Muñoz & Azofeifa 2010). On the other hand, some of the authors with many publications have served as station directors (David B. Clark, Deborah A. Clark, Luis Diego Gómez, Eugenio González and Rakan A. Zahawi).

Considering our limited knowledge of tropical nature, the first question is typically “which species live in these ecosystems?” and the second is “how do they interact?” In agreement with these two basic questions, most studies reported in BINABITROP dealt with systematics and ecology. This is quite different from the situation in Western Europe, where research has been intense for centuries and finer details such as the physiology and genetics of organisms are more common than systematics or general ecology.

Considering that the comprehensive coverage of formal and grey literature makes BINABITROP unique in the tropics, we hope future research will ask new queries of BINABITROP, such as how much impact the database has had on new research, how it

differs from Scopus and Web of Knowledge, and how it affects other activities such as education and conservation.

ACKNOWLEDGMENTS

We thank Susana Aguilar, Sergio Aguilar, Julie Denslow, Gilbert Fuentes, Pedro León, Óscar Madrigal, Carolina Murcia, Karla Vega and Zak Zahawi for BINABITROP data, their kind assistance and valuable suggestions to improve an earlier draft. The authors did not receive financial support to do this research, which they dedicate to the OTS in its 50th Anniversary.

RESUMEN

BINABITROP es una base de datos bibliográfica con más de 38 000 registros sobre los ecosistemas y organismos de Costa Rica. En contraste con bases de datos comerciales como Web of Knowledge y Scopus, que excluyen a la mayoría de las revistas científicas publicadas en los países tropicales, BINABITROP registra casi por completo la literatura biológica sobre Costa Rica. Analizamos los registros de La Selva, Palo Verde y Las Cruces. Hallamos que la mayoría de los registros corresponden a estudios sobre ecología y sistemática; que la mayoría de los autores sólo registraron un artículo en el período de estudio (1963-2011) y que la mayoría de la investigación formalmente publicada apareció en cuatro revistas: *Biotropica*, *Revista de Biología Tropical/International Journal of Tropical Biology*, *Zootaxa* y *Brenesia*. Este parece ser el primer estudio de una base de datos integral sobre literatura de biología tropical.

Palabras clave: investigación tropical de campo, publicaciones, artículos por investigador, temas de estudio.

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