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THE PREPARATION OF A LICHEN CHECK-LIST OF THE IBERIAN PENINSULA AND BALEARIC ISLANDS: PROBLEMS AND COMMENTS

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Abstract

With the main aim of writing a lichen Flora of Spain and Portugal, the SEL (Spanish Lichen Society) has produced a check-list in the form of a guide to the bibliographical sources of published floristic information. The data-base is available in a FoxPro version, adapted by HLADUN. Each entry (usually a species name) is followed by the citation, in chronological order, of the sources (authors, date of publication) including page and number of references. So far, 1087 sources have been incorporated to our check-list (170 with data only from Portugal, 824 with data from Spain). In all, 41.507 data are entered, each corresponding to 1-10 records. A comment on this bibliographical list is provided, treating problems found during preparation, such as the search for sources, assembly of a Thesaurus of sources, entering of information and search for valid names. A comparison between the check-list information and the results of working with herbarium and self-collected material is presented in the case of the lichen genus Rinodina.

Introduction

At the end of the era of ACHARIUS (death of ACHARÍMS, 1819; de ath of CLEMENTE), the number of publications including floristic and taxonomic information on lichens of the Iberian Peninsula were rather scarce, especially in comparison with that of France and Italy.

The evolution of lichenology is different in Portugal and in Spain. In Portugal, there was a period of vitality in the nineteenth century, and a peak between 1930 and 1965. In Spain, a certain activity in 1895-1910 was followed by a long silence, after which there was a "snowball effect" in the prospections and the subsequent publication of data, which began in 1973 and continues to accelerate (Fig. 1).

At present there is a wealth of more than 1100 publications, meaning a strong dispersion of the information and a serious difficulty to retrieve it. The commission of lichens of OPTIMA decided in the meeting held in Trieste (1990) that if we intend to improve our knowledge of Mediterranean lichens, we must undertake a serious synthesis, a sort of "digestion" of the available data.

We were fortunate that this priority was appreciated by the Spanish scientific authorities. CRESPO played a very important role in establishing the priority of biodiversity studies in Spain. Thus, some lichenological projects have been funded and integrated with others devoted to the production of a comprehensive Flora and Fauna of the Iberian Peninsula.

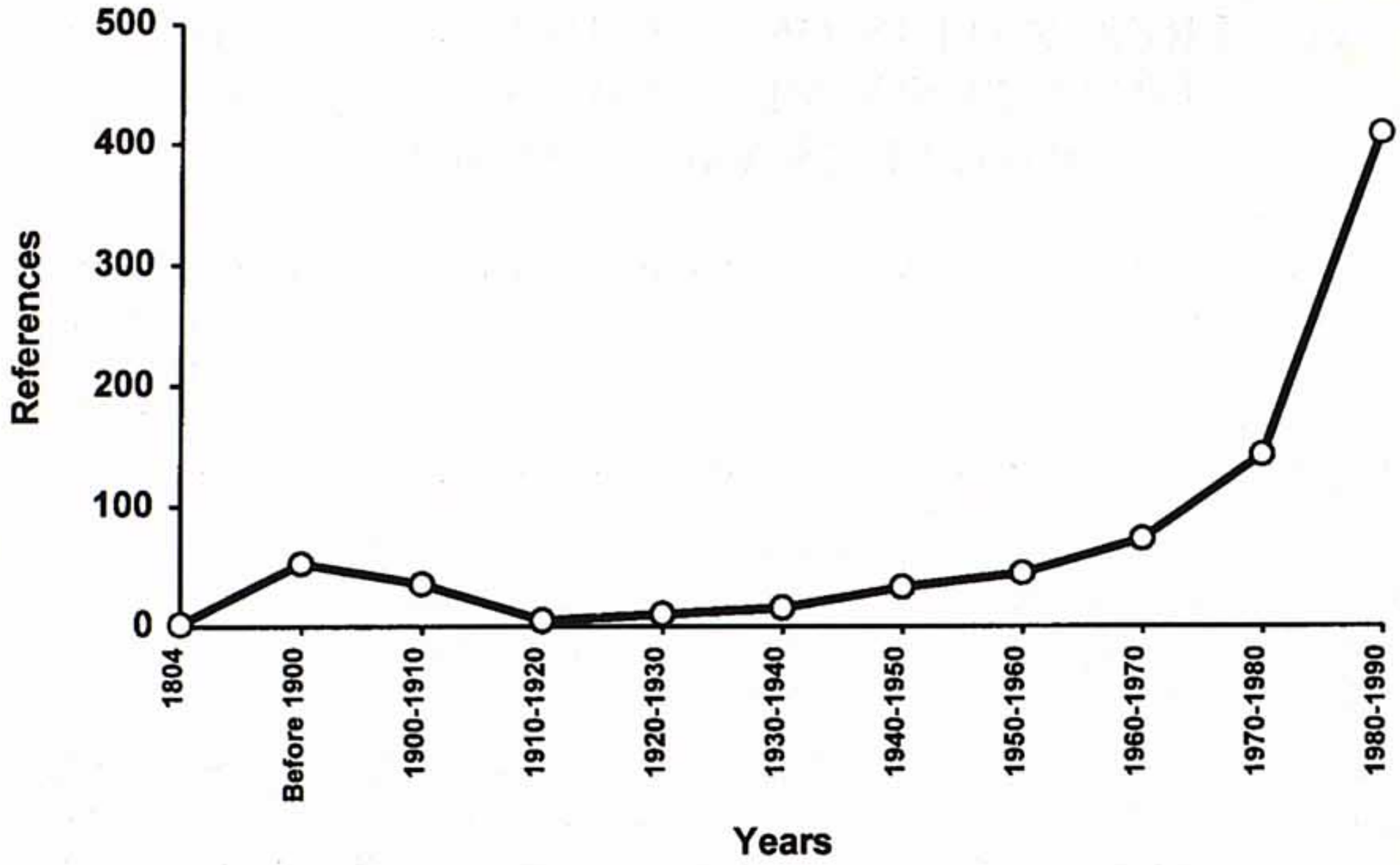

Fig. 1. Number of studies on lichens of Spain and/or Portugal published in the decennia from 1900 to 1990.

The Sociedad Española de Liquenología (SEL) coordinates the projects aimed at the production of a "*Lichenological Flora of the Iberian Peninsula and Balearic Islands*", to be published in different volumes, following the orientation of the *"Flora Mycologica Iberica Flora"* (TELLERÍA & MELO, 1995).

This contribution is subdivided in two parts: A general explanation of the main problems met during the preparation of the check-list, and a comparison between the raw check-list and the results of checking herbarium and recently collected material, based on the taxonomic revision of the lichen genus *Rinodina* which was carried out by the first author.

The preparation of the check-list

The preparation of the check-list received financial support from the Dirección General de Investigación Científica y Técnica of Spain (Programs PB89/0518 and PB92/0795).

The authors of the present study are only two of the many colleagues who have worked on the preparation of the check-list of the Iberian Peninsula and Balearic Islands. A complete list of the team involved is given below:

Tasks and Team of collaborators: Direction and coordination, Xavier LLIMONA; Computer programs, Néstor HLADUN; Source detection, Ana Rosa BURGAZ, Regina CARBALLAL, Xavier LLIMONA, SOCIEDAD ESPAÑOLA DE LIQUENOLOGÍA; Preparation of the sources, Mercedes BARBERO, Montserrat BOQUERAS, Mireia GIRALT, Antonio GÓMEZ-BOLEA, Xavier LLIMONA, Pere NAVARRO-ROSINÉS; Data introduction, Néstor

HLADUN, Maria Farners LLIMONA; Nomenclatural updating, Néstor HLADUN, Xavier LLIMONA; Layout, Néstor HLADUN.

Two previous steps were completed, to provide the essential infrastructure needed for the writing of the *"Lichenological Flora of the Iberian Peninsula and Balearic Islands"*: 1, *The Thesaurus*, containing mre than 1100 bibliographical references of sources, 170 with data from Portugal, 824 with data from Spain. This bibliographical list is backed by a library in which almost all the sources included in the thesaurus are gathered and available to the authors of the Lichen Flora and to other colleagues. 2, *The check-list*, a bibliographical data-base of the sources of each taxon, ordered, first, according to the names used in the sources, and, second, by the valid name.

Phases of the preparation of the check-list and main problems

Detecting the sources. We scanned the series *"Recent Literature on lichens"* published in *The Bryologist* by Culberson (1951-1978), Egan (1979-1991) and Esslinger (1991-1996...), bibliographical works (as BARRENO & CRESPO, 1977), the bibliographic references included in lichenological articles and the collection of offprints and books in our library (BCC). On the other hand, Burgaz (Madrid) checked the series *"Bibliografía Botánica Ibérica. Líquenes"* published in *Botanica Complutensis* (1992-1995....) and shared her data with us before publication. It should be noted that we gave special attention to classical books, maps and information concealed under uninformative titles. Local journals and exsiccata schedae were also checked.

Obtaining the sources. Most were obtained from our (BCC) library and offprint collections, but many colleagues and Institutions also kindly contributed copies on request (e.g. botanical Institutes of Lisboa (LISU), Madrid (MA) and Barcelona (BC), several departments of Botany (MAF, BCF SANT, etc)). Obtaining copies of articles published in rare journals was often difficult. Interlibrarian Exchange was sometimes used.

Preparation and introduction of data. Sources were analyzed and marked by a lichenologist. We used floristic and chorologic lists, maps, relevés and species cited in the "material and methods" of experimental papers. Unpublished studies (degree and doctoral theses, reports, etc) were also consulted (indicated INED). Introduction of data was performed by a non-lichenologist.

First Print. Entries were first ordered under the name used by each author. So, after each taxon, we find the mention of the sources of the data, ordered from ancien to modern and indicating (mention: INED.) the case of unpublished information (theses, reports, etc...). The total number of these entries (citation of a taxon in a work) is 41.507. The total number of entries x localities, that is, the total amount of citations, is 118.581. At the present stage, it is only available for consultation, by mail, to the contributors of the *"Lichen Flora"* and other colleagues. No attempt has been made to synthetise chorological or ecological data, as our database was compiled mainly to help in the production of the *"Lichen Flora"*, the central contribution to the Biodiversity Program for the Spanish government. This first print was used for nomenclatural and general corrections.

Search for the valid name of each taxon used in the sources. We used mainly ZAHLBRUCKNER (1931), CLAUZADE & ROUX (1985), SANTESSON (1993), NIMIS (1993), PURVIS & al. (1994) and WIRTH (1994). For author abbreviations, we decided to follow the *"Authors of fungal names"* (KIRK & ANSELL, 1992) because there is too much variation in recent studies. The total number of taxa is 3483, but some of them are "uncertain", and its inclusion in any modern taxon has not been yet possible.

Layout of the check-list. After the first nomenclatural revision (1995), the references were arranged under the valid name, but conserving the original name. The check-list is now ready in computer form only. In a second revision, we shall attempt to solve many remaining nomenclatural problems. A shortened version adapted for publication in *Bocconea* will be ready shortly. In a later phase, we aim to add the chorological and ecological data and other useful information now scattered in the sources.

Some features revealed by the check-list

A first overwiew of the check-list reveals trends and conclusions, some of which we state here: 1, Macrolichens, classical (old) species, eurioic species and large or bright coloured species are overemphasized; 2, Epiphytic species are given a broader treatment; 3, In contrast, saxicolous lichens, are much less studied this is outstanding in the case of calcicolous lichens; 4, The treatment is even less satisfactory in the case of terricolous, lignicolous, turphophylous and hydrophylous lichen species; 5, The "fathers of the lichenology" (Acharius, Frey, Schaerer, etc) had surprisingly good knowledge of the lichens of the area; 6, The nomenclature used before 1970 shows a strong dispersion, with a large number of synonyms, varieties, forms, etc., which are difficult to interpret; 7, Herbarium material of records previous to 1973 is very hard to locate or to obtain on loan, except that of Tavares (LISU) and Werner (BC). Especially problematic are the cases of Sampaio and Clemente herbaria; 8, Many data in degree and doctoral theses, reports, herbaria, etc., are unpublished or incompletely published, mostly because of limitations imposed by editors of some botanical journals (because of devaluation of floristic works). So, much interesting information (chorologic, ecologic, morphologic, chemical and iconographic) is now unavailable to lichenologists; 9, We have detected frequent misidentifications: in addition to those caused by taxonomical advance, we have often found merging of rare species in common ones. See as an example, the case of Rinodina (second part of this contribution); 10, Many common but inconspicuous species have often been overlooked.

Modifications of the check-list after the taxonomic revision of the lichen genus *Rinodina*

Introduction

During the last four years, the taxonomic revision of the lichen genus *Rinodina* in the Iberian Peninsula and Balearic Islands has been carried out (GIRALT, 1994; GIRALT & MATZER, 1994; GIRALT & MAYRHOFER, 1994a, 1994b, 1995; GIRALT & al., 1995, 1996a, 1996b; GIRALT & BARBERO, 1995 and GIRALT & LLIMONA, 1996).

Starting the taxonomic revision required a list of all *Rinodina* taxa reported from the area studied. Thanks to the Iberian Lichen Flora project, devoted, in a first phase, to the production of a check-list, these previous data were available.

In the original check-list all synonyms are cited as valid taxa. The search for the actual valid name of each *Rinodina* taxon was carried out with the aid of several books (see the first part of this contribution) and monographs and articles (e.g., MAYRHOFER & POELT, 1979; and MAYRHOFER, 1984).

As already noted, the check-list gives, under each taxon, the reference/s where the taxon is mentioned. It was necessary to obtain these publications, not only to confirm the information provided by the check-list, but also to determine the herbarium in which the *Rinodina* specimens were kept.

Material belonging to each *Rinodina* species mentioned in the check-list was requested on loan from the herbaria. All herbarium specimens were analysed by standard techniques with stereoscopic and compound microscopes. At least one specimen of each species was analysed by TLC.

Results

First analysis of the original check-list, mainly based on bibliographical research. According to the original check-list, 105 *Rinodina* taxa have been reported from the Iberian Peninsula and Balearic Isles.

1, The bibliographic research has shown that 33 are no longer considered valid taxa: e.g., *R. confragosa* var. *immersoareolata* and *R. iberica* are synonyms of *R. trachytica; R. melanocarpa* and *R. serpentini,* of *R. rinodinoides;* and *Rinodina oreina,* of *Dimelaena oreina.*

2, Five more taxa have been excluded from the original check-list: *Rinodina bischoffii* var. *reagens, R. castanoplaca, R. conimbricensis* and *R. conimbricensis* var. *tumidula,* because they represent still unsolved taxonomic problems, and *R. fimbriata,* because the single specimen collected in the area studied (PEREIRA, 1992) could not be examined (lost ?).

In our opinion, these five taxa should, for the moment, be mentioned at the end of the revised check-list as "excluded species".

After this first analysis of the check-list, mostly based on the existing literature, in all 38 *Rinodina* taxa have been deleted from the check-list, which now includes 67 taxa ([105 -. (33 + 5)] = 67).

Second analysis of the check-list, based on the revision of herbarium material. Revision of the herbarium specimens introduced the following new changes to the first revised check-list:

1, Nine of the 67 *Rinodina* taxa mentioned in the check-list have been eliminated: a, Five correspond to misidentifications: *R. arnoldii* (is *R. milvina*); *R. cinereovirens* (is *R. capensis*); *R. llimonae* (is *R. dubyana*); *R. polyspora* (is *R. polysporoides* or *R. crespoae*) and *R. venostana* (is *R. occulta*). b, Four correspond to new synonyms: *R. cintrana* is a new synonym of *R. pruinella*; *R. iodes* is a new synonym of *R. luridata; R. pruinella* f. *laevigata* is a new synonym of *R. pruinella* and *R. sophodes* var. *lusitanica* is a new synonym of *R. sophodes.*

2, Twenty *Rinodina* taxa that were not included in the first revised check-list have been added: a, One taxon corresponds to a new combination and should be transferred from the genus *Buellia* to the genus *Rinodina*: *R. anomala* (as *Buellia anomala* in the original check-list); b, Two taxa correspond to valid species which were considered synonyms: *R. oleae* and *R. pruinella*; c, Sixteen taxa were recorded under other name/s (misidentifications):

1, *R. algarvensis*; 2, *R. aspersa*; 3, *R. crespoae*; 4, *R. diplinthia*; 5, *R. interpolata;* 6, *R. kalbii*; 7, *R. llimonae*; 8, *R. madeirensis*; 9, *R. nimisii*; 10, *R. orculata*; 11, *R. parasitica*; 12, *R. pityrea*; 13, *R. polysporoides*; 14, *R. septentrionalis*; 15, *R. sicula*; 16, *R. striatotunicata*.

After this second analysis of the check-list, based on the revision of the herbarium specimens, 9 *Rinodina* taxa have been deleted from and 19 taxa have been added to the first revised check-list, which now includes 77 taxa ([67 - (5 + 4) + (1 + 2 + 16)] = 77).

Additional changes due to the taxonomic revision of the genus *Rinodina* but which do not modify the number of taxa on the check-list are the following: the actual valid name of *R. corticola* is *R. capensis* and that of *R. sorediata* is *R. colobinoides*. Furthermore, *R. castanomelodes* is considered a variety of *R. bischoffii*.

Synthesis of the results

The changes introduced to the first revised check-list following the study of the herbarium specimens may be synthesized with the following percentages:

The new check-list includes, on one hand, 9 taxa fewer than the first revised check-list and, on the other hand, 19 taxa more than the first revised check-list. Thus, in all, 28 taxa were erroneously reported in the check-list, that is an error of 41.8%.

The new check-list includes 77 taxa, 10 more than the first revised check-list, which means that the known biodiversity of the genus *Rinodina* in the Iberian Peninsula and Balearic Islands has increased 15% after the revision of the herbarium material, that is a 15% increase in our knowledge of *Rinodina* biodiversity.

Analysis of the revised check-list

It includes 77 taxa. Among them: 45 % of the species are corticolous (35 species); 49 % of the species are saxicolous (38 species) and 5 % of the species are terricolous-muscicolous (4 species).

It includes ±950 sources, of which aproximately 40% correspond to corticolous species and the rest (60%) to saxicolous (terricolous not treated). The sources include 2280 records (localities).

Detailed analysis of the corticolous species. Among the 35 corticolous species listed, only 19 were reported from the area before 1983:

Species / First record / Second record: 1. *R. exigua*, 1899, 1903; 2. *R. sophodes*, 1901, 1906; 3. *R. roboris*, 1916, 1918; 4. *R. pruinella* (as *R. p.* var. *cintrana*), 1918,

1947; 5. *R. isidioides*, 1921, 1947; 6. *R. capensis* (as *R. corticola*), 1947, 1950; 7. *R. colobinoides* (as *R. sorediata*), 1947, 1965; 8. *R. furfuracea*, 1947,1965; 9. *R. albana*, 1947, 1969; 10. *R. confinis*, 1947, 1969; 11. *R. conradii*, 1947, 1975; 12. *R. oleae* (*), 1947, 1985; 13. *R. archaea* (*), 1947, 1984; 14. *R. dalmatica* (*), 1947, 1994; 15. *R. polysporoides* (as *R. polyspora*), 1956, 1982; 16. *R. pyrina*, 1959, 1970; 17. *R. anomala* (as *Buellia anomala**), 1969, 1985; 18. *R. biloculata* (as *Buellia biloculata**), 1969, 1985; 19. *R. colobina* (as *R. leprosa*), 1982, 1985.

Of these 19 species, 5 (indicated above with (*)) were reported only once before 1983 (most records are from MAGNUSSON 1947).

The remaining corticolous species (35-19= 16) were mentioned for the first time during or after 1983:

Species / First record: 1. *R. mayrhoferii* Crespo, 1983 (*), 1983; 2. *R. euskadiensis* Crespo & Aguirre, 1984 (*), 1984; 3. *R. efflorescens*, 1989; 4. *R. griseosoralifera* Coppins, 1989 (*), 1989; 5. *R. malangica* (as *R. rhododendri*), 1989; 6. *R. boleana* Giralt & Mayrhofer, 1992 (*), 1991; 7. *R. plana* (**), 1993; 8. *R.crespoae* Giralt & Mayrhofer, 1994 (*), 1994; 9. *R. diplinthia* (**), 1994; 10. *R. kalbii* Giralt & Matzer, 1994 (*), 1994; 11. *R. madeirensis* Kalb & Hafellner, 1993 (*), 1994; 12. *R. orculata* (**), 1994; 13. *R. septentrionalis* (**), 1994; 14. *R. llimonae* Giralt & Etayo, 1995 (*), 1995; 15. *R. nimisii* Giralt & Mayrhofer, 1995 (*), 1995; 16. *R. pityrea* Ropin & Mayrhofer, 1995 (*), 1995.

Of these 16 species, 10 (indicated above with (*)) have recently been described and 4 (indicated above with (**)) were reported for the first time from the study area after the revision of the herbarium material.

Detailed analysis of the saxicolous species. Of the 38 saxicolous species listed, only 18 were reported from the area before the taxonomic revision of MAYRHOFER & POELT (1979).

Species / First record / Second record: 1. *R. lecanorina*, 1906, 1916; 2. *R. oxydata* (as *R. contribuens*), 1906, 1921; 3. *R. immersa*, 1906,1921; 4. *R. dubyana* (*), 1906, 1979; 5. *R. atrocinerea*, 1916, 1918; 6. *R. milvina*, 1935, 1970; 7. *R. teichophila* (as *R. colletica*), 1937, 1975; 8. *R. trachytica* (as *R. confragosa* var. *immersoareolata*), 1937, 1975; 9. *R. bischoffii*, 1953, 1965; 10. *R. calcarea* (*), 1965, 1979; 11. *R. confragosa*, 1868, 1906; 12. *R. beccariana* var. *beccariana* (as *R. subglaucescens*), 1968, 1979; 13. *R. lesdainii* (*), 1970, 1979; 14. *R. luridescens* (as *R. coniopta**), 1970, 1984; 15. *R. santorinensis* var. *olivieri* (*) (as *R. confragosa* var. *olivieri*), 1970, 1990; 16. *R. alba* (as *R. michaudiana**), 1978, 1979; 17. *R. gennarii* (*), 1978, 1979; 18. *R. santorinensis* var. *santorinensis* (*) (as *R. pertusariophila*), 1978, 1980.

Of these 18 species, 8 (indicated in the table above with (*)) were reported only once before 1979.

The remaining saxicolous species (38-18= 20) were mentioned for the first time during or after 1979:

Species / First record: 1. *R. cana*, 1979; 2. *R. obnascens*, 1979; 3. *R. occulta*, 1979; 4. *R. guzzinii*, 1984; 5. *R. insularis*, 1984; 6. *R. rinodinoides* (as *R. serpentini*), 1984; 7. *R. beccariana* var. *lavicola* (as *R. subglaucescens* var. *lavicola*), 1985; 8. *R. epimilvina*, 1986; 9. *R. tunicata*, 1989; 10. *R. bischoffii* var. *castanomelodes* (as *R. castanomelodes*), 1990; 11. *R. luridata*, 1990; 12. *R. castanomela*, 1991; 13. *R.*

canariensis Matzer & al., 1994 (*), 1994; 14. *R. vezdae*, 1994; 15. *R. aspersa* (**), 1995; 16. *R. algarvensis* Giralt & al.,1996 (*), 1996; 17. *R. interpolata* (**), 1996; 18 *R. parasitica* (**), 1996; 19. *R. sicula* (**), 1996; 20. *R. sriatotunicata* Matzer & Mayrhofer, 1996 (*), 1996.

Of these 20 species, 3 (indicated above with (*)) have recently been described and four additional species (indicated above with (**)) were reported for the first time from the study area after the revision of the herbarium material.

Comparison between the results of the corticolous and the saxicolous Rinodina species: In general, the number of corticolous *Rinodina* specimens misidentified is rather high. Most corticolous specimens that belong to species recently described or recently reported from the area were concealed among specimens identified mainly as *R. exigua*, or as *R. pyrina* and *R. sophodes*. For instance, hardly any of the specimens identified as *R. exigua* correspond to this species. Aproximately 50% of the records of the check-list which correspond to corticolous *Rinodina* species are classified under one of these three classic taxa.

In general, the number of saxicolous specimens misidentified is relatively low. In contrast to the corticolous, the saxicolous species misidentified are hidden among different species and not accumulated in classical ones.

The number of sources with data on corticolous *Rinodina* species has increased substantially the last 10 years. In the case of the saxicolous species the increase has been more gradual.

The differences observed in the check-list between the saxicolous and the corticolous *Rinodina* species (lower number of misidentifications, higher number of species and sources) are probably due to the taxonomic revisions of MAYRHOFER (Graz) and his lichenological team (e.g., MAYRHOFER & POELT, 1979; MAYRHOFER, 1984; MAYRHOFER & al. 1990, 1992, 1993; MATZER & MAYRHOFER, 1994, 1996; MATZER & al., 1994) and to several chemical studies on *Rinodina* carried out since 1981 (HECKLAU & al., 1981; LUMBSCH & TITZE, 1983; LEUCKERT & MAYRHOFER, 1984; MAYRHOFER & LEUCKERT, 1985; ELIX & al., 1995).

The same has been observed in other check-lists like, for instance, that of the lichens from Sardinia (MAYRHOFER, 1987), in which the number of corticolous species is lower than that of saxicolous (9 versus 24) and where, also as occurs in our check-list, the number of misidentifications concerning the corticolous species is high (4 of the 9 species listed are erroneous citations).

Conclusions

The check-list is essential to carry out a local taxonomic revision as it provides information on the area. However, the Lichen Flora of an area should not be extracted from a check-list without previous checking of herbarium material. As already noted, for the genus *Rinodina* we have detected 41,8% of error in the check-list. Furthermore, after the taxonomic revision of the genus *Rinodina*, its biodiversity in the study area has increased 15%.

At the beginning, we believed that the high percentage of error detected was because *Rinodina* is a "difficult" genus. However, according to BOQUERAS (pers. comm.), the percentage of error detected for the genus *Ochrolechia*, a genus considered "easier" than *Rinodina*, is very similar (47%).

It should also be noted, that either the data presented here or those forthcoming from new revisions of the check-list, will never be definitive, at least because of some of the following reasons: new species are always being described; nomenclatural problems are always being discussed; many herbarium specimens have still to be examined; some classical studies have still to be introduced in the data-base, etc.

Finally, we must draw the attention to some additional information that has been revealed by the check-list: the knowledge of silicicolous species is greater than that of the calcicolous (as occurs, in general, for other genera); the alpine and montane species, both corticolous and saxicolous, are poorly known; the knowledge on terricolous, muscicolous, etc., species is almost nil; most sources refer to Spain, whereas the records from Portugal and Balearic Islands are very scarce; in general, the best known part of the study area is the whole Mediterranean region; for saxicolous species is the S and SE Mediterranean coast, mainly due to the studies of EGEA, CASARES and ROWE and their collaborators; for corticolous species is the northern Mediterranean coast and the central part of northern Spain, mainly due to the studies of the lichenological team of Barcelona and to ETAYO, respectively; the most imcompletely known areas are the southern atlantic coast of Portugal and Spain, and some inland places.

General conclusions

Preparing a check-list is a long time-consuming and tedious task. For these reasons some questions emerge: Is the preparation of the check-list scientific research or merely "documentalism"? Is the check-list really appreciated by the scientific community as a worthwhile contribution? We prefer to consider this work as a public service. In exchange, information and comments on overlooked sources, nomenclatural incorrections, etc., are welcome.

We hope that one of the first services rendered by our check-list will be to encourage the international use of Spanish and Portuguese data (including herbarium material), which unfortunately have too often been neglected or overlooked.

Finally, the check-list is *essential* in evaluating the interest and novelty of floristic records, and *basic* when attempting to write an Iberic or regional lichen flora.

A check-list is also useful when planning field and taxonomic research, as it makes possible to detect underexplored areas and neglected taxonomic groups, detect threatened species (writing red lists) and trace the history of the lichenology (evaluation of floristic, taxonomic, and chorologic contributors; evaluation of scientific standard of each author, problems of "incontinence" in the description of new species, etc).

As the main conclusion, a check-list requires a sustained effort of criticism and cross-checking. The preparation of the "Lichen flora" is advancing in this direction.

As a final concusion, we wish to state that the second part of this contribution is the result of four years work on the genus *Rinodina*. So, if the same has to be done for each genus on the check-list, the definitive "Lichen flora of the Iberian Peninsula and Balearic Islands" is still far away!

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