

Rapid Communication

EASIN-Lit: a geo-database of published alien species records

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Abstract

EASIN-Lit is an initiative of the Joint Research Centre of the European Commission, aiming to facilitate access to spatial data published in the literature through the EASIN (European Alien Species Information Network) portal. Currently, information from 227 publications has been included, covering geo-referenced records for 236 species (1655 single records) and country-level occurrences for 3105 species. Systematic and harmonized access to such kind of data, otherwise dispersed in scientific libraries and archives, can be crucial for alien species distribution modeling and the implementation of early warning systems.

Key words: biological invasions; EASIN; Europe; geo-database; geo-referenced records; mapping

Introduction

The European Alien Species Information Network (EASIN) is an initiative of the Joint Research Centre (JRC) of the European Commission (EC) aiming to facilitate the exploration of alien species information from distributed sources and to assist the implementation of European policies on biological invasions (Katsanevakis et al. 2012; 2013).

In EASIN, data are collected from several on-line or off-line databases, are harmonized and integrated, and then made available to the end-users through the EASIN portal (<http://easin.jrc.ec.europa.eu/>). Most alien species databases provide species presence information at country or sub-country (e.g. main islands or prefectures) level or static maps of species distribution (Gatto et al. 2013). However, there is a huge amount of information on alien species distribution (geo-referenced records and distribution ranges) in scientific and technical papers, which is not commonly available through existing online databases (with some exceptions, such as the REABIC database, http://www.reabic.net/GIS_europe.html, which includes data reported in the

REABIC journals, and is linked to EASIN as a data provider). In order to facilitate access to such spatial data published in the literature, a new product, EASIN-Lit (abbreviation of EASIN-Literature), has been developed by JRC (<http://easin.jrc.ec.europa.eu/About/EASIN-Lit>). Here, we describe EASIN-Lit and present its current status.

Methods

EASIN-Lit is a geo-database providing data on species distribution (geo-referenced records and distribution ranges) collected from scientific literature and technical reports. Due to the vastness of literature available and to the continuous adding of new publications, the process of retrieval of data from the literature is an on-going process, which provides regular updates (every few weeks) through the EASIN portal. The focus was initially on marine high impact species, according to the lists of DAISIE (<http://www.europe-alien.org/speciesTheWorst.do>), NOBANIS (<http://www.nobanis.org/Factsheets.asp>), GISD (<http://www.issg.org/database/species/search.asp?st=100ss>) and

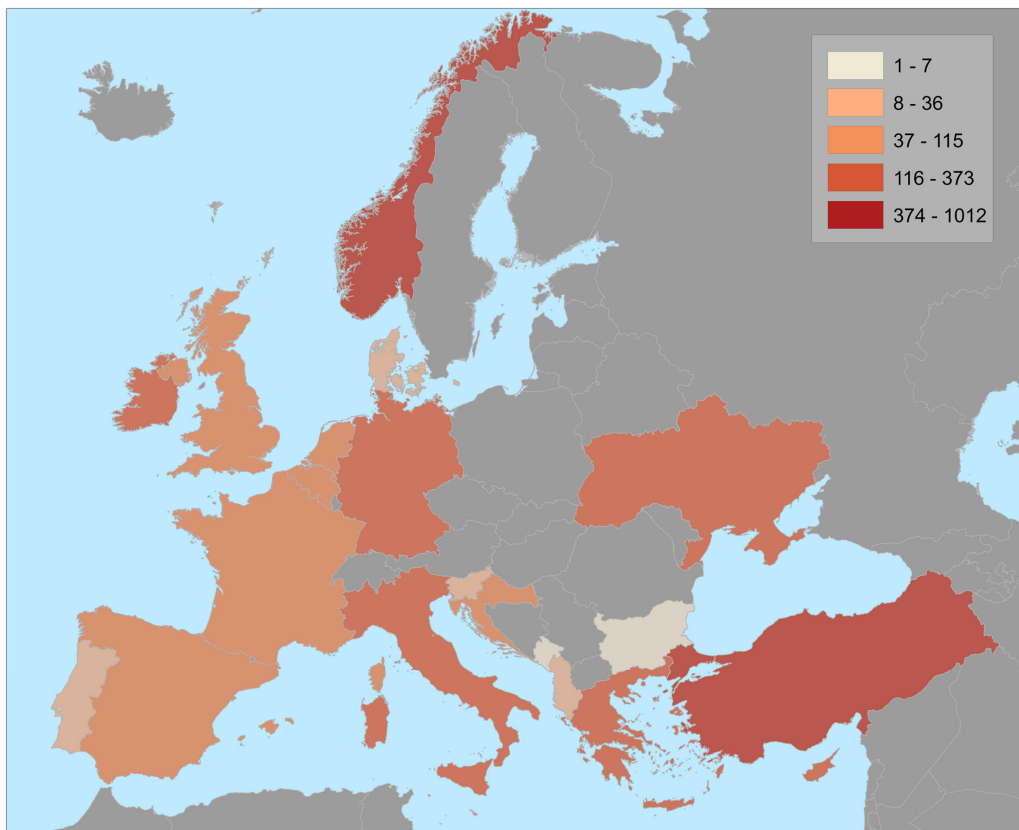


Figure 1. Number of alien species per country as reported by EASIN-Lit (5/9/2013).

IUCN/MedPAN (Otero et al. 2013). This was mainly because we expected to find many more data available for these species and thus be able to launch the first versions of the product as soon as possible. For a similar reason, the initial focus was on the Mediterranean basin, considered as an alien hot-spot. Currently, EASIN-Lit is being extended to include records of high-impact species also from the other European sea basins and soon it will also cover the other environments (terrestrial and freshwater).

From each analyzed publication, data about location, year of sampling and citation are retrieved and stored in the EASIN-Lit geo-database. The geo-coordinates are always checked against site descriptions or place names as described in the paper, to avoid acquiring wrong information. If the reported location is not geo-referenced, a conversion of cited place names or maps to a spatial format is performed with the best possible accuracy. Furthermore, when available, a hyper-

link to the article in PDF or to the publisher's webpage is also included in the database record. Although more details on the type and accuracy of the original data are not directly provided through EASIN, a link to the original data provider is given for each record, so that the interested user may retrieve additional information. Through the EASIN data broker (feature for collecting and indexing spatial data), EASIN-Lit is connected to the EASIN platform contributing to the enrichment of the geo-spatial catalogue for a better insight into alien species distribution in Europe and surrounding sea basins. Furthermore, in the framework of EASIN-Lit, published country-level information (mainly national reviews) is also compiled to build inventories at country level of reported alien species. On the EASIN website, full reference of the source publications is provided (<http://easin.jrc.ec.europa.eu/About/EASIN-Lit>) and the authors involved are notified once the updates are available on-line.

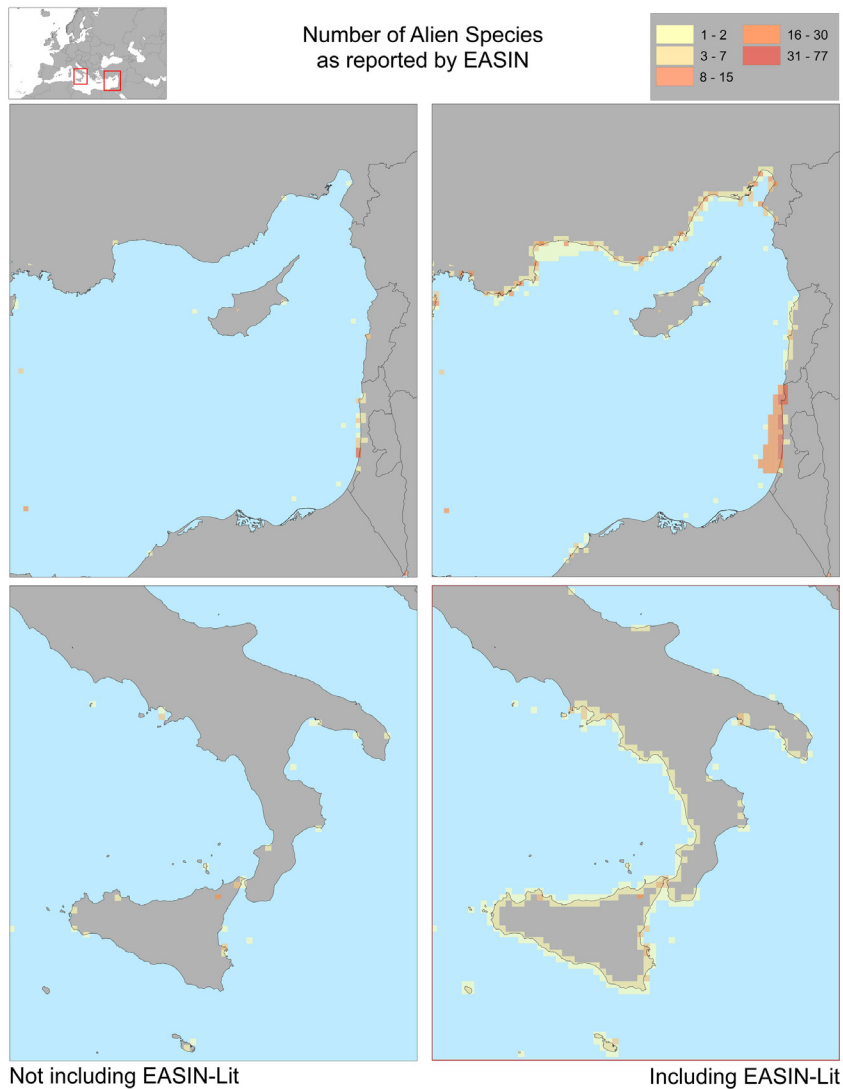


Figure 2. Examples of the added value of EASIN-Lit in mapping the spatial distribution of marine alien species. The maps on the left include all records of marine alien species retrieved from GBIF (<http://www.gbif.org>), the Global Invasive Species Information Network (GISIN; <http://www.gisin.org>), and the Regional Euro-Asian Biological Invasions Centre (REABIC; <http://www.reabic.net/>). Records from CIESM Atlas of Exotic Species (<http://www.ciesm.org/online/atlas/index.htm>) that are also available in EASIN have not been included; although the CIESM data are very rich, they are expert-judged distribution ranges and not real geo-referenced records and were thus herein excluded. The maps on the right include all previous records plus the ones retrieved through EASIN-Lit.

Preliminary Results and Discussion

Currently (September 5, 2013), information from 227 scientific and technical papers has been added to the EASIN-Lit database. The retrieved information embraces country-level occurrences for 3105 species and geo-referenced records for 236 of them (Figure 1). EASIN-Lit currently

includes 1655 single records of geo-referenced reported occurrences.

The added value of the information reported in EASIN-Lit is especially evident in areas not sufficiently covered by other databases (Figure 2). Especially in the marine environment, available geo-referenced records are scarce. Even in the Global Biodiversity Information Facility (GBIF; <http://www.gbif.org>), which is the largest global

provider of biodiversity occurrence records, marine alien species in European waters are under-represented. The growing EASIN-Lit geo-database aims to fill this gap by appropriately exploiting the accumulated spatial data published in the literature. Such data could then be fed to other biodiversity databases such as GBIF. Spatial data are currently provided to the end-users through the EASIN mapping tools at three different scales, country-level, 10×10 km grid, or river basins, while soon it will be possible to map alien species occurrences at a marine ecoregions scale. Even when the occurrence is reported in the literature as a precise sampling point, thus recording the detailed information, EASIN represents the map of occurrences at a coarser resolution (10×10km). Due to the continental level of this portal and the scope of the project, this accuracy is currently considered adequate.

Increasing the spatial resolution of occurrence data by providing geo-referenced species occurrences is important for supporting the dedicated Regulation on Invasive Alien Species, recently proposed by the European Commission. The lack of such data is a substantial bottleneck for assessments of biological invasions, modeling current and future distribution of alien species, assessing demographic rates of alien populations and their interaction with native biota and managing biological invasions by controlling pathways and by early prevention or eradication measures (Lee et al. 2008; Simpson et al. 2009). The existing functionality in the EASIN mapping tools of showing and selecting the time range of occurrence reporting could allow for assessing invasion rates and trends in alien species introductions. EASIN interactive maps coupled with EASIN-Lit provide a powerful, freely accessible search engine of literature, based on spatial relevance of records and not only on keywords as with conventional web search engines, i.e. the user can select a specific country or a 10×10 km cell or a river basin (or, in the near future, a marine ecoregion) and retrieve lists of articles reporting the presence of the target species. Furthermore, geo-referenced occurrence records can also be easily aggregated at scales that are more relevant to particular policies, such as the river basin scale for the EU Water Framework Directive (EC 2000) or the marine sub-regions defined in the Marine Strategy Framework Directive (EC 2008), thus, providing for useful data for their implementation and assessment. Soon, EASIN maps will be down-loadable through WFS (Web

Feature Service), thus it will be possible to combine them with any kind of ancillary data (temperature, depth, salinity, etc.) through common GIS software, e.g. for modeling current and future distributions under climate change scenarios.

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