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## 1. Executive summary

This deliverable presents a test version of a citizen observatory system for marine biodiversity. It describes two prototypes for citizen observatory systems developed during the project, one for research on marine invasive species and one for research on endangered species. These demonstrators are customised versions of existing biodiversity monitoring systems and are largely compatible in their underlying technology. Both platforms feature new functionalities that allow individual scientists to establish their own network of reporters and collect data for a specific scientific purpose. Such functions are especially useful when trying to respond quickly to an event (e.g. a biological invasion) or when trying to obtain data from regions and habitats that are difficult to sample (e.g. large distribution areas across many countries). Both citizen observatories are already in use and allow citizens to submit, store, share, trace, and visualise data on marine species and habitats, while they are linked to national and global data repositories. The present report provides the basis for tutorials that will be used in the next stage of the project to teach marine scientists to how establish their own ‘human sensor network’ and collect biodiversity data via a customized online recording system.

## 2. Introduction to the demonstrator

In the *Description of Work* we stated that the objective of this test case is to develop a marine citizen observatory able to generate harmonized information on the spatio-temporal distribution of coastal species and habitats in Europe in order to monitor change, and to quickly react to impacts in coastal environments. The platform will be built from technology and know-how of existing research infrastructures and be used for citizen data acquisition as well as for citizen education, including functions for visualisation, scientist-citizen feedback, crowdsourcing, event response, long-term engagement, and social media integration. As a part of ENVRI+ we should have a demonstrator, conduct training with scientists, and work towards an adoption of the platform by a larger Marine biological community, the EMBRC network. The approach is compatible with other biodiversity applications, and applicable to visual observation networks in general.

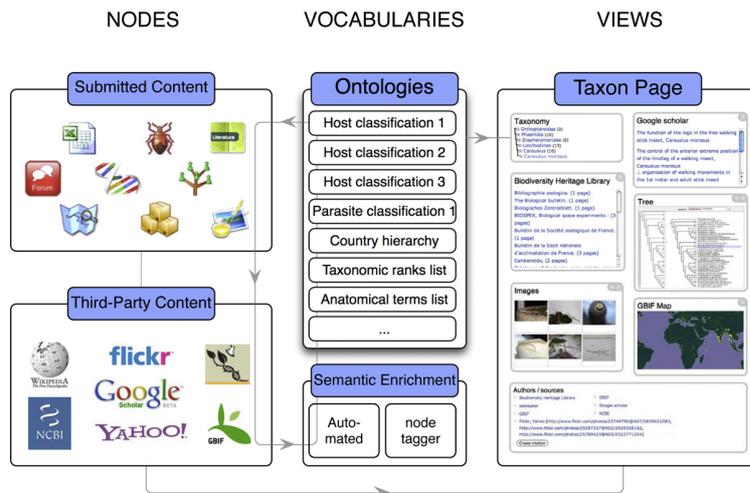
In our citizen science demonstrator we would like to offer functionalities that enable marine researchers to set up and administer their own online recording system and use citizens and peers to collect relevant biological and environmental information for scientific analysis. Hobby scientists, volunteers, school classes, researchers, sport divers, or others may provide this information. The added value of the site should be that it generates the desired data better (i.e. with higher quality), cheaper, or faster when compared to conventional scientific practice (e.g. using fieldtrips by the scientist and/or scientific networks). With this background and after a series of meetings and discussions among the ENVRI partners we identified two systems, which seems fit for this purpose. These are the iRecord/Indicia system and the Scratchpads. Both platforms are based on the same underlying technology, the Drupal content management system, while they are well documented and frequently used for biodiversity data recording. In addition, both systems are maintained and administrated in the United Kingdom, which makes these platforms largely compatible.

**iRecord/Indicia.** Indicia is a well developed and fully documented Drupal-based open source wildlife recording software kit (<http://www.indicia.org.uk/>) currently hosted by the Centre of Ecology and Hydrology, UK (CEH). The system allows automated data feeds from customized websites and offers a series of standard data models that are already available. Various user communities (including citizen scientists) currently use the system for multiple recording schemes. The system allows users to develop their own front end but retain data within constrained data warehouses through Indicia. The iRecord system (<http://www.brc.ac.uk/irecord/>) also allows for a data verification procedure that users can implement themselves and have control over the data and data release.

Interfaces are available to connect to other information systems like the ISPOT (<http://www.ispotnature.org>) where participants can submit photos while experts can identify species from those photos. However, a link to ISPOT is outside the scope of this project and may be pursued further in the future.

**Scratchpads.** The Scratchpad Virtual Research Environment (<http://scratchpads.eu/>) is a flexible data-publishing framework for groups of people to create their own social networks (Smith et al., 2011). The system is administrated by the Natural History Museum in London and is designed to cater to the particular needs of individual research communities through a common database and system architecture (Smith et al., 2009). This is a flexible and scalable solution to support multiple networks, each with its own choice of features, visual design, and constituent data. The Scratchpad data model supports web services on standardized data elements

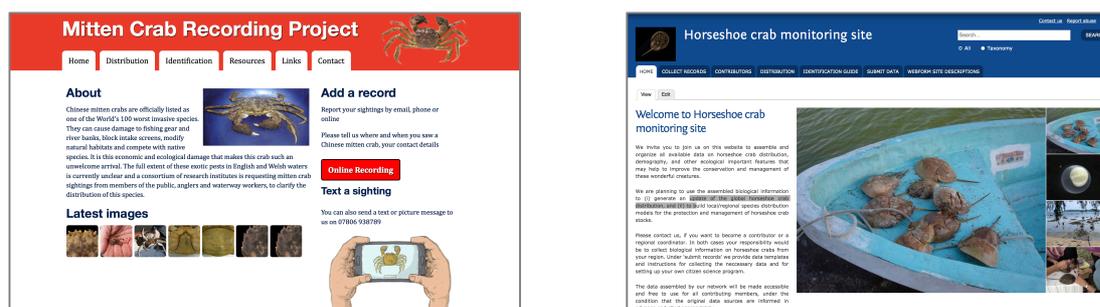
used by related initiatives such as GBIF and the Encyclopedia of Life. A Scratchpad allows users to organize data around user-defined or imported ontologies, including biological classifications. Automated semantic annotation and indexing is applied to all content, allowing users to navigate intuitively and curate diverse biological data, including content drawn from third party resources. The Scratchpad system seems to have particular advantages when collecting and organizing different types of information through a network consisting of both citizens and scientists. Here citizens can be guided to make observations, including movies, pictures, and measurements of abundances. All information is then added to the platform where it can be semantically enriched (tagged/annotated), e.g. a habitat picture can be linked to a species name, a location, or a contributor. The website can then be browsed or searched to find related information, e.g. anyone can search all photos submitted by person X, or all habitats associated with species Y. The website can be used to collaboratively annotate the submitted information, thereby creating a community of scientists and citizens.



**Figure 1.** Schematic overview of the Scratchpad design. Users independently submit content in Drupal nodes and vocabularies of terms (e.g. biological classifications of taxon names) associated with content. Nodes are grouped into content types (e.g. images, DNA sequences, phylogenetic trees, GBIF maps etc.), each of which has specific workflows for data entry and editing. Terms from a vocabulary (e.g. taxon names) common to nodes are used to semantically enrich (tag) content on submission. Tagged nodes can be represented in predefined views according to their content type, and are dynamically aggregated on term pages (e.g. taxon pages) that can be navigated through their vocabulary. This model provides a highly generic solution to submitting, grouping, enriching, and navigating diverse data types.

Based on the chosen technology we will develop and launch two prototypes with examples of self-made citizen science systems. We will also use the established invasive mitten crab observatory based on the iRecord system (<http://mitten-crabs.org.uk/>). The first demonstrator observatory to be developed is designed to collect data about endangered horseshoe crabs and is based on the Scratchpad system (<http://horseshoecrabs.myspecies.info/>). We customized and improved relevant functionalities to submit, store, share, and visualise data on marine species and habitats by citizens. We then engaged with citizens and researchers to test the data collection and analysis process and obtain feedback. Some system development and customisations in the UK host infrastructures will still be necessary to make the iRecord/Indicia system available for individual citizen science projects. This development will continue beyond the delivery date of the present documents (month 18), and for this reason our tutorials are currently based on the Scratchpads system. We expect to add the iRecord/Indicia tutorial before the end of the ENVRI+ project. The demonstrators were used to design a tutorial that guides marine biologists when setting up their own recording site. A second novel demonstrator observatory will collect data on non-native crabs and will be developed for CrabWatch, part of the EU funded Sea Change project. Recording pages will be developed using iRecord. The team are also currently exploring the potential to incorporate a 3rd demonstration platform, using App-based technology, currently being developed by the company Natural Appetite in the UK and if successful, will incorporate this new technology into the training planned for 2017-2018.

Although both systems (iRecord/Indicia and Scratchpads) are very similar, we decided to demonstrate two slightly different functionalities. While iRecord/Indicia will allow a set of very specific data types (photos, geo-points) to be submitted through mobile devices, the Scratchpads observatory has a stronger focus on organising and visualising the data, rather than submitting the data.



**Figure 2.** Current citizen science demonstrators for marine biologists. Left: The Indicia-based front end user interface customized to record the invasive mitten crab (<http://mittencrabs.org.uk/>) and in the future CrabWatch. Right: The Scratchpad-based front end user interface customized to record endangered horseshoe crabs (<http://horseshoecrabs.myspecies.info/>).

### 3. Data licencing rules and ethical requirements

Citizens may submit biological observations as **publicly accessible data** under the Creative Commons licence CC BY 3.0. In this case all biological observations will become public under the condition that anyone re-publishing these data cites the original data source. The intellectual property will thereby be transferred to the data provider collecting the reports. Our agreement in the demonstrator will be based on MBA's data recording terms and conditions (<http://www.mba.ac.uk/recording/terms-and-conditions>). The recording sites include appropriate wording to ensure that all rapporteurs agree with these rules before data submission.

Citizen science reports may include **personal data** (e.g. account name, email address, country). In addition, citizens may also submit biological observations as personal records (i.e. restricted access). In this case the data will be treated as personal. All personal data will be stored in the United Kingdom, more specifically at the Natural History Museum London (Scratchpads system) and the Marine Biological Association of the UK, Plymouth (iRecord/Indicia system). These institutions are registered as Data Controllers with the UK Information Commissioners Office (<https://ico.org.uk/>) and are required to fully comply with the core principles of the UK Data Protection Act (<https://ico.org.uk/for-organisations/guide-to-data-protection/>). The demonstrator includes wording to explanation that all personal records will be treated under the British Data Protection Act.

Citizens may submit **data collected by third parties**, e.g. a teacher may submit observations or images collected by the school class. In such cases the rapporteur needs to obtain permission from all the associated individuals who have their data published by the submission. The online data submission forms in our demonstrator explain that all rapporteurs need to obtain consent from third parties who have their data published by the submission.

Citizens may submit data with personal **information about third parties**, e.g. a picture of a child with an invasive crab in its hand. In such cases the provider of the information needs to obtain permission from all the associated individuals who have personal information exposed by the submission. The online data submission forms in our demonstrator explain that all rapporteurs need to obtain consent from third parties owning personal information as a part of the submission.

### 4. Specification of functionalities

Important functionalities that the demonstrator should provide are

1. The site must be easy and intuitive to set up. The site should offer a fixed set of 2-3 standard skins/layouts in order to keep the setting up process simple. Content pages and dialogues should only have a single or a few options to choose from. Interactions with other databases and systems (e.g. for quality control) should be predefined as much as possible, e.g. only offer one reference taxonomy provided by WoRMS (World Register of Marine Species).
2. The site must have all available functions documented.

3. The site must be easy to be maintained/updated by the researcher.
4. The site must accept worldwide records.
5. The site must include a detailed agreement that regulates the data licencing and treatment. Specifically, wording should be added in the data submission dialogue.
6. The site should have account and data management functions, to enable various degrees of data access (e.g. public, restricted) as well as access rights (e.g. anonymous users, contributors, editors).
7. The site should include functions to help with the quality control (verification) and further aggregation of the collected data in international repositories (e.g. GBIF, OBIS).
8. The site should offer predefined reporting schemes with attributes for taxonomic, ecological or life history traits (e.g. life stage, gender, feeding type), abundance (e.g. number of individuals, biomass), and habitat information (e.g. substrate).

## 5. Setting up your own citizen science recording site

### 5.1. The Basic structure of the monitoring site

Our demonstrators support research on invasive crabs, and endangered horseshoe crabs of the sub-family Tachypleinae, including three species (*Carcinoscorpius rotundicauda*, *Tachypleus gigas*, and *T. tridentatus*). The demonstrators feature a minimum of information and dialogue sites or tabs necessary to interact with citizens. These include:

| Purpose             | Description  | Examples from the demonstrators  |
|---------------------|--|--|
| <b>Front page</b>   | This page should feature a welcome message, some photos and introductory information.  | <a href="http://horseshoecrabs.myspecies.info/">http://horseshoecrabs.myspecies.info/</a><br><a href="http://mittencrabs.org.uk/">http://mittencrabs.org.uk/</a>   |
| <b>About page</b>   | This tab contains background information about the site, the researcher(s) behind the site, the ecology of the organisms, and the problem that the site is addressing. Here, also important data licence statements should be displayed.   | <a href="http://horseshoecrabs.myspecies.info/content/collect-records">http://horseshoecrabs.myspecies.info/content/collect-records</a>  |
| <b>How-to page</b>  | This tab should provide all relevant information that the citizens need to collect the desired data. Typically, this will imply identification keys with text and pictures, field guides, and sampling protocols.  | <a href="http://horseshoecrabs.myspecies.info/content/identification-guide">http://horseshoecrabs.myspecies.info/content/identification-guide</a><br><a href="http://mittencrabs.org.uk/identification">http://mittencrabs.org.uk/identification</a>   |
| <b>Submit page</b>  | This tab should open the data submission dialogue. It should offer the lead scientist to create and customize a data submission form with the necessary data fields. It should also offer the scientist to define a minimum set of required fields, without which the submission will not proceed.   | <a href="http://horseshoecrabs.myspecies.info/content/collect-records">http://horseshoecrabs.myspecies.info/content/collect-records</a><br><a href="http://www.brc.ac.uk/risc/mitten_crab.php">http://www.brc.ac.uk/risc/mitten_crab.php</a>   |
| <b>Results page</b> | This tab should give an overview over the data collected by the site. Such information may be displayed in raw format (e.g. as table) or in aggregated form, such as on a map (e.g. for reported observations), in a table (e.g. for various life stages), in a graph (e.g. observed biomass over the year), or simply by showing a gallery with collected photos. | <a href="http://horseshoecrabs.myspecies.info/taxonomy/term/13/maps">http://horseshoecrabs.myspecies.info/taxonomy/term/13/maps</a><br><a href="http://horseshoecrabs.myspecies.info/specimen_observation">http://horseshoecrabs.myspecies.info/specimen_observation</a><br><a href="http://horseshoecrabs.myspecies.info/gallery">http://horseshoecrabs.myspecies.info/gallery</a><br><a href="http://mittencrabs.org.uk/distribution">http://mittencrabs.org.uk/distribution</a> |
| <b>Contact page</b> | This tab should inform about the network using the data. It can be used to promote projects and networks that benefit from the site.   | <a href="http://horseshoecrabs.myspecies.info/content/contact-us">http://horseshoecrabs.myspecies.info/content/contact-us</a><br><a href="http://mittencrabs.org.uk/contact">http://mittencrabs.org.uk/contact</a>   |

### 5.2. Scratchpads tutorial

#### 5.2.1. Getting started

## Prepare your citizen observatory

There are a few important points that you need to think about to make sure the site useful for both you and the citizens. Most importantly, you need to be clear about the purpose of your citizen observatory, what you expect from the potential contributors, and what they can expect from you. Before you start with the website, you need to have a clear picture of the user group that you target. To help you with the focus of your site we provide you here with a short checklist of important points for consideration that you should answer for your case before you create your citizen science site.

| Question   | Example from the demonstrator   |
|--|---|
| What is the scientific purpose of my site (be as specific as possible)?  | Improve the knowledge on the distribution of endangered horseshoe crabs in Asia.  |
| Why use citizens, e.g. aren't there any better alternatives? What is the added value?  | It is too expensive for researchers to collect this information with field trips. Scientific networks do deliver some data, but not enough to get an overview.  |
| What is your target group (this has implications on how to design your site and where to advertise it)?                            | I would like to obtain the information from school classes and hobby scientists (e.g. beach watchers)   |
| Where do you want to advertise the site?   | Schools, diving clubs, local students   |
| How do you want to advertise your recording site?  | Through local researchers, email lists, and social media  |
| What are the incentives for citizens to deliver data to you?   | They will obtain an up-to-date overview of the current distribution of the species<br>They will be cited<br>Teachers will get teaching material (outdoor projects, identification keys, pictures, etc.) |
| What is the expected time frame to collect your data (this has implications for how intensively you should advertise the website)? | I would like to have the necessary information collected within 1 year  |
| What is the desired outcome of your recording project? Can you specify which data you need and which results you expect?           | We would like to collect species occurrence data (absence, presence, abundance) for endangered and invasive species.  |

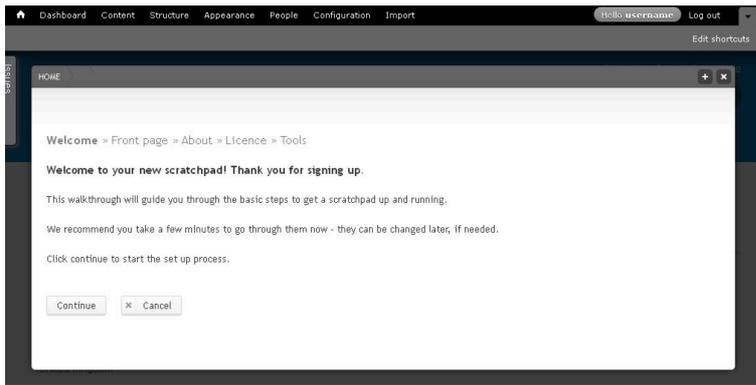
## Register a new Scratchpad

1. Go to <http://scratchpads.eu/> and check a few examples of existing sites to get a feeling for possible layouts.
2. Sign up for a new Scratchpad and follow the instructions for creating both title and domain name.
3. Go through the training and documentation wiki ([http://help.scratchpads.eu/w/Main\\_Page](http://help.scratchpads.eu/w/Main_Page)), while setting up your own site.

## Setting up your site

On new sites after saving the user account page for the first time, you automatically start a wizard that leads you step-by-step through the basic set up of your site

1. Click the *Continue* button to start the set up process



- The first step is writing a welcome message that will appear on the front page of your site. Images will appear separately on the front page, so don't add them to the welcome message. Here is an example from our demonstrator (<http://horseshoecrabs.myspecies.info>):

*'Welcome to the horseshoe crab monitoring site. We invite you to join us on this website to assemble and organize all available data on horseshoe crab distribution, demography, and other ecological important features that may help to improve the conservation and management of these wonderful creatures.'*

- The next step is adding an 'About' page. Use the icons of the rich text editor to format your text or to add links or images that explain the purpose of the page. You don't need to call the tab 'About', in our example we call the tab 'Collect records'. Here is an example from our demonstrator (<http://horseshoecrabs.myspecies.info/content/collect-records>):

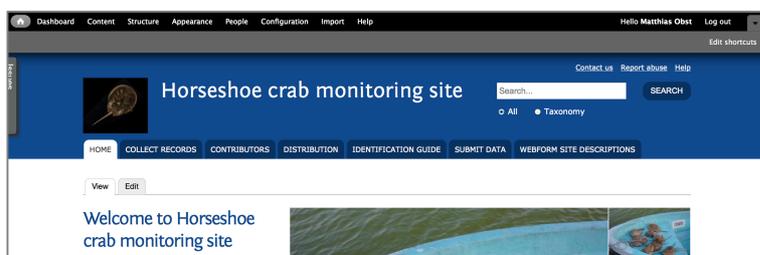
#### **1. Why do we want to monitor horseshoe crabs?**

*The current distribution of Asian horseshoe crabs is not well known, especially in Asia. We therefore want to use this monitoring website to connect horseshoe crab researchers around the world and assemble important biological data for horseshoe crab conservation. More specifically, we want to use this site to generate data for*

- updating our knowledge on global horseshoe crab distribution
- building local and regional species distribution models

*These guidelines should help you to participate in the effort as a collaborator and assemble the necessary biological information from your region by collecting data on species occurrence, life stage, gender, density, etc. from yourself as well as from colleagues, students, and hobby scientists.*

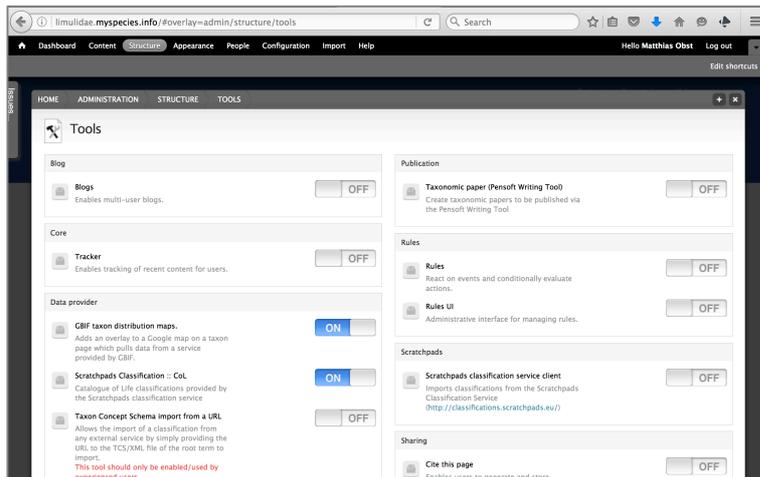
- The next step is selecting a Creative Commons license. The default license is "Attribution CC BY" but you can select a different license if you want. See <http://creativecommons.org/licenses/> for an explanation of licenses
- The last step is selecting which tools you need on your site. Only choose those tools you really need. You can always activate more tools later by clicking on *Structure* in the Admin menu (top row in figure below) and selecting *Tools*.



For the Citizen Science websites we will only choose the following tools:

- GBIF taxon distribution maps
- Scratchpads Classification: CoL
- WoRMS – Importer

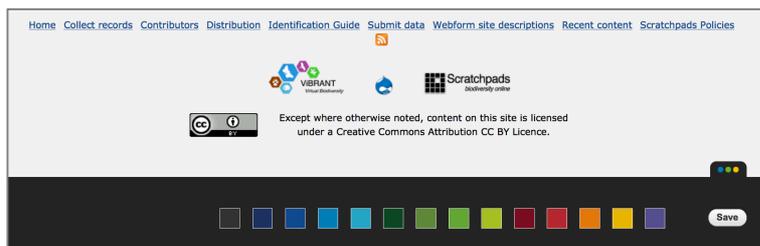
- *DarwinCore Archive (DwC-A) export*
- *DarwinCore Archiver (DwC-A)*
- *Google Maps: Input filter*
- *CSV Import*
- *Pretty URLs*
- *Darwincore; Dictionary Export*
- *Show Taxonomy revision*
- *Views*
- *Views: Charts*
- *Webforms.*



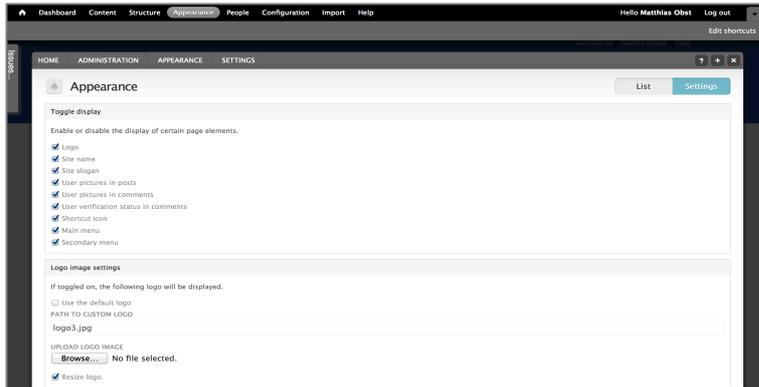
6. Click on the *Save* button to complete the set up. You now have the option to add content and taxonomic structure in case you have more than one species.
7. Go to the front page of your site by clicking on the home icon in the upper left corner.

### Changing theme colour and adding a logo

To change the theme colour, click on the 'Colours' icon in the lower right corner of your Scratchpad, select one of the colours and click on *Save*.



1. From the *Admin menu* (top row) choose *Appearance > Settings*
2. Disable *Use the default logo*
3. Click *Browse* to find the desired logo in your computer
4. Click *Save*



## Logging in your new Scratchpad

1. A few minutes after signing up for a new Scratchpad you will receive an email with a one-time login. Clicking on this link will open a *Reset password* page.
2. Click on the *Log in* button. Your user account page will open and ready for editing.
3. Enter your user data, add a new password, accept the terms & conditions and save.

*Please note*, when sites are put by maintainers in maintenance mode the *Log in* option will not be available. To log in go to the following address: [http://\[your site\]/user/login](http://[your site]/user/login).

## 5.2.2. Site administration

### The Admin menu

The administration pages are accessed via the *Admin menu* at the top of the Scratchpad (see figure below). The *Admin menu* will be present once you have logged in to a site. The menu items you see will depend on your access permissions.



1. The first of the admin links is the *Home* icon that will always bring you back to the front page of the site.
2. The ***Dashboard*** gives administrators an overview of important site information. You can customize the dashboard or disable it.
3. Under ***Content*** you can create and view the content on your site. Please note, this is a different structure as the contents exposed on the website.
4. ***Structure*** has links to administer site taxonomies, character projects, relations and the various site layout options like blocks
5. ***Appearance*** is where you can edit the theme of your site
6. Under ***People*** you can administer the site's users, including adding or removing administration privileges
7. ***Configuration*** gives access to various advanced administration pages that you will need only rarely or not at all.
8. The ***Import*** page is the place to go when you want to import any kind of data into your Scratchpad

### Adding & editing users

You can control user access under *People* in the *Admin menu*. The *People* page allows you to list all users of your site and perform actions (upgrade, delete, edit) on them.

When a new user creates an account, the site maintainer will receive an email and will have to unblock them and add a user role before they can use the site. There are four user roles:

- **Anonymous:** Able to access public content
- **Authenticated** (unblocked) user: Able to access non-public content.
- **Contributor:** Able to create and edit content own content
- **Editor:** Able to create and edit own content, and also edit other people's content
- **Maintainer** (site owner): Like editor, but also has administration privileges

For simplicity, we should only assign the role of a **Contributor** to citizen science sites.

### Adding a new user

1. Go to *People* in the *Admin menu*
2. Click *Add user* at the top of the overlay
3. For users that are allowed to log in, you need to check the *Allow user to login?* box at the bottom
4. Complete all the relevant boxes with example data (compulsory fields are marked with a red asterix)

### Authorizing new user accounts

1. Go to *People* in the *Admin menu*
2. Check the status and role of the user(s) you want to edit. Newly signed up users will have a status of "blocked"
3. Click the check box to the left of their username and select "Unblock the selected users" then click *Update* (see figure below)

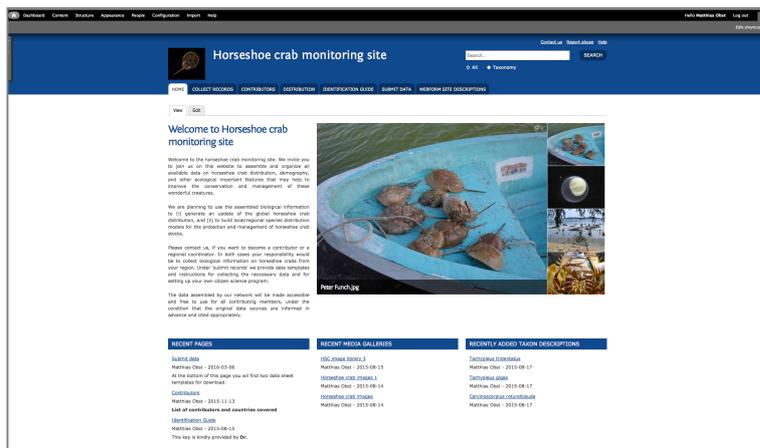
| Username     | Given names | Family name | Status | Roles       | Member for        | Last access           | Operations |
|--------------|-------------|-------------|--------|-------------|-------------------|-----------------------|------------|
| Kevin.Laurie | Kevin       | Laurie      | Active | contributor | 8 months 4 days   | 5 months 1 week ago   | Edit       |
| Eron.Higgins | Eron        | Higgins     | Active | contributor | 8 months 1 week   | Never                 | Edit       |
| bioshin      | Shin        | Nishida     | Active | contributor | 8 months 3 weeks  | Never                 | Edit       |
| biovestbo    | Stine       | Vestbo      | Active | editor      | 11 months 3 weeks | 11 months 3 weeks ago | Edit       |
| biofunch     | Peter       | Funch       | Active | maintainer  | 11 months 3 weeks | 11 months 3 weeks ago | Edit       |

### Changing existing user roles

1. Check the role of the user(s) you want to edit
2. Click the check box to the left of their username and add or remove the required role then click *Update* (see figure above)

## Edit the front page

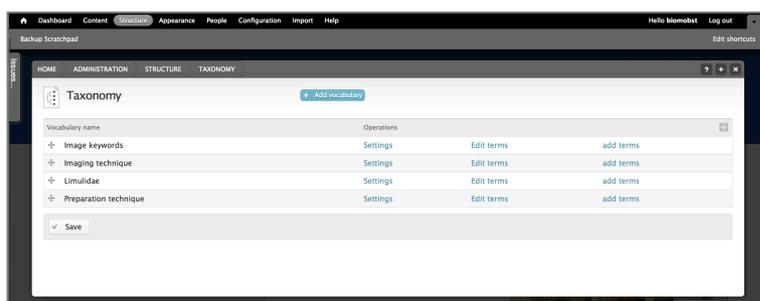
1. Click on the *Home* icon to go to the front page (see figure below). As part of the set up procedure you will have produced a welcome message for your front page.
2. To the right of the welcome message is an image block. If you haven't added any images, yet, this space will be empty. For adding images, see section 5.2.3.
3. Below the welcome message and images is a row of three blocks. These blocks will always show teasers of the most recent posts for the respective content type without them having to be promoted to the front page. The blocks are only visible when content is available for the respective content types. Click on the *Edit* tab above the welcome message to have a look at the blocks. At the top of the overlay you can edit the welcome message if you want. At the bottom you can select which small blocks to show on the front page. For our citizen site, lets choose *Page*, *Media Gallery*, and *Taxon description*.
4. Save



## 5.2.3. Create a taxonomic hierarchy for your species

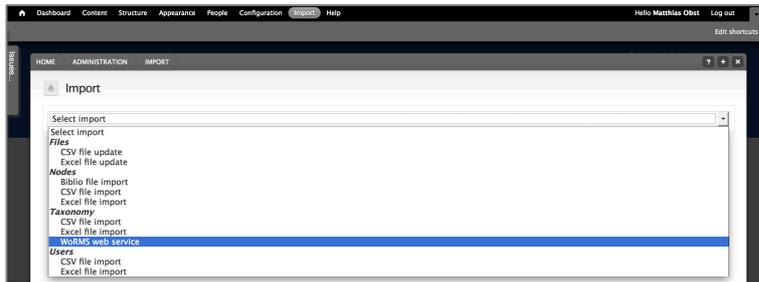
There are 3 ways to create a taxonomic hierarchy for you species. These include (i) importing an existing hierarchy from the World Register of Marine Species (WoRMS), (ii) importing your own hierarchy, and (iii) creating your taxonomic hierarchy directly in the taxonomic editor. For our citizen science sites we will import an existing hierarchy and then modify it in the taxonomic editor.

1. In the *Admin menu* choose *Structure* and then *Taxonomy*
2. Press the button '+ Add Vocabulary' in the middle of the page to add a new taxon, e.g. a family (see figure below)
3. Now add the taxon name (e.g. Limulidae) and choose a biological classification and a display option. Please note if you choose 'Display tab' you will get a separate tab for this group next to the 'About us' tab where you can display the information for all members of your group. For example, see <http://horseshoecrabs.myspecies.info/limulidae/limulidae>

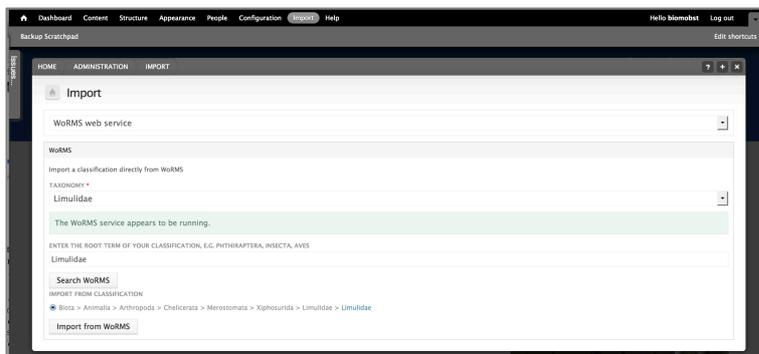


4. Save

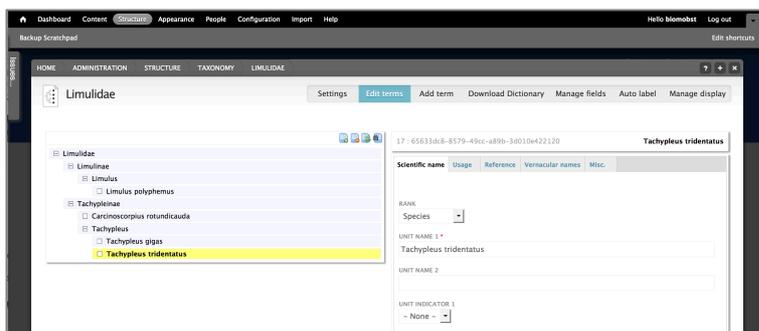
- Now go to the *Admin menu* choose *Import*, and then select under *Taxonomy* the option *WoRMS web service* (see figure below)



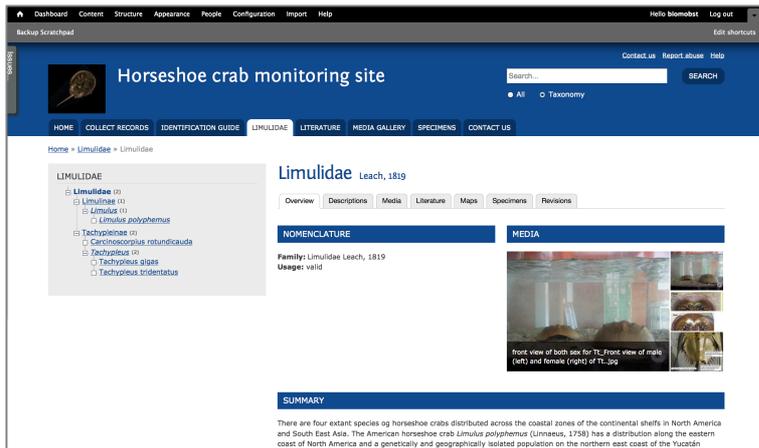
- Choose a name for which you want the taxonomy imported (e.g. Limulidae), enter a root term for your classification that helps the service to start looking for your taxon in the right branch of the tree of life (e.g. write Limulidae). Then press *Search WoRMS*, and choose a classification returned by WoRMS. Then press *Import from WoRMS* (see figure below).



- When the WoRMS Taxonomy is imported, you should revise and possibly complete it. In order to do that, go to the *Admin menu* choose *Structure* and then *Taxonomy*. Then choose '*Edit terms*' for your taxon of interest (e.g. Limulidae). This opens the Taxonomic editor dialogue (see figure below)



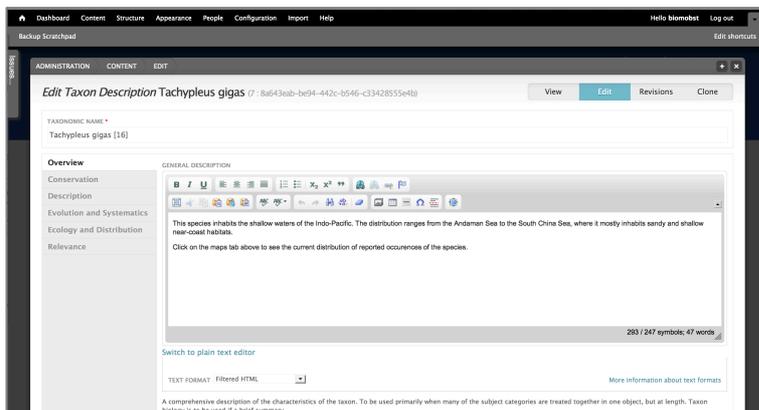
- In the Taxonomic editor you can add/change names on any taxonomic level (species, genus, family, etc), or add the taxonomic author to a species (e.g. (Leach, 1819) for *Tachypleus gigas*) under the 'Reference' tab.
- If you go to the frontpage of your website, you should see a new tab with the name of your taxon (e.g. <http://horseshoecrabs.myspecies.info/limulidae/limulidae>). Under this tab you will find the species pages ordered according to your taxonomic hierarchy. Each species page has tabs with species-relevant information. These tabs are called Overview, Description, Media, etc, and they will be empty to begin with. See next section on how to add contents.



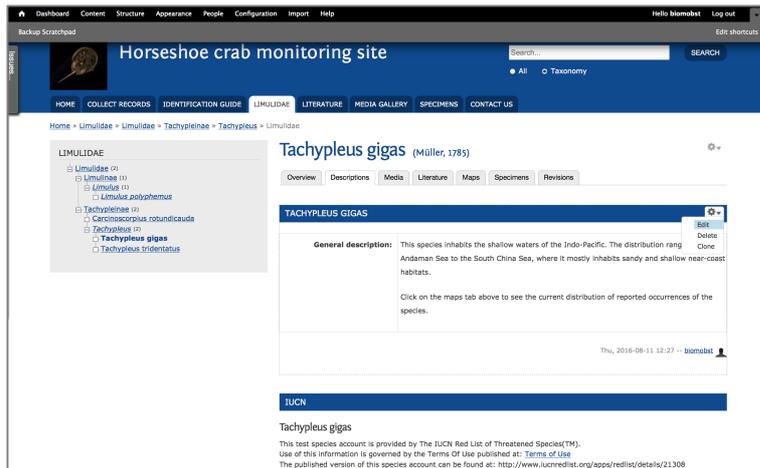
## 5.2.4. Add species pages

1. Once you have created a taxonomy for the species in question, you can populate the species pages with information relevant for your citizens (e.g. short introduction to the invasive or conservation status) as well as with data obtained from your citizens (e.g. images, movies, occurrences, measurements). There are 2 ways to populate your species pages.
2. The first option is to go in the *Admin menu* on *Content*, and then choose *Taxon description*. Then either choose an existing taxon (e.g. Limulidae) or press '+ Taxon description' and add a new species/genus that exists in your taxonomy. For example add a Taxon page for *Tachypleus gigas*. The upcoming dialogue page allows you to add relevant information about the taxon (see figure below). Here is an example text:

*This species inhabits the shallow waters of the Indo-Pacific. The distribution ranges from the Andaman Sea to the South China Sea, where it mostly inhabits sandy and shallow near-coast habitats. Click on the maps tab above to see the current distribution of reported occurrences of the species.*



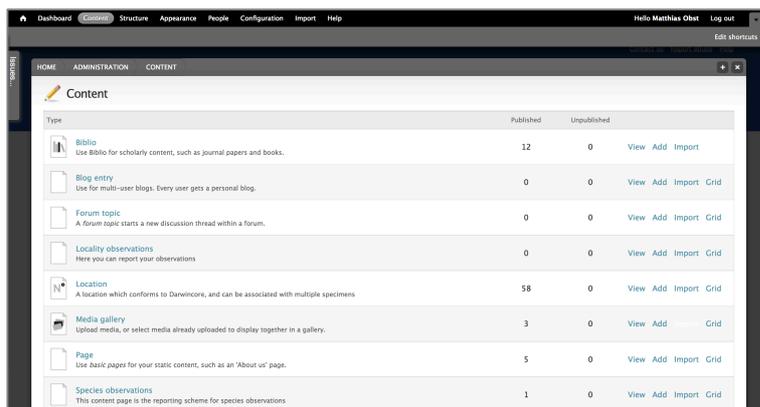
3. *Save*.
4. The second option is to go directly to the species page, then press the 'Description' tab, and the cogwheel next to the species name bar. Choose 'edit' (see figure below). This will open the same dialogue as under point 2.



## 5.2.5. Add static pages

In Scratchpads you can create custom pages to present content in a static way. You can consider these pages like any other static web page. Here we will create a set of basic pages for our citizen science site, including About page (introducing the project) or How-to page (providing the keys or other practical information).

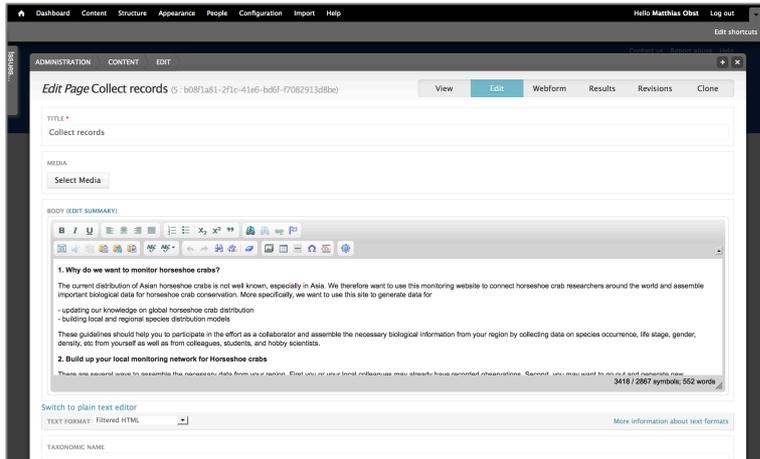
1. From the *Admin* menu go to *Content*
2. Click *Add* next to *Page* (see figure below)



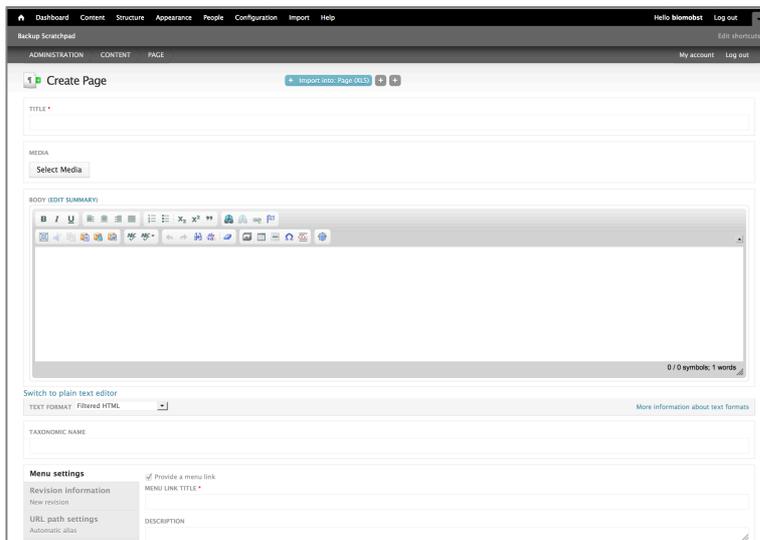
3. Enter a *TITLE*, e.g. "Collect records" (see figure below), and some *BODY* text, e.g.

*Why do we want to monitor horseshoe crabs?*

*The current distribution of Asian horseshoe crabs is not well known, especially in Asia. We therefore want to use this monitoring website to connect horseshoe crab researchers around the world and assemble important biological data for horseshoe crab conservation...*



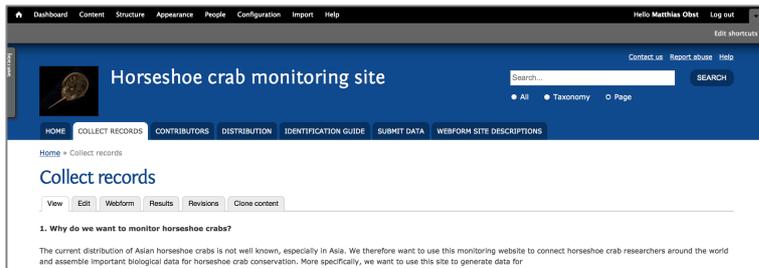
4. Use the *MEDIA* field to link media (images, audio or video) to your page. These items will appear as links beneath the text of your page.
5. To add images to your text, you need to add them using the *Add media* icon directly in the *BODY* field
6. In *MENU SETTINGS* select where you want the page to be placed by choosing the appropriate *PARENT ITEM*. By default, a page (named “Collect records”) will be set to *Main menu*. You can also choose a taxon to associate the page to under ‘Taxonomic name’, but in our case we’ll leave this box empty. You should also provide a ‘Menu link title’, i.e. if you write ‘**Contact us**’ then the page will get the URL <http://horseshoecrabs.myspecies.info/content/contact-us>. The ‘*Weight*’ decides the order in which the page appears together with the other pages. More grey tabs on the left hand side of the dialogue page allow you to specify options for publishing and comments by your citizens (see figure below).



7. Click the *Save* button at the bottom left

**Edit static pages**

1. Edit content on the page by clicking the *Edit* tab above the text *BODY* of the page (see figure below)
2. The *BODY* field has a Rich text editor. Explore some of the features of the rich text editor by modifying the format of the text you have entered
3. Click *Save*

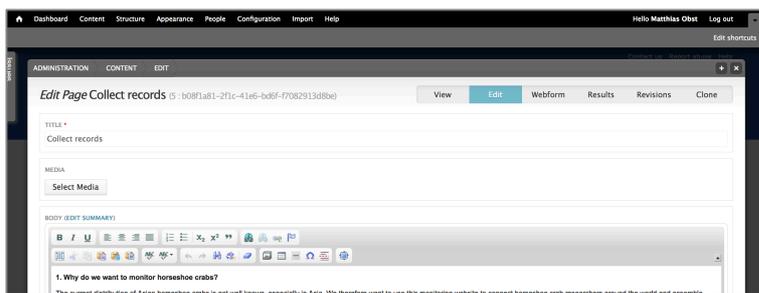


## Clone a page

For cases where there are only slight differences between nodes you can create a duplicate:

1. Click on the *Clone* tab in the upper right tab menu of the Edit mode (see figure below).
2. Change the *Title* of the page and some of the text
3. Switch the *parent menu* item from "Main menu" to the new menu item you created with your previous page
4. Click *Save*

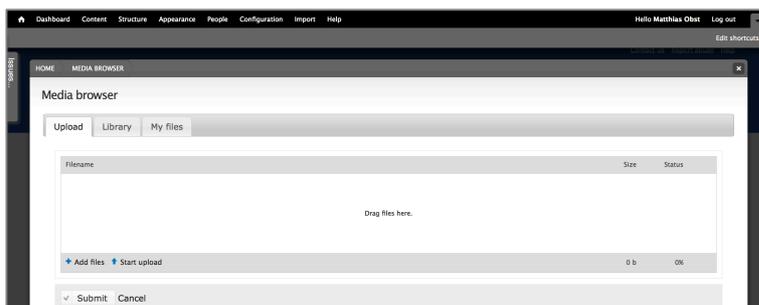
Instead of popping up in the Main menu, the menu link title now appears in a block next to the page. This block will fill with a hierarchy of menu items as you add more pages. You can use it to structure your pages in a way that helps users to find the information.



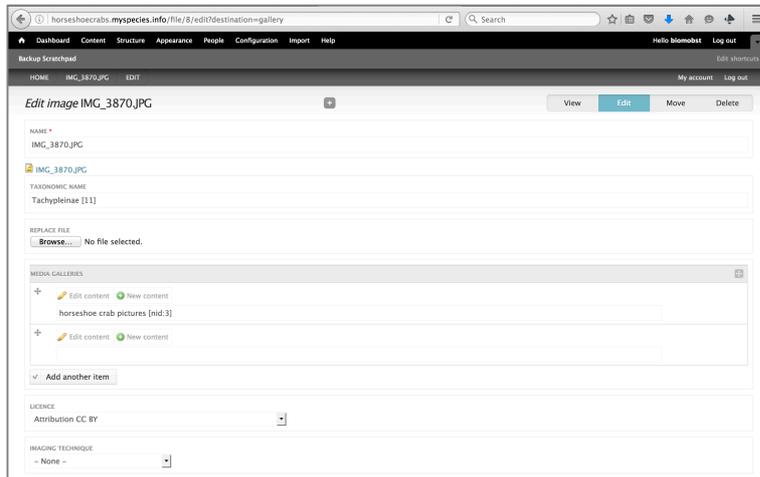
## 5.2.6. Add images and other media files

Here you can add images and link them to species or higher rank classifications.

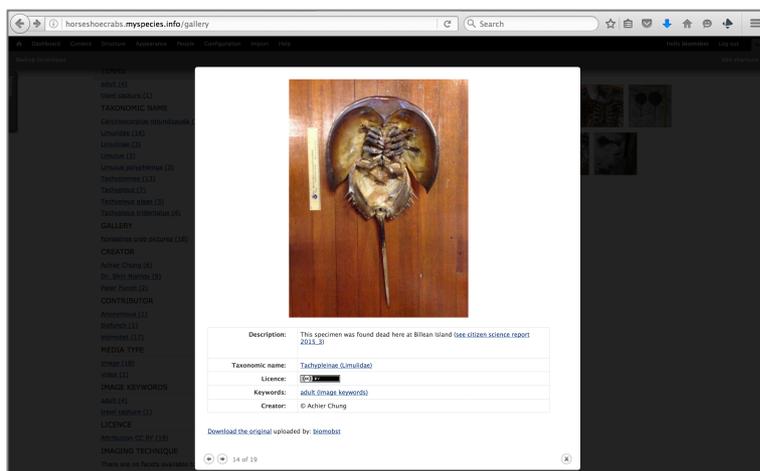
1. From the Admin menu go to *Content*
2. Click on the *Add* link next to *Images* in the *Files* section at the bottom
3. Click on *Add files* to select one or more files to be uploaded. You may also drag and drop files in the *filename box* from your file explorer, e.g. windows explorer (*This functionality is not compatible with Internet Explorer Browsers*), see figure below
4. After selecting your file(s) click *Start upload* and wait for the files to upload (see figure below)
5. Click on *Submit*



6. Change the *TITLE* if necessary by clicking on *Content* in the *Admin menu*, then *Image files* and then *Edit* for the respective file, and fill in the other fields as needed
7. To link the image to the classification and have it show on taxon pages enter a name in the *TAXONOMIC NAME* field. After typing a few letters you will get a list of names starting with these letters. Choose one of these (see figure below)
8. Under *Creator*, add the original source of the picture. Under *Description*, add descriptions of the content and/or a link to a citizen science report, e.g. ‘This specimen was found dead here at Billean Island ([see citizen science report 2015\\_3](#))’



9. Click on the *Misc* vertical tab
10. Fill the *Media Gallery* you wish your image(s) to belong to
11. Click *Save*
12. When you see the picture in the frontpage, media gallery, or species page, or when you search for any of the names associated with the picture – you will get a link to the original citizen report (see figure below)



## 5.2.7. Import data

There are two options to import data from citizens. The first option is that you upload the data you have gathered from citizens manually, e.g. if they were sent to you via email or Dropbox. This option may be better if citizens prefer to communicate with you, rather than with the website. The second option allows citizens to upload their observations, images and data files directly to the website. This option is explained in the next section. Of course you can combine both options in your citizen observatory.

To import data into your Scratchpad (either by yourself, or by a citizen) they need to be in the correct format matching the fields, and in some cases the values within these fields. To help prepare your data in the correct

format you can export a template Excel file that includes all the fields and any pre-defined field values for the respective content type. Populate this file with your data and import into the Scratchpad.

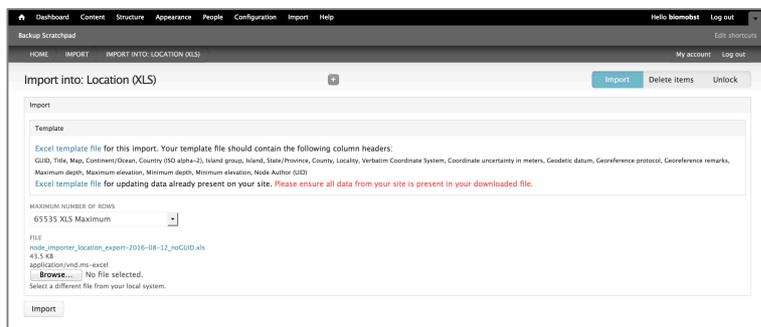
### Adding data from citizens manually

To upload citizen data manually you should first offer a template file for download on your site, containing the desired information, and including explanations what to measure and which unit to apply. You can download an example file at the bottom of this page: <http://horseshoecrabs.myspecies.info/content/collect-records> (see figure below). The information should provide the basic data associated with observations, movies, and images.

Once you have collected this information from the citizen network, you can use the scratchpad templates for Locations and Specimen/Observations to upload this information.

### Step 1 – Upload Locations

1. In the *Admin menu* go to *Content* and then choose *Location*. Now press ‘+ Import into Location (xls)’. This opens the data file export/import dialogue for this particular type of data (i.e. geographical locations where observations, images, or movies were made).
2. Now press ‘Excel template file for this import’ (see figure below). This will download the empty template file. **Please note, these templates contain the appropriate headers to export the submitted data automatically to larger databases like GBIF, OBIS, etc. Do not change them!**



3. Add the information from your citizens to the xls-sheet. You basically only need to add geo-locations and depth (see figure below). For example, provide information on
  - *TITLE: Miller id 122322474*
  - *Map: POINT:(41.64,-70.65)*
  - *Maximum depth: 12.3*
  - *Minimum depth: 4*

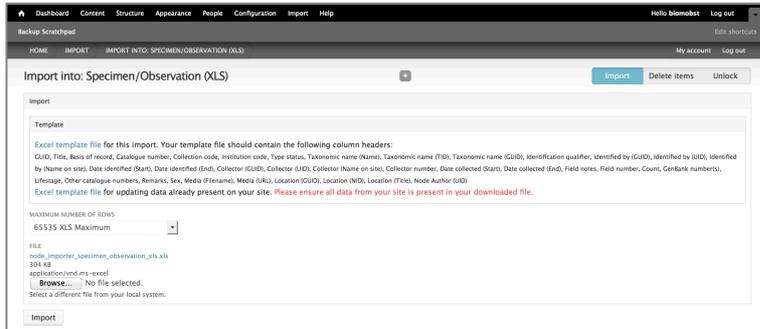
4. Upload the file in the same import/export dialogue where you downloaded the file. After the completed upload press ‘Excel template file for updating data’. This will download the imported template file which now has a unique identifier (GUID) assigned to each location (see figure below). You need to

add these to the Species observations files (described in Step 2) to be able to plot species observations on a map.

|    | A                                | B                  | C                          |
|----|----------------------------------|--------------------|----------------------------|
|    | GUID                             | Title              | Map                        |
| 1  |                                  |                    |                            |
| 2  | 95afab2cab5de3ef7d68426fd4ee3d   | GBIF_id_126551735  | POINT:[26.92336,-82.32985] |
| 3  | c0884cf7f982e4429b34b5b2d5a478   | GBIF_id_1265596292 | POINT:[19.62246,-90.77627] |
| 4  | 1100afe3762245de7a80b276651d1f6  | GBIF_id_1098893151 | POINT:[27.51687,-82.62591] |
| 5  | ed73570c663d9c78bd3c8eef7cdd4    | GBIF_id_1020055605 | POINT:[10.1162,99.8118]    |
| 6  | 1a2f1fe542a2c014d17ed78d6922ae   | GBIF_id_891062892  | POINT:[41.2732,-72.47695]  |
| 7  | a06f725262b1707a1174edf35f08bf   | GBIF_id_1272075179 | POINT:[38.49983,-75.04422] |
| 8  | 077bf6e6961d631281231715c10370a  | GBIF_id_1088900900 | POINT:[29.77885,-81.34981] |
| 9  | 6143ab9af967a9ef707726a4f941016  | GBIF_id_1272105196 | POINT:[26.47858,-81.85468] |
| 10 | 72c77850049b1c549f634c37d8ee34   | GBIF_id_1143545092 | POINT:[41.86917,-70.12208] |
| 11 | e7150fdd1a433fea03eade6f3ca7a8   | GBIF_id_891070022  | POINT:[38.83018,-75.22688] |
| 12 | 1866203c26b70415b2b2786f88e6ddc7 | GBIF_id_1211969714 | POINT:[38.75245,-75.0319]  |
| 13 | e1e48af8836aa08e8ec3aeef3a5fc8   | GBIF_id_1065602517 | POINT:[28.19539,-82.9931]  |
| 14 | 011f0a56b171cbe00860e13c93179fa  | GBIF_id_12322475   | POINT:[41.69,-70.64]       |

### Step 2 – Upload Specimen/Observations

- In the *Admin menu* go to *Content* and then choose *Specimen/Observation*. Now press ‘+ Import into *Specimen/Observation (xls)*’. This opens the data file export/import dialogue for this particular type of data (i.e. Specimen and observation).
- Now press ‘Excel template file for this import’. This will download the empty template file (see figure below). **Please note, these templates contain the appropriate terms to export the submitted data automatically to larger databases like GBIF, OBIS, etc. You can delete white-marked terms and even add your own (e.g. on pH, salinity, body length, weight, etc), but you MUST NOT change the red-marked terms.**



- Add the information from you citizens and add the GUIDs (obtained in Step 1) to the column named ‘Location (GUID)’ in the xls-sheet. The red-marked fields are essential - they need to be filled. As an example (see figure below), provide information on

- *Title: horseshoe crab observation report 2016-08-11\_7*
- *Basis of record: Occurrence*
- *Catalogue number: NA*
- *Collection code: personal observation number 7*
- *Institution code: Department of Marine Sciences, University of Gothenburg*
- *Taxonomic name (Name): Tachypleus gigas*
- *Date collected (Start): 13/09/21*
- *Date collected (End): 13/09/21*
- *Remarks: record originates from Itsara Intanai citizen report#12*
- *Location (GUID): 763043ce0e31f93c35792d1b900ae2f0*

| GUID | Title   | Basis of record | Catalogue number | Collection code | Institution code  | Type status | Taxonomic name (Name)    | Tax |
|------|---|-----------------|------------------|-----------------|---|-------------|--------------------------|-----|
| 1    | Norwegian crab observation report 2016-08-11_1  | Occurrence      | NA               |                 | 1. Department of Marine Sciences, University of Gothenburg  |             | Tachypleus gigas         |     |
| 2    | Norwegian crab observation report 2016-08-11_2  | Occurrence      | NA               |                 | 2. Department of Marine Sciences, University of Gothenburg  |             | Tachypleus gigas         |     |
| 3    | Norwegian crab observation report 2016-08-11_3  | Occurrence      | NA               |                 | 3. Department of Marine Sciences, University of Gothenburg  |             | Tachypleus gigas         |     |
| 4    | Norwegian crab observation report 2016-08-11_4  | Occurrence      | NA               |                 | 4. Department of Marine Sciences, University of Gothenburg  |             | Callinectes rotundicauda |     |
| 5    | Norwegian crab observation report 2016-08-11_5  | Occurrence      | NA               |                 | 5. Department of Marine Sciences, University of Gothenburg  |             | Littoridin               |     |
| 6    | Norwegian crab observation report 2016-08-11_6  | Occurrence      | NA               |                 | 6. Department of Marine Sciences, University of Gothenburg  |             | Littoridin               |     |
| 7    | Norwegian crab observation report 2016-08-11_7  | Occurrence      | NA               |                 | 7. Department of Marine Sciences, University of Gothenburg  |             | Littoridin polyphemus    |     |
| 8    | Norwegian crab observation report 2016-08-11_8  | Occurrence      | NA               |                 | 8. Department of Marine Sciences, University of Gothenburg  |             | Tachypleus               |     |
| 9    | Norwegian crab observation report 2016-08-11_9  | Occurrence      | NA               |                 | 9. Department of Marine Sciences, University of Gothenburg  |             | Tachypleus               |     |
| 10   | Norwegian crab observation report 2016-08-11_10 | Occurrence      | NA               |                 | 10. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 11   | Norwegian crab observation report 2016-08-11_11 | Occurrence      | NA               |                 | 11. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 12   | Norwegian crab observation report 2016-08-11_12 | Occurrence      | NA               |                 | 12. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 13   | Norwegian crab observation report 2016-08-11_13 | Occurrence      | NA               |                 | 13. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 14   | Norwegian crab observation report 2016-08-11_14 | Occurrence      | NA               |                 | 14. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 15   | Norwegian crab observation report 2016-08-11_15 | Occurrence      | NA               |                 | 15. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |
| 16   | Norwegian crab observation report 2016-08-11_16 | Occurrence      | NA               |                 | 16. Department of Marine Sciences, University of Gothenburg |             | Tachypleus               |     |

- Please note, you can introduce controlled vocabularies (e.g. life stage terms) for each column by adding available terms to the corresponding columns in the PermittedValues tab (see figure below)

|    | A | B | C                       | D | E | F | G             | H                            | I | J | K |
|----|---|---|-------------------------|---|---|---|---------------|------------------------------|---|---|---|
| 1  |   |   | Fossil Specimen         |   |   |   | allolectotype | Carcinoscorpius rotundicauda |   |   |   |
| 2  |   |   | Human Observation       |   |   |   | alloneotype   | Limulidae                    |   |   |   |
| 3  |   |   | Living Specimen         |   |   |   | allotype      | Limulinae                    |   |   |   |
| 4  |   |   | Machine Observation     |   |   |   | cotype        | Limulus                      |   |   |   |
| 5  |   |   | Preserved Specimen      |   |   |   | epitype       | Limulus polyphemus           |   |   |   |
| 6  |   |   | Nomenclatural Checklist |   |   |   | exepitype     | Tachypleinae                 |   |   |   |
| 7  |   |   | Sample                  |   |   |   | exholotype    | Tachypleus                   |   |   |   |
| 8  |   |   | Occurrence              |   |   |   | exisotype     | Tachypleus gigas             |   |   |   |
| 9  |   |   |                         |   |   |   | exlectotype   | Tachypleus tridentatus       |   |   |   |
| 10 |   |   |                         |   |   |   | exneotype     |                              |   |   |   |
| 11 |   |   |                         |   |   |   | exparatype    |                              |   |   |   |
| 12 |   |   |                         |   |   |   | exsntype      |                              |   |   |   |

- Upload the file in the same import/export dialogue where you downloaded the file. The imported observations are now visible under *Content* in the *Admin menu* (see figure below, showing 571 published and 2 unpublished specimen/observations).

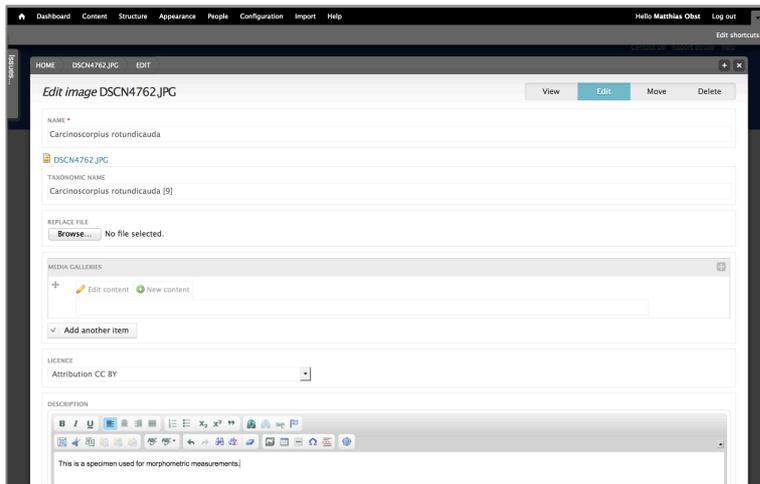
| Type  | Published | Unpublished |                      |
|---|-----------|-------------|----------------------|
| Biblio<br>Use Biblio for scholarly content, such as journal papers and books.   | 163       | 0           | View Add Import      |
| Location<br>A location which conforms to Darwincore, and can be associated with multiple specimens.   | 0         | 573         | View Add Import Grid |
| Media gallery<br>Upload media, or select media already uploaded to display together in a gallery.   | 1         | 0           | View Add Grid        |
| Page<br>Use basic pages for your static content, such as an 'About us' page.  | 3         | 0           | View Add Import Grid |
| Specimen/Observation<br>A Specimen content type based upon Darwincore   | 571       | 2           | View Add Import Grid |
| Taxon Description<br>A taxon description content type based on the TDWG/EOL Species Profile Model.  | 5         | 0           | View Add Import Grid |
| Webform<br>Create a new form or questionnaire accessible to users. Submission results and statistics are recorded and accessible to privileged users. | 0         | 0           | View Add Import Grid |

### Step 3 – Revise and publish the observations

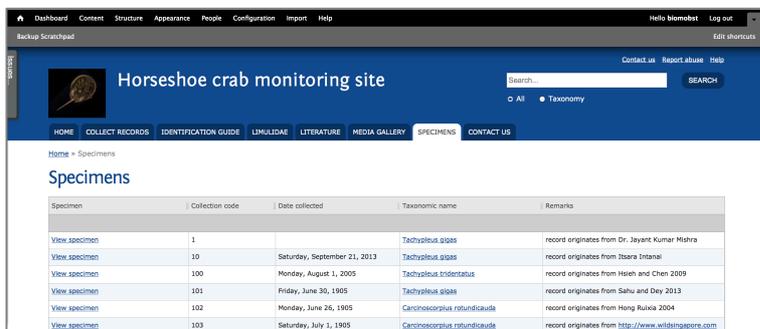
- If you press *Specimen/Observation* you can delete or publish the data as a batch or individually using the filter dialogue (see figure below).

| Title   | Contributor | Updated date     | Status    | Operations  |
|---|-------------|------------------|-----------|-------------|
| Department of Bioscience, Aarhus University – 24 – NA | biomobst    | 2016-08-15 08:02 | Published | edit delete |
| Department of Bioscience, Aarhus University – 23 – NA | biomobst    | 2016-08-15 08:02 | Published | edit delete |
| Department of Bioscience, Aarhus University – 22 – NA | biomobst    | 2016-08-15 08:02 | Published | edit delete |
| Department of Bioscience, Aarhus University – 21 – NA | biomobst    | 2016-08-15 08:02 | Published | edit delete |
| Department of Bioscience, Aarhus University – 20 – NA | biomobst    | 2016-08-15 08:02 | Published | edit delete |

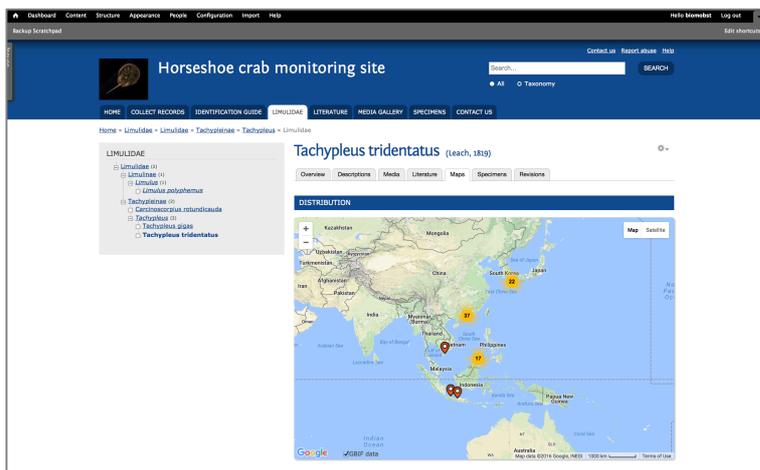
- You can also revise individual records by pressing the edit button (See figure below).



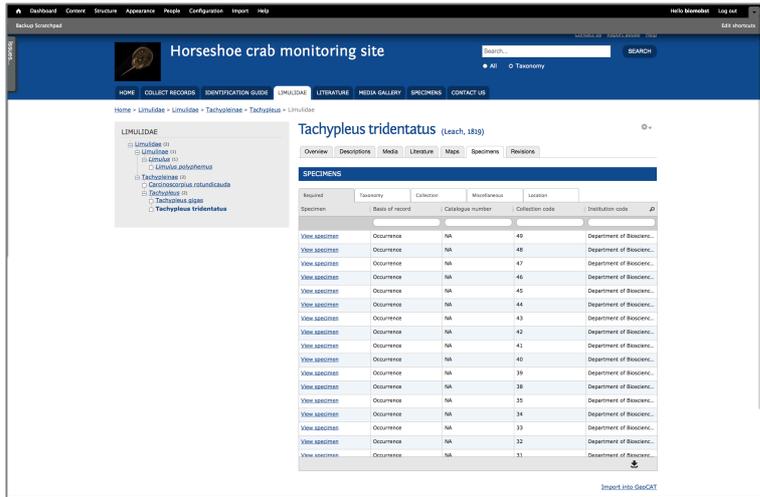
3. When you go to the frontpage, you can now see all published data in different views, e.g. in tabular format using the SPECIMEN tab (see figure below)...



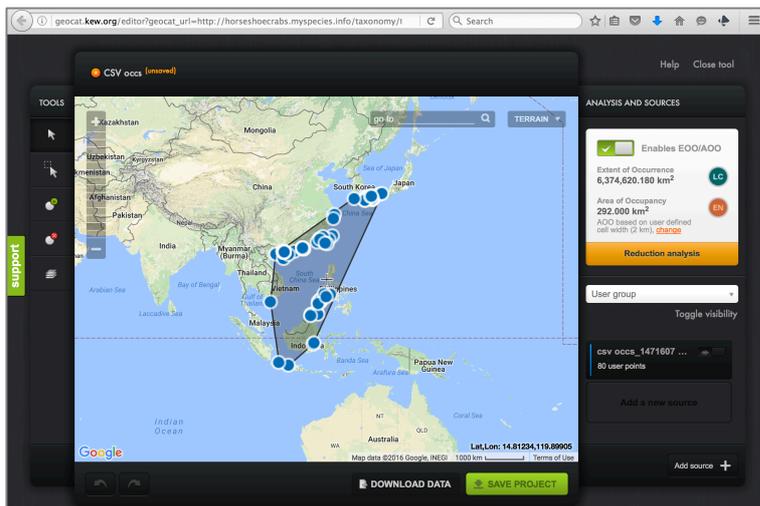
...or on a map using the LIMULIDAE tab, and then browsing the desired taxon and pressing the Maps tab (see figure below).



4. If you press the Specimens tab under any species page (see figure below), you can see and explore all reported records of this species.



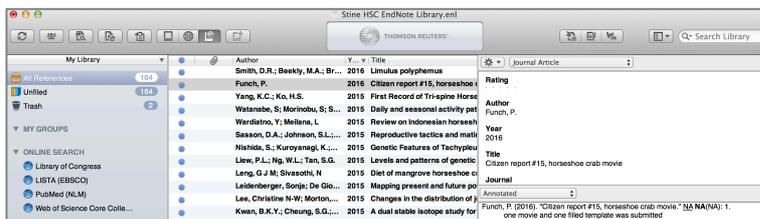
5. If you press ‘Import to GeoCAT’ on the bottom of the page, your species records are exported into an analytical environment that allows you to calculate the extent of occurrence and the extent of occurrence for your species (see figure below).



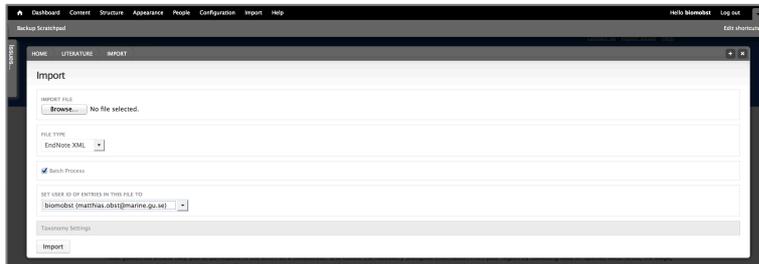
### 5.2.8. Add source references to original observations

In order to make sure that you can trace every record, movie, photo, or report to its original source and credit all contributors you should make reference to original information resources. These include citizen reports as well as scientific papers (in case your citizen has reported records from the literature).

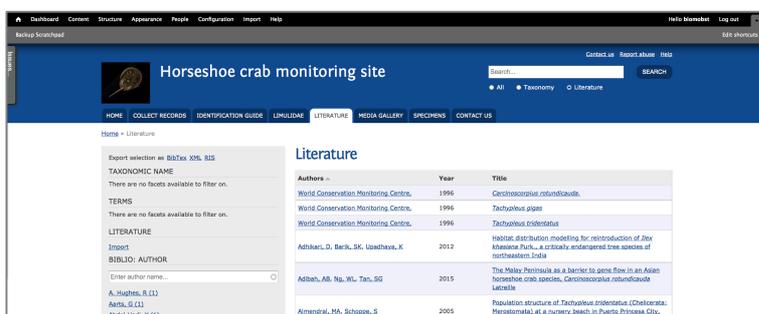
1. Prepare an EndNote file where you add all bibliographic information from citizen reports and literature (see figure below). Citizen reports should be stored as ‘Personal Communication’ with information on data, author, and contents. The actual citizen report can then be added under Abstract (either in EndNote, or later when editing the Literature records in the Scratchpad). Scientific articles can be imported from e.g. Web of Science.



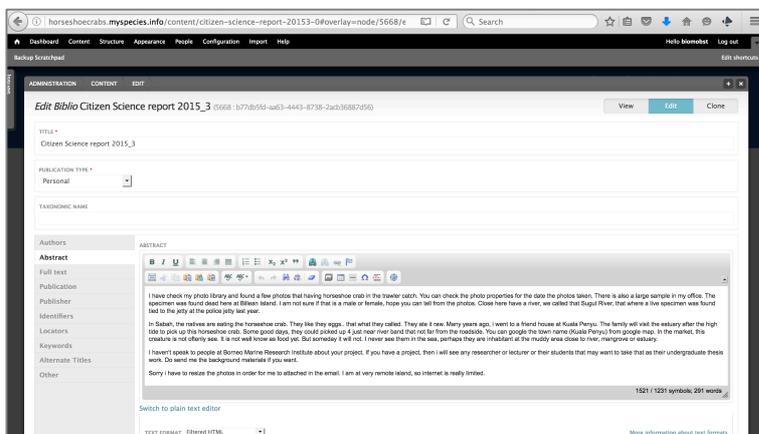
- Export your EndNote library file as XML-file.
- In the *Admin* menu, go to *Contents* and then press *Biblio*, and press the '+ import' button. Then upload the EndNote XML file (see figure below).



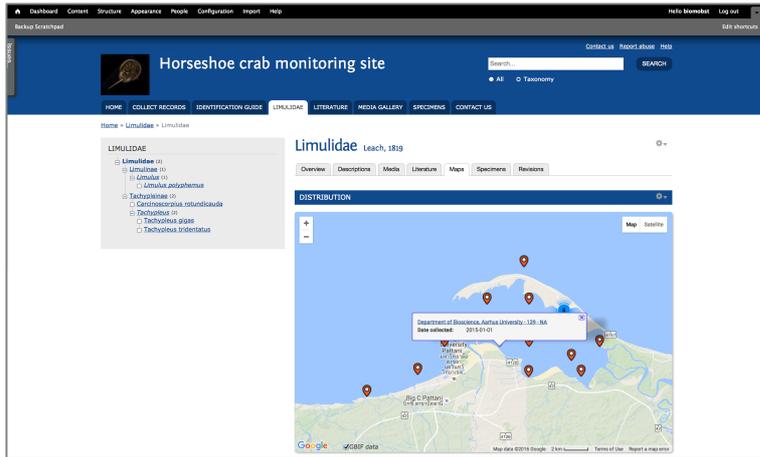
- In the *Admin* menu, go to *Contents* and then press *Biblio*. Then select and publish all your records. All your data sources are visible and searchable in a separate tab called *Literature* (see figure below).



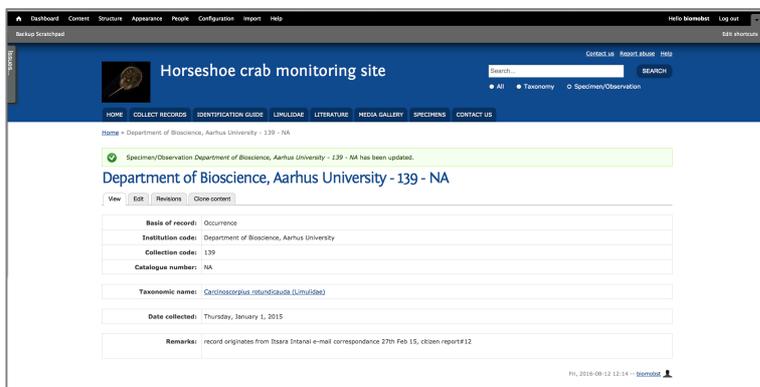
- For citizen reports, click on each individual report under the *Literature* tab, then on the *Edit* tab, and thereafter on the *Abstract* sub-menu (see figure below). Here you can add the personal communication you had with the citizen.



- All your data (movies, records, photos) can now be linked to original citizen reports either manually by editing a single record, or by adding the reference (e.g. 'record originates from Sahu and Dey 2013') to the xls-sheet on Specimen/Observation. In the latter case, go to *Content* in the *Admin* menu and press *Specimen/Observation*. Now press the '+ Import: Specimen/Observation (xls)' button and then press 'Excel template file for updating data' button. This will download the latest data file and you can simply add the reference to the data source in the remarks column (e.g. record originates from Itsara Intanai citizen report#12)
- You can now explore records through the table (choosing the Specimen tab) or on the map (choosing the Limulidae tab, and then the Maps tab). If you click on a individual record (see figure below)...

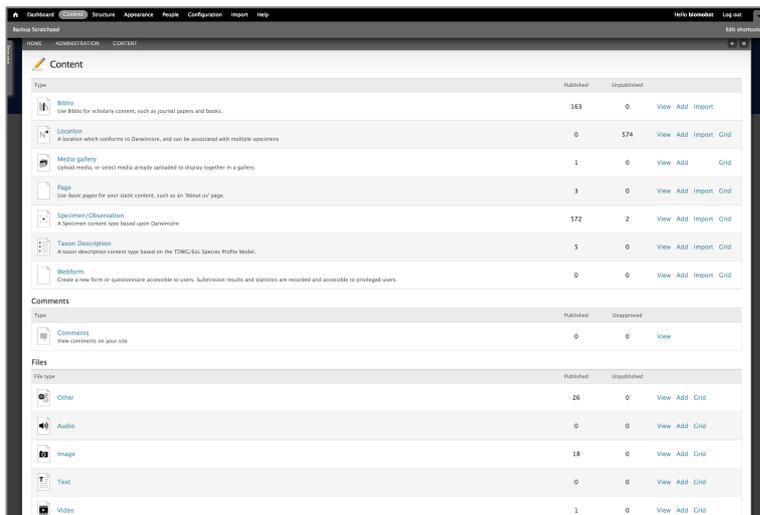


... you see the information source (see figure below).



## 5.2.9. Overview your content

If you choose *Content* in the *Admin* menu you will get an overview over the different files, pages, and data types that you have imported to your site. You can also see which ones are published. In our example (see figure below) we have 163 bibliographical records, 574 unpublished locations, one Media gallery, 3 static pages (Contact us, Collect records, and Identification guide), 572 public observation records and 2 unpublished ones, 5 taxon pages (visible under the Limulidae tab), 18 images, 1 video, and a number of other files (xls-sheets).

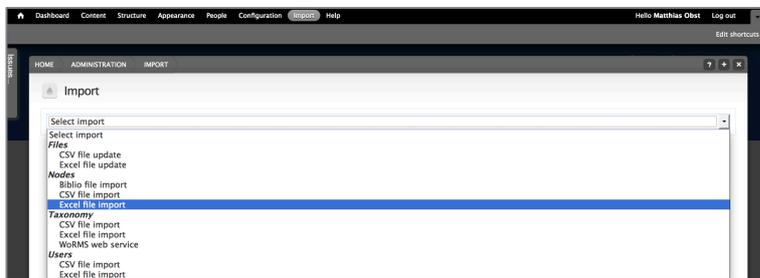


## 5.2.9. Export your data

At some point the data collected by your citizen platform should be forwarded and made accessible in larger repositories such as National databanks, the Ocean Biogeographic Information System (<http://www.iobis.org/>) or the Global Biodiversity Information Facility ([www.gbif.org](http://www.gbif.org)). This is a straightforward exercise because Scratchpads support multiple ways of exporting your data. You can export data in specific content types as an .xls file or generate a standard compliant Darwin Core Archive file that includes all of your Scratchpads data. This makes it easy to import the data into other databases or archives.

### Exporting your data as .xls

1. From the *Admin* menu go to *Import* (see figure below).
2. From the *Select Import* drop-down menu choose *Excel file Import* under *Nodes*
3. From the second drop-down menu select the content type you wish to export as .xls file, e.g. Pages, Locations, Specimen/Observations.
4. Now click on ‘*Excel template file for updating data already present on your site*’ to download the full contents of your site. The downloaded .xls file will include all your data in rows under columns that represent the fields in the corresponding content type or taxonomy.



### Exporting as DwC-A

Darwin Core archive files can be used to automatically feed your data to other web-services (e.g. EOL, GBIF). Please note, that the DwC-A export module must be activated under Tools (see section 5.2.1).

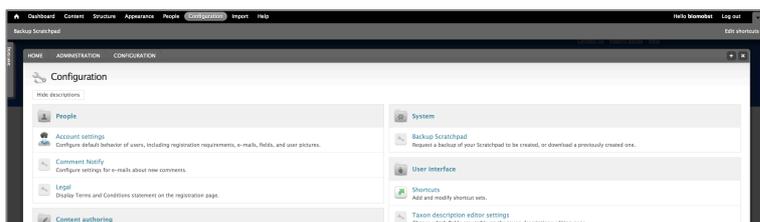
1. Open a new browser tab and enter the address of your Scratchpad site adding */dwca.zip*. (e.g. <http://horseshoecrabs.myspecies.info/dwca.zip>)
2. You will be prompted to download a .zip file. Accept and save in your local or network disk

Please note that DwC-A files are not human readable, they are built to allow the sharing and re-use of biodiversity related information between machines over the web.

## 5.2.10. Back up your content

You should make regular backups of the contents as well as exceptional backups before you make larger changes. The backup will be stored for one week.

1. Go to *Configuration* in the *Admin* menu, and choose *Backup Scratchpads* on the right hand list of options (see figure below).



2. Press *Generate new backup*.

## 5.3. Use of Indicia/ iRecord to develop a basic Citizen Science observatory

### 5.3.1. Use of Indicia to create a Citizen Science Observatory

Indicia has been used to develop [www.mittencrabs.org.uk](http://www.mittencrabs.org.uk), a Drupal-based species recording website that will be used as a demonstration project. An additional CrabWatch page will also be developed. As part of the process of developing this new demonstrator, the team has identified a need to produce templates and simplify the existing development guidance. Detailed simplified instructions will be developed by April 2017 and form a basis for the training program that will run from 2017 – 2018. Existing instructional documentation on developing using Indicia can be found here: <https://indicia-docs.readthedocs.io/en/latest/>

### 5.3.2. Use of iRecord ‘Activity’ function

In addition to allowing users to develop and establish their own data collection interfaces, iRecord includes a facility, which allows users to create ‘Activities’ within the site. These allow users to develop their own data collection forms and host these on the iRecord site. These schemes then benefit from the data flow and validation system in place. The ‘Activity’ function has been developed for a variety of uses, including single events such as BioBlitz events, as well as single species/ taxonomic group recording schemes. Full instructions on how to develop an ‘Activity’ can be found here: [www.brc.ac.uk/irecord/make\\_activity](http://www.brc.ac.uk/irecord/make_activity). In order to access and participate in an ‘Activity’, it is necessary to first set up an iRecord account, which is a fairly simple process. The Activity function can allow users to incorporate a logo, but the page will retain the iRecord branding. It also connects with the iRecord app, allowing project participants to remotely collect and submit geographical data as well as photographs to the ‘Activity’ directly from a mobile device.

The screenshot shows the iRecord website interface. At the top, there is a navigation bar with links for Home, Record, Explore, Summarise, Verify, Download, Forum, and How do I...?. Below this, the 'Activities' section is displayed. It includes a search bar and three tabs: 'My activities', 'Browse all activities', and 'My finished activities'. The main content area lists five activities, each with a title, description, and a 'Non-member' status. The activities are:

- Biodiversity Gatwick Project**: Monitoring biodiversity in and around 2 conservation areas at Gatwick Airport. Part of 2 biodiversity action plans commenced in 2012. Non-member.
- Biological Sciences, Reading - Enter a list of records**: Recording form for Reading University, Biological Science students. Non-member.
- BIOS2302: Invertebrate Biology Class Recording**: Biological records from fieldwork for University of Worcester's Invertebrate Biology Class. Non-member.
- BLS lichen records**: Enter lichen records and their substrates for a location. Non-member.
- Boat of Garten Wildlife Group**: Recording around the Boat of Garten, Cairngorms NP. Non-member.

## 6. Experience from the use cases (impact on project)

Designing an online recording site is only one out of several critical steps (shown in Fig. 3) necessary to make the monitoring site useful and generate valuable scientific data. The success of the site, i.e. the value of your data will depend on all steps not only on the quality of the recording site. Below are a few comments to each of these steps based on the experiences we made with our demonstrators.



**Figure 3.** Overall workflow to establish an online recording site with citizen data. Grey boxes indicate important preparatory activities and outcomes, while green boxes indicate important steps for the recording site construction.

**Step 1: Prepare your scientific question.** In our example we are concerned with the conservation of Asian horseshoe crabs. The habitats of these ancient animals span across the coastal waters of many countries and biogeographic regions in the Indo-Pacific. Such ubiquitous presence not only makes it difficult to obtain an overall and up-to-date picture of the current distribution of these animals, but makes it also very difficult to collect records with field trips, with obvious implications for the conservation efforts of the three Asian species. Consequently, all three Asian horseshoe crab species cannot be classified in their conservation status by the International Union for Conservation of Nature’s Red List (IUCN) red list and are currently registered as ‘data deficient’. In order to improve this knowledge, we built an online recording site to collect species occurrence records from our own scientific work, the literature, as well as citizens. We then want to use the collected data to obtain an overview over the biogeographic range of the three species and build a series of species distribution models for current and future climate scenarios.

In Europe, non-native species are a growing concern and measures are underway to monitor and control the spread of several species, which are considered to be invasive (having a negative social, economic or environmental impact). The Chinese mitten crab *Eriocheir sinensis* is included in the List of Invasive Alien Species of Union Concern Adopted as part of the EU Regulation 1143/2014 on Invasive Alien Species. A number of additional crab species have been identified as being invasive or having the potential to become invasive in and around the EU. In order to provide relevant, accurate information to support management, scientists require accurate information about the distribution, rate of spread and other biological traits of these species. The use of data from citizen scientists will contribute to this information and provide data on a scale that would otherwise prove unaffordable to collect.

**Step 2: Design the website.** Here are the examples <http://horseshoecrabs.myspecies.info> and <http://mittencrabs.org.uk/>

**Step 3: Advertise the website.** Our site was advertised to local networks of marine researchers in Thailand, Indonesia, and Borneo during 2015-2016, as well as during a horseshoe crab conservation meeting in Japan (Funch et al., 2015), and also to the horseshoe crab conservation network on Facebook with currently 79 members.

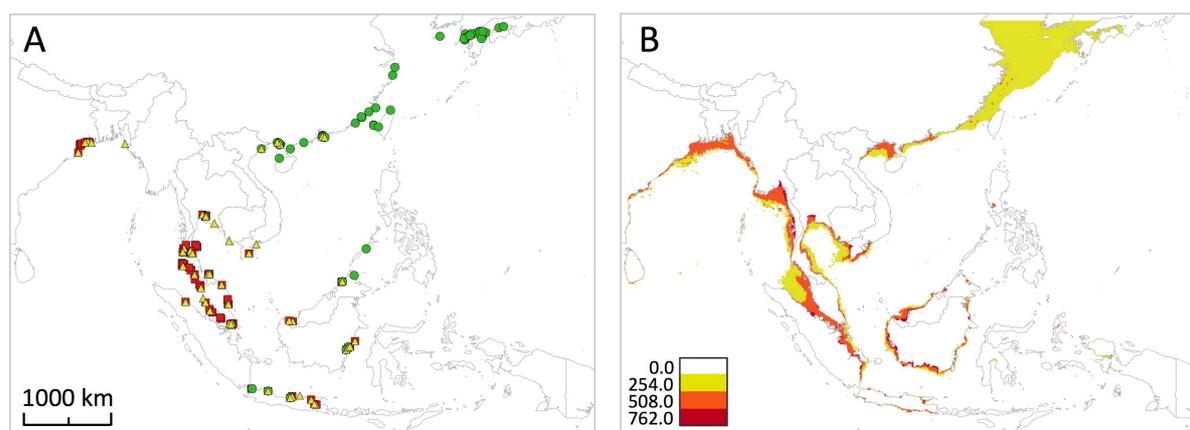
The Mitten Crab recording project has been promoted online as well as through small fliers distributed at events and to relevant user groups likely to encounter the species. In the initial stages of the scheme it received a large amount of media attention in the UK, leading to an initial influx of records. CrabWatch will be promoted through the Sea Change project partners including through special events and displays at aquaria and science centres around Europe.

**Step 3: Collect data and feedback, improve the site.** Feedback was very positive among researchers, but the data collection protocols and the site was not yet sufficiently developed to be used by many school classes and students. Instead students submitted records from the literature and own observations via email. The site administrator then uploaded these records. Overall, we collected new 288 occurrences from the literature,

researchers, and citizens within one year, including 112 records of *Carcinoscypus rotundicauda*, 101 records of *Tachypleus gigas*, and 75 records of *Tachypleus tridentatus*. Given that there are only 41 records of these species available in public repositories, this exercise substantially increased the biogeographic knowledge. However, we did not manage up to this point to engage school classes and hobby scientists (e.g. beach watchers). This is because the site has been under continuous construction during the last months. We will continue our effort and specifically target these groups in the coming year.

No formal evaluation has yet been undertaken for Mitten Crabs or Crab Watch, however this will be a key element of the next stage of the project.

**Step 4: Analyse and publish the data and/or results.** The collected data were analysed during 2016 and a manuscript is currently in preparation (Vestbo et al., in prep). The data could not have been collected with conventional field trip, because the species have a vast distribution range across many Asian countries and every country required tedious permission applications for biological sampling.



**Figure 4.** Potential distribution overlap for all three Asian horseshoe crab species. A. Environmentally unique occurrence points for *C. rotundicauda* (yellow triangles), *Tachypleus gigas* (red squares), and *T. tridentatus* (green circles). B. Suitable biogeographic regions for one (yellow), two (light red) and three (dark red) species indicate high-priority areas for conservation efforts. Data were obtained from citizens, scientific networks, and the literature, using the horseshoe crab monitoring site at <http://horseshoecrabs.myspecies.info> (from Vestbo et al., in prep).

## 7. Training & handover to the marine biological community

We plan to use this document to design training our and dissemination activities with marine biology networks and for presentations of the platform at various conferences. The training will include a series of short (e.g. 2-day) workshops at EMBRC marine stations where we will invite marine researchers and representatives of marine LifeWatch infrastructure initiative (<http://marinevre.lifewatch.be/>), the SeaChange program ([www.seachangeproject.eu/](http://www.seachangeproject.eu/)), the MARS network ([www.marsnetwork.org/](http://www.marsnetwork.org/)), as well as other relevant partners. Digital training resources including online tutorials will also be produced in order to extend the value and reach of the program. The training program will be designed as a part of deliverable D14.7 (Citizen observation training program, training delivery and evaluation, and impact assessment report). We plan to prepare and advertise our training activities during 2016 and deliver and conclude the training program during 2017-2018.

## 8. References

Vestbo et al., In prep. Present and Future Distributions of Horseshoe Crabs under Predicted Climate Changes. *Journal of Biogeography*.

Smith et al., 2009. Scratchpads: a data-publishing framework to build, share and manage information on the diversity of life. *BMC Bioinformatics* 10, Suppl 14:S6. DOI: 10.1186/1471-2105-10-S14-S6.

Smith et al., 2011. Scratchpads 2.0: a Virtual Research Environment supporting scholarly collaboration, communication and data publication in biodiversity science. *ZooKeys* 150: 53-70 (28 Nov 2011) DOI: 10.3897/zookeys.150.2193.

Funch et al., 2015. Present and future distributions of horseshoe crabs under predicted climate changes. The Third International Workshop on the Science and Conservation of Horseshoe Crabs. Saikai National Park Kujukushima, Nagasaki, Japan.