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RDInfratech: An Online Repository of Species and Research for Mt. Hamiguitan Range

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ABSTRACT. The study aimed to develop an online repository for wildlife species and research conducted in Mt. Hamiguitan Range (MHR) that will contain MHR research outputs for public information and education. The study used agile development in planning, creating, deploying, and testing the online portal. CodeIgniter PHP framework was utilized in the development and MySQL as the database and web hosting services for its deployment. The online portal provides administrator functions such as managing records of species, researches, events, articles and article comments as well as users. It features easy site navigation for the general public in viewing and searching the information about different species, researches and articles. An adopted questionnaire was used for the usability evaluation of the online repository. Based on the results, the users perceived that the online repository was able to meet the user satisfaction in terms of system, information, and interface quality. The user feedback became the basis for the system's continuous improvement.

Keywords: *Biodiversity, Davao Oriental, Mt. Hamiguitan, online repository*

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INTRODUCTION

Biological diversity is a platform for environmental integrity (Angermeier and Karr, 1994; Kimmins, 1997). With such life-sustaining products and services that it provides, the maintenance of the integrity of the ecosystem biodiversity cannot be overemphasized (Brooks et al., 2002; Payne, 2017).

In 2014, the province of Davao Oriental was internationally celebrated for the declaration of at least 16,000 hectares of Mt. Hamiguitan biodiversity as UNESCO World Heritage Site. This parcel of land is part of what is called as Eastern Mindanao Corridor, one of the few remaining ecosystem biological corridors in the Philippines with relatively intact condition. The UNESCO declaration is rooted in its unique and highly diverse biota, some of which are nowhere else found in other parts of the Philippines and the world (UNESCO World Heritage Centre, 2014).

At present and even before the declaration, various researches and activities were done and are underway for the purpose of protecting and developing the mountain. However, the dissemination of the results of the research and even the activities is limited in nature. For many of the public, Mt. Hamiguitan and its diversity is a distant reality. To make the information gathered available to the public, and increase public immersion and appreciation of the value of the area's biodiversity, the Online Repository of Species and Research for Mt. Hamiguitan Range was developed. Specifically, it aims to provide administrator capabilities of adding and updating species, research and articles, moderate comments and view messages. Furthermore, it will also provide the general public access to species, research, activities and articles added. In addition, an adoptedquestionnaire is used to evaluate online repository in terms of user satisfaction.

Online repositories or web-based repositories are utilized as data banks for research outputs relevant to biodiversity (Zemmrich et al., 2013). Considering that most of the people nowadays are connected to the internet, this platform is utilized by the researchers to deliver information and educate the public. This repository will serve as a gateway to information that can be used in drawing greater participation of the public in the management of MHR ecosystem biodiversity.

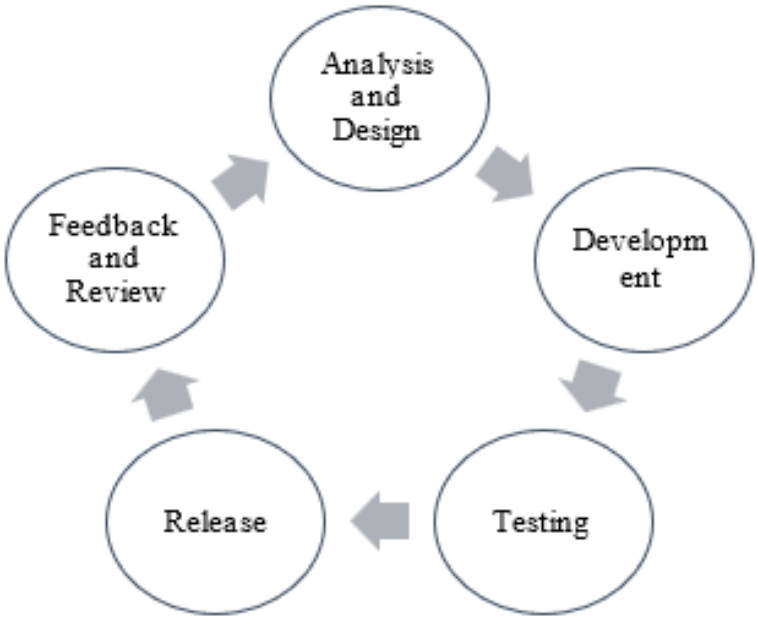

Figure 1. The agile development cycle adopted for the online repository of research and species of Mt. Hamiguitan Range (MHR).

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METHODOLOGY

The development of the online repository was carried out using the Agile development techniques which features several iterations of analysis and design, development, testing, release and feedback and review. For every iteration the functionalities of the online repository were improved until it reached the acceptable final release as shown in Figure 1.

Agile methodology is mostly used for web development as it gives priority to user's feedback and support for change and flexibility based on the reviews (Ríos and Pedreira, 2019). Thus, in the duration of the online repository development, changes were supported to cater the feedback of the users in every iteration.

Analysis and Design

In the analysis and design, diagrams were created to provide communication between the users and developers for the functionalities of the online repository. The requirements gathered from the users and benchmarked layout from websites were translated into quick design and architectural structure. Figure 2 shows the architectural design of the providing a clear separation for users.

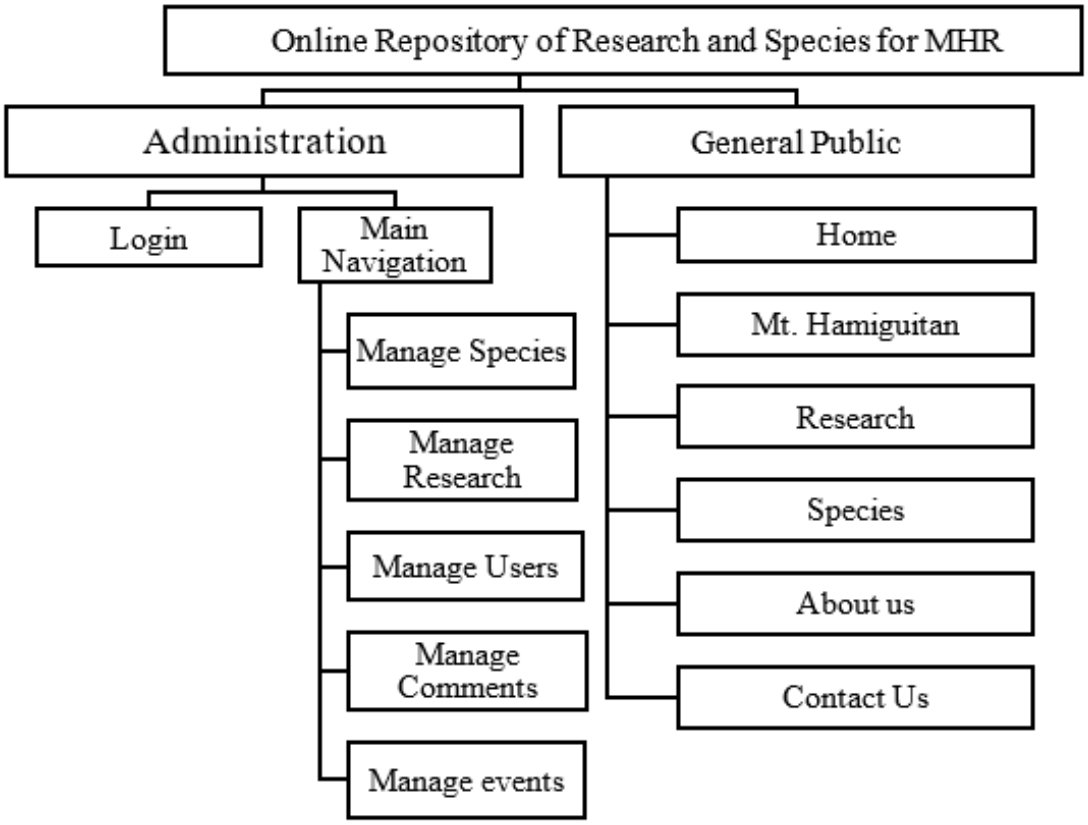

Figure 2. Architectural design of the online repository of research and species of Mt. Hamiguitan Range (MHR).

Development

The team used Codeigniter, an open-source PHP framework which enables the rapid development of the online repository as well as ensuring security to its content. It is based on Model-View-Controller (MVC) development pattern which separates logic from presentation and those partitions are independent (Leff and Rayfield, 2001). With this, the organization of codes and changing the behaviour of the existing libraries were made easier. The model component represents

data-related logic of the online repository that the user works with to be able to retrieve, insert and update information from the database. The view component is the user interface presented to the user. The webpages of the online repository serve as the view component that enables the user to do interaction.

The controller acts as the interface between the model, the view and other resources. Whenever there is a request from the user through the view component, the controller will handle the interaction with the model and present the result to the user through the view component. Figure 3 shows the interaction of the components.

Technologies supported for the framework were used for the portal development. For the scripting language, HTML5 was used because of its cross-browser support and the ability to deliver animation and graphics. To make the site design easier and more intuitive, CSS3 was utilized. It is a style sheet language that offers browser compatibility. JavaScript (JS) is used for the inclusion of different programs in the site like incorporating the map, counter of visitors and sharing through social media sites. jQuery is a JavaScript library that simplifies the JavaScript programming. It is a tool that helps streamline the work of JavaScript which is to make the portal more dynamic and interactive.

MySQL was the relational database used for the online repository for the storage of information regarding users, species, research, activities and its comments. This software is open source, secure and easy to operate.

Testing

For the testing part, the team used the development testing by performing unit testing for each page of the online repository, integration testing for ensuring that the pages interact with each other and system

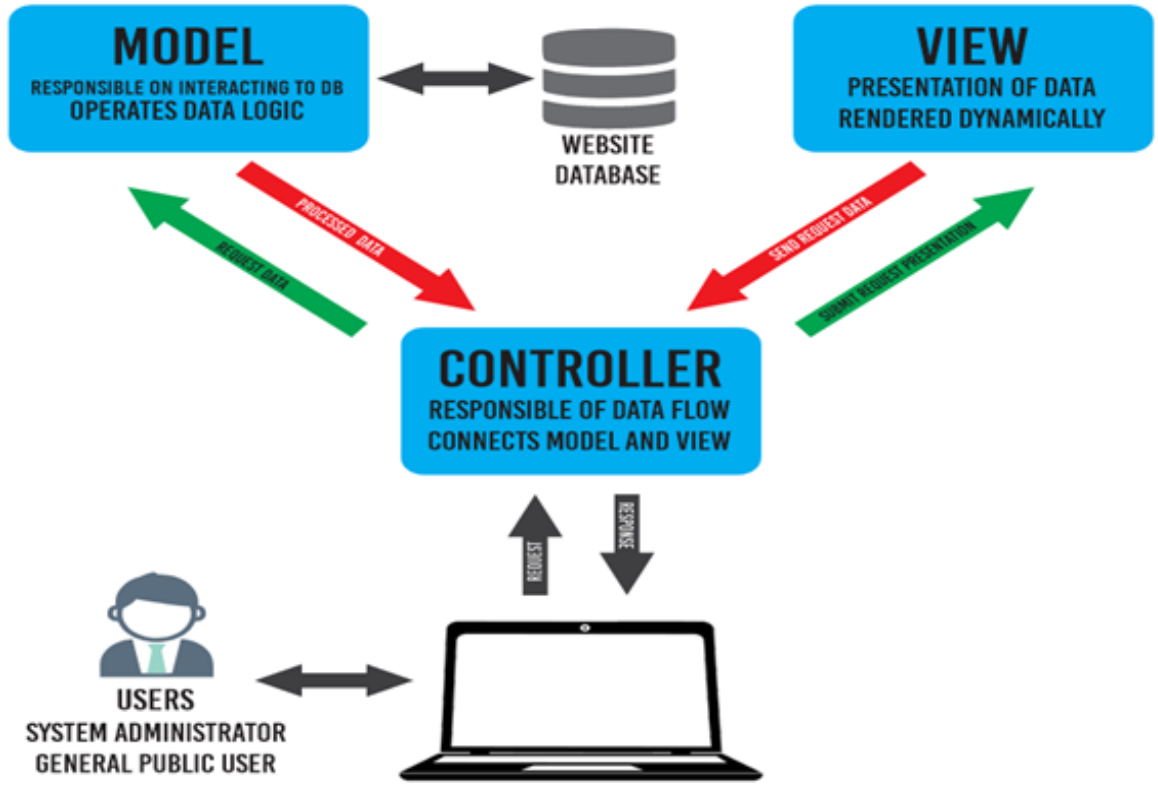

Figure 3. Model-View-Controller (MVC) Framework showing the interaction among components.

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Table 1. Range of Means for User Satisfaction while using the online portal.

Rate	Verbal Interpretation	Range
5	Strongly Agree	4.50-5.00
4	Agree	3.50-4.49
3	Neither Agree nor Disagree	2.50-3.49
2	Disagree	1.50-2.49
1	Strongly Disagree	1.00-1.49

testing for the overall performance of the site.

Release

The purpose of each release was to perform the release testing in which the users who were not part of the development team used and tested the system to validate if the system meets the user requirement and is ready for external use.

Review and Feedback

During the release testing phase, the feedback of the users were listed and became the basis of improvement to be done for the next cycle. This process continues until the maintenance phase of the online repository. Feedback of the users came from three biology faculty who were part of the research.

Online Repository Evaluation

An adopted questionnaire was used to capture the perception of users in terms of user satisfaction while using the online repository. The questionnaire was based on Post-Study System Usability Questionnaire (PSSUQ) with 3 subscales such as System Quality, Information Quality and Interface Quality (Lewis, 1992). During the launching of the online repository in July 2018, a demonstration was conducted and participants were asked to navigate through the online database. The participants who were able to navigate through the system were asked to answer an adopted questionnaire.

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RESULTS AND DISCUSSION

Online repository screenshots

The online repository being developed is capable of administrator functions such as managing records of species, researches, events, articles and article comments as well as users. The administrator and research staff need to login to the system and are directed to the main navigation as shown in Figure 4. The user can now choose to manage the species, research and events. The administrator can view and approve comments and reply to inquiries sent through the “contact us” menu of the online repository.

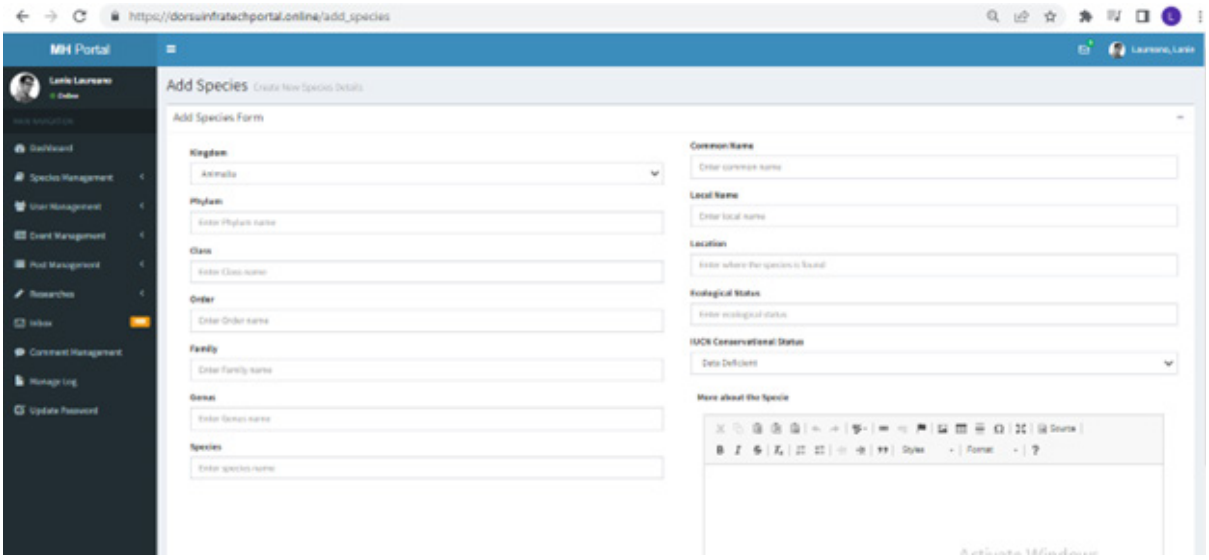

Figure 4. The administrator page of the online repository of research and species for Mt. Hamiguitan Range (MHR).

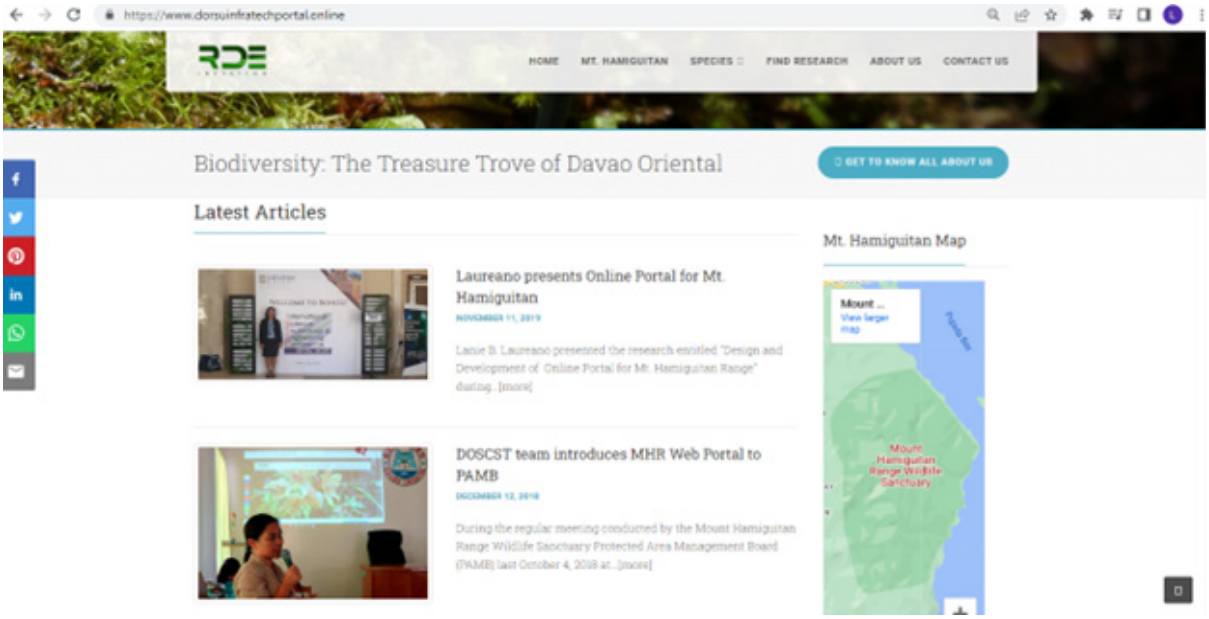

Figure 5. The homepage of the online repository of research and species for Mt. Hamiguitan Range (MHR).

The general public users or site visitors can access the online repository through https://www.dorsuinfratechportal.online and will be directed to the homepage. They can view the latest events and research through the homepage. They can also see the different menus and choose what particular pages they would like to view as shown in Figure 5.

The general public can view and search for species through the "Species" menu. The details about the particular species will be displayed if it is already recorded, as shown in Figure 6 and Figure 7.

In the detailed description, the kingdom, phylum, class, order, family, genus, common name, ecological status, vulnerability, references and additional photos were included. The description of species in this portal is more comprehensive compared to other online repositories like in the study of Gomez et al. (2015), in which

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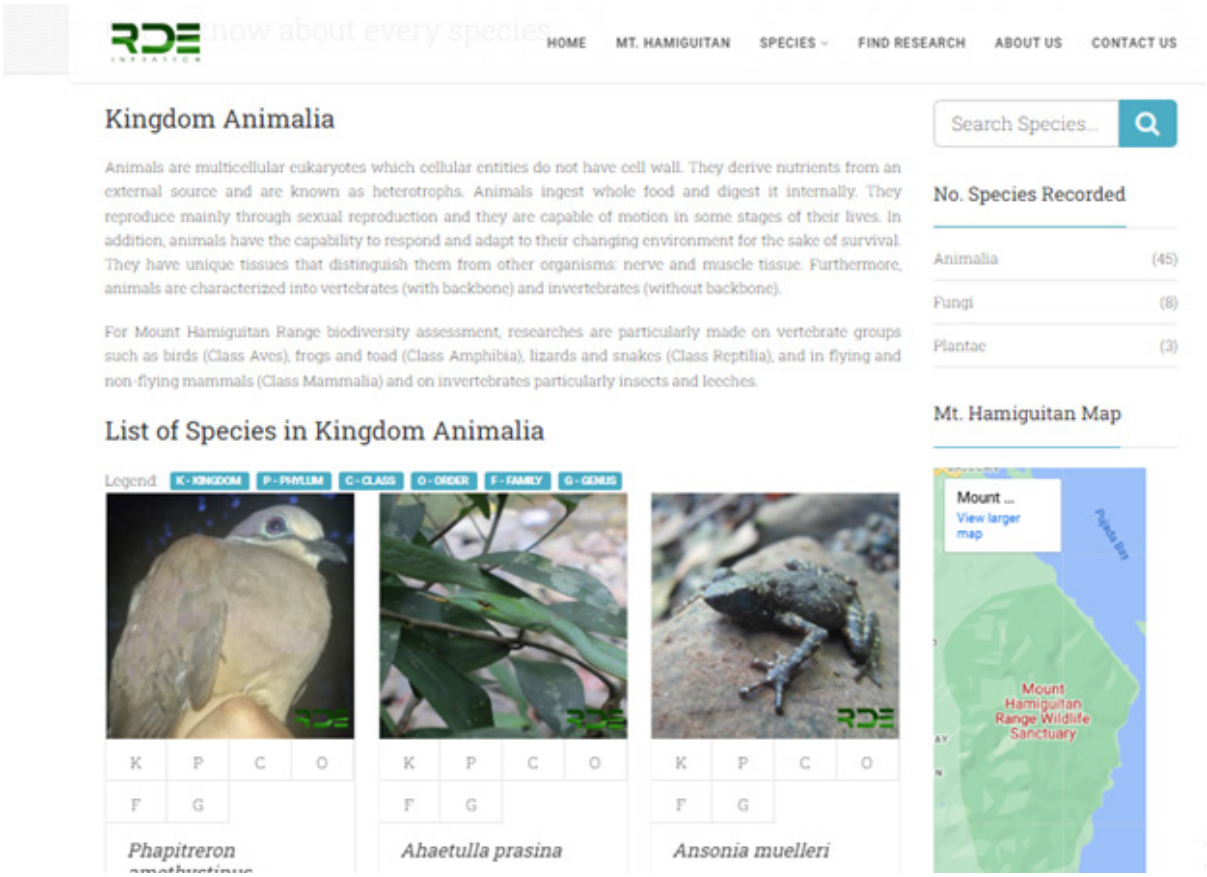

Figure 6. The page for the list of species in Kingdom Animalia found in Mt. Hamiguitan Range.

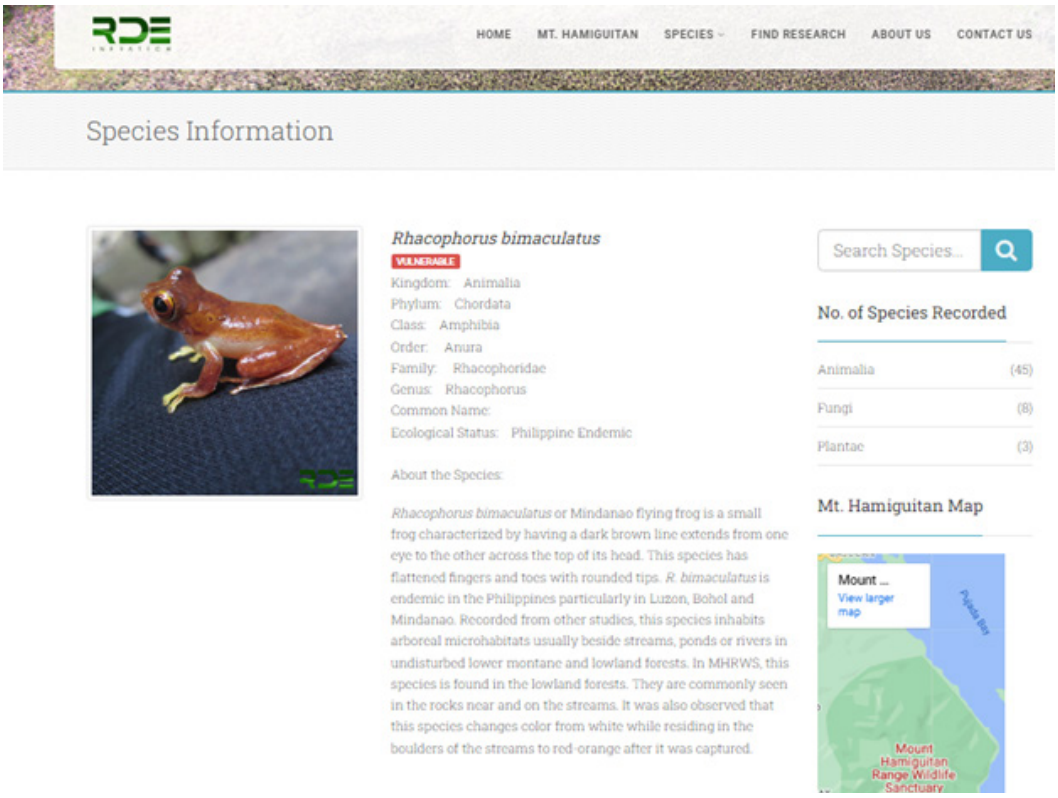

Figure 7. Sample page for detailed species information for *Rhacophorus bimaculatus,* one of the species found in Mt. Hamiguitan Range (MHR).

they created COMPADRE a plant matrix database and COMADRE, an animal matrix database (Gomez et al., 2016) which focused on the demography of plant and animal species found in the world.

Figure 8 shows the page for the list of research. The research abstract can be downloaded by the site visitor.

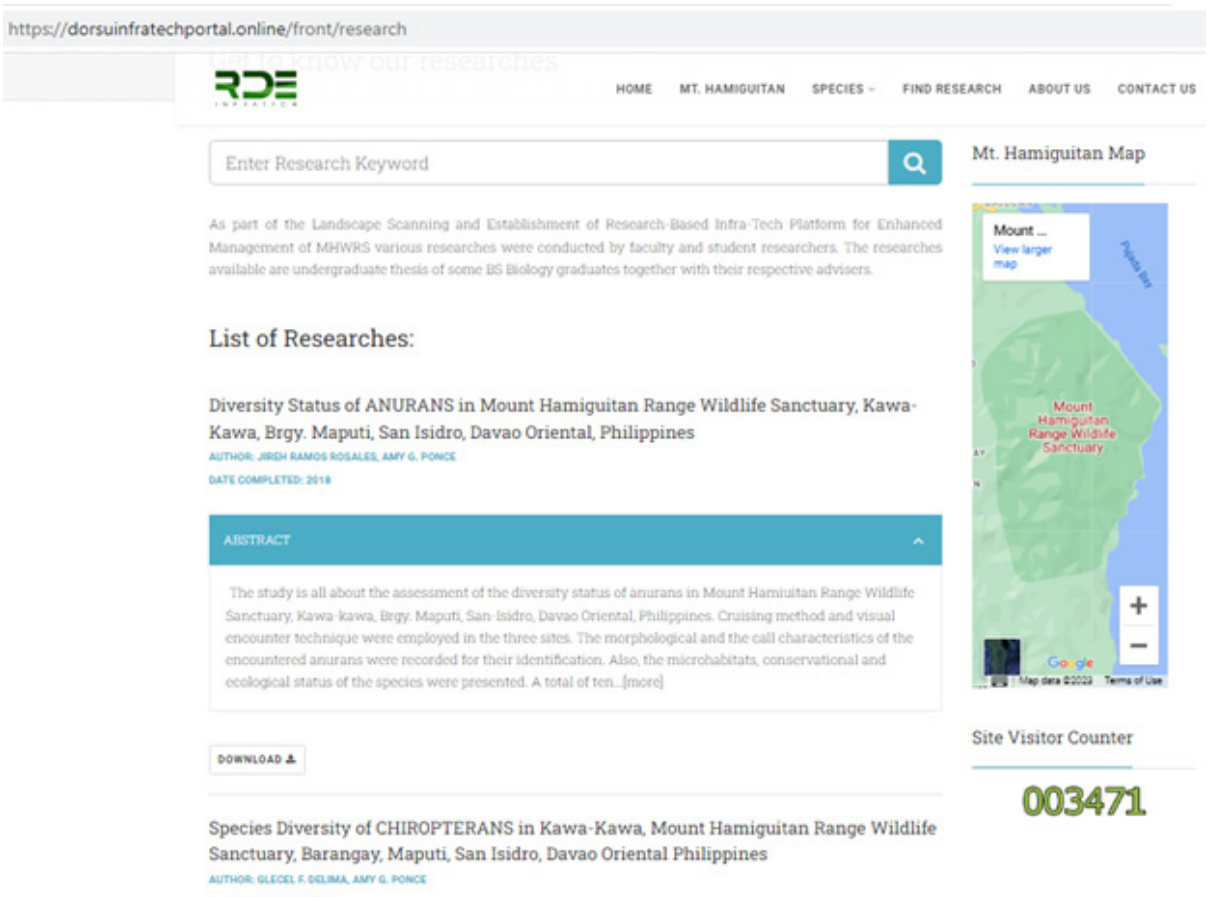

Figure 8. List of research conducted in Mt. Hamiguitan Range (MHR) which are uploaded in the online portal.

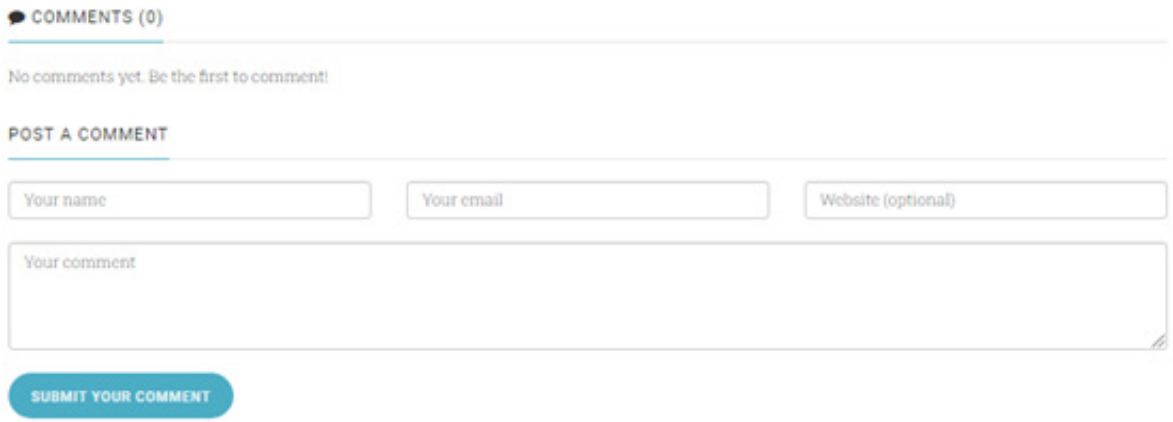

Figure 9. User comments section for adding user relevant comment on the article posted in the portal.

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The site visitor can also put comments on the articles but it needs approval of the administrator as shown in Figure 9. In cases that the visitor has inquiries, a message can be sent through the Contact Us page of the online repository.

Online Repository Evaluation Results

From the evaluation made by 26 users, as shown in Table 2, it is gleaned that the users agree that the online repository features were able to meet the user satisfaction in terms of system quality (4.44) and information quality (4.48). Furthermore, the respondents strongly agree (4.51) that the interface quality of the repository meets the user satisfaction. Overall, the online repository proves to meet the user satisfaction as perceived by the users as manifested with the mean rating of 4.48. However, for its improvement, users suggested adding videos of research expeditions, complete information lists for the species and advanced search options for the species.

While the online repository is in progress, the high respondent rating is an affirmation that it has achieved what it is designed for. Further, this is also an affirmation for the project team to sustain it to realize the goal of being an active player in environmental protection through provision of information to others who need it. With the current digital era, environmental management and education is not exempt to a transforming "new normal" educational landscape (Mansourvar and Yasin, 2010; Nguyen, 2015; Greenwood and Hougham, 2015; Brečka et al., 2022). With improved design, it is hoped that a better appreciation of the data of the online repository offers through a wider audience reach can be achieved.

Table 2. Perceptions of the respondents in using the online repository.

Subscale	Mean Grade	Verbal Interpretation
System Quality	4.44	Agree
Information Quality	4.48	Agree
Interface Quality	4.51	Strongly Agree
Grand Mean	**4.48**	**Agree**

CONCLUSION AND RECOMMENDATIONS

The online repository for Mt. Hamiguitan Range is developed to store the results of related research and record the species being studied and to provide access to the general public to this information. It has an administrator's capabilities that allows the management of species, researches, events as well as comments to posts. Only those with authorized access to the online repository can edit and add information. The portal has a user-friendly interface that can be used by administrators, researchers and the general public. Through the use of appropriate tools and techniques the portal is made available online. During the alpha testing of the website, respondents were able to evaluate the system using an adopted questionnaire and they perceived that, overall, the online repository is acceptable in terms of system, information and interface quality. Nevertheless, some suggestions were given for which would guide the researchers in the enhancement of the website. Further, promotional efforts will be heightened to increase public awareness of its existence, and thus, the achievement of the goal of public information and education on Mt. Hamiguitan diversity and the use of such information in the enhanced management of the area.

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