PLANTS AS FLAGSHIP SPECIES IN TOURISM DESTINATION: A CASE STUDY AT MOUNT MAHAWU TOMOHON, NORTH SULAWESI, INDONESIA

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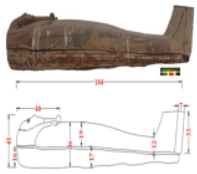
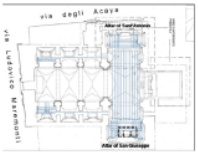
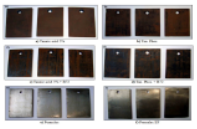
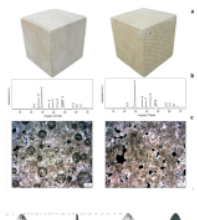
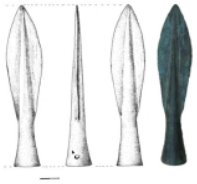
Issue Cover











Research articles

A. Abdrabou, M. Abdallah, M. Abd El Kader

Analytical Study and Conservation Processes of a Painted Wooden Graeco - Roman Coffin

[Abstract] [Full Article - PDF] pp. 573-586

This paper describes conservation processes of an Ancient Egyptian painted wooden coffin dating back to Graeco-Roman period using several scientific and analytical methods in order to provide a deeper understanding of the deterioration status, and a greater awareness of how well preserved the object is. Visual observation and 2D Program as well as Optical Micros-copy (OM), Environmental scanning Electron Microscopy (ESEM), X-ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR) were used in our study. Studies that include the identification of wood species, ground layer, red paint layer, binding medium and previous restoration materials were made. The coffin was previously conserved and stored in im-proper conditions which led to its further deterioration, the surface of the lid was extensively embedded with dust and bird droppings which obscured the decorations as well as missing and peeled painted gesso layers in many places and previous plaster fills obscured original surface. Soon after transportation from El-minia storage to the Wood Conservation Laboratory of the Grand Egyptian Museum-Conservation Center (GEM-CC), conservation procedures have been applied with high accu-racy to conserve the coffin including cleaning, stabilization of the friable painted gesso layers, reattaching lifting paint layers, removal of previous restoration and filling cracks and voids. The materials and methods that had been applied were extremely effective to stability and reinforcement of the coffin without harmfulness on the original materials and the coffin was success-fully conserved and ready to display or storage in the Grand Egyptian Museum (GEM).

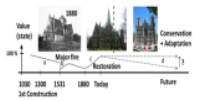
Keywords: Painted coffin; Deterioration aspects; Wood identification; Stratigraphic structure

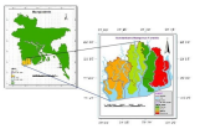
Z. Youssef, F. Kharrat

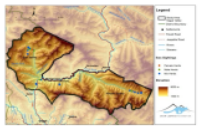
The Conservation of the Roman Mosaics in the Museum of Sousse in Tunisia: Between Doctrines and Practices

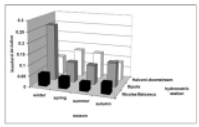
[Abstract] [Full Article - PDF] pp. 587-600

Our paper deals with the discipline of conservation of Roman mosaics based on the proceedings of the workshop of the Museum of Sousse. Thus, we highlight two main objectives. In the first place, it is a question of revealing the techniques adopted by professionals to handle mosaics. In the second place, we are going to interpret the works initiated to preserve the archaeological heritage in order to protect it in present time and transmit it to future generations. To this end, we paid attention to four Roman mosaics currently exhibited in the Museum and known under the names of: Orpheus Charming the Animals, Gladiator and Bears, Land farm of Sorothus and Head of Medusa. They show different gaps at the level of their surfaces, and the method used to fill them seems to be interesting to analyze. The study on the conservation passes through two chained phases. We start with a small historical overview. Afterward, the intervention process is analyzed by handling three complementary elements that are: diagnosis of the existing state, the study of the medium processing and the study of the processing of the tesselatum surface which includes the pictorial composition of the mosaic. Furthermore, we have implemented an evaluation matrix with seven operating principles allowing the assessment of the appropriateness of the intervention. These principles are the following: minimal intervention, reversibility, compatibility,









visibility, durability, authenticity and enhancement. Various accumulated outcomes are pointing out the techniques used to fill the gaps as well as the level of compliance with the principles of conservation. Accordingly, the conservation of mosaics in Tunisia is a practice that combines various techniques without really arguing about the choice of a particular theory.

Keywords: Roman mosaics; Museum of Sousse; Conservation; Operating principles; Particular theory.

G. Leucci, F. Grasso, R. Persico, L. De Giorgi

Integrated GPR Prospecting and Historical Research in three Churches

[Abstract] [Full Article - PDF] pp. 601-610

In this paper, we show the results of three case histories where GPR prospecting has been interpreted also with the aid of a specific archive research on documents of the XVI and XVII century. The case histories are related to three churches of the renaissance and baroque period in Lecce, Lecce, Southern Italy. The aim is to deliver the usefulness of GPR prospecting in these kind of monuments and to show how the likelihood of the interpretation can be increased when historical information is available.

Keywords: Archaeology; Baroque; GPR; Monuments.

M.M. Rifai, Z.A. Hamid, S.M. Saleh, M.M. Abdelbar

Evaluation of new Coatings for the Protection of Ornamental Cast Ironwork Exposed in Uncontrolled Environment

[Abstract] [Full Article - PDF] pp. 611-624

Ironworks constitute a great part of the world cultural heritage of metallic objects. Amongst these only a small part are on display in controlled environments. The rest is often exposed to uncontrolled atmospheres, high humidity and fluctuating temperatures and are usually heavily corroded. The aim of this study is to evaluate the efficiency of organic coating materials and corrosion inhibitors to protect ornamental cast ironwork from corrosion in uncontrolled environment using electrochemical techniques (Potentiodynamic polarization Tafel lines and electrochemical impedance (EIS)) and one year of exposure inside the clock tower of Muhammed Ali's mosque in Salah El-Din Citadel in Cairo (natural ageing). Grey cast iron coupons were prepared to simulate the composition and morphology of the historic cast iron staircase, and treated with different protection systems. Four organic coatings have been studied; a methyl acrylate / ethyl methacrylate copolymer resin (Paraloid™ B-72) dissolved in acetone, an ethylene copolymer wax (Poligen® CE 9), Permalac (N-Butyl acetate-14.0) and Permalac EF (N-Butyl acetate-14.0). The last two have not been commonly used in conservation and restoration treatments. Two corrosion inhibitors have been studied; tannic acid and tannic acid mixed with phosphoric acid. The results indicated that the best protection of cast iron coupons was afforded by Permalac, which protects cast iron from corrosion and the effect of UV. Finally, Permalac was applied on the staircase inside the clock tower of Muhammed Ali's mosque.

Keywords: Ornamental Cast Ironworks; Corrosion; Conservation; Protection

E. Torrero, D. Sanz, M.N. Arroyo, V. Navarro

The Cathedral of Santa María (Cuenca, Spain): Principal Stone Characterization And Conservation Status

[Abstract] [Full Article - PDF] pp. 625-632

The Cathedral of Santa María of Cuenca is one of the earliest Gothic cathedrals in Spain. The stone used in its construction mostly came from a quarry (now abandoned) in Arcos de la Cantera. It is a white lacustrine limestone with two lithotypes coded as hard (H) and soft (S). The two have similar chemical compositions, but type H has minor quartz, which type S lacks.

There is also a small difference in the chromaticity in type S with respect to type H. The pore size ranges from 0.1 to 1 μm for type H and from 0.1 to 20 μm for type S. The conservation status of this stone depends on the lithotype and on the location of the stone in the monument. Type S is the most heavily affected by honeycombing. Inside the Cathedral, there is also abundant salt efflorescence due to both absorption and porosity.

Keywords: Cathedral; Cuenca; Limestone; Pore Structure; Durability; Conservation Status

V. Vasilache, I. Sandu, C.-C. Lazanu, I.G. Sandu

Archaeometalurgical Evaluation of two Spearheads from the Bronze Age

[Abstract] [Full Article - PDF] pp. 633-642

The paper presents the results of the conjoint MO, SEM-EDX and micro-FTIR analyses conducted on two spearhead discovered in Stuhuleț and Huși (Vaslui County, Romania), attributed to the Bronze-Age Sabatinovka culture, in order to authenticate and establish the state of preservation, and to establish the manufacturing technique (the archaeometalurgical procedure) and the provenance of the raw materials, based on the chemical composition.

Keywords: Spearheads; Bronze; Archaeometallurgy; OM; SEM-EDX; micro-FTIR

T. Grontoft

A Condition Modelling Tool for Cultural Heritage Objects

[Abstract] [Full Article - PDF] pp. 643-656

A modelling tool was developed, as a tutorial and for research purposes, to predict the future condition, lifetime, and time before repeated conservation intervention for cultural heritage objects, depending on their historical condition, present conservation and changes in the environment. Model application was illustrated for a locomotive exposed outdoor at the Warsaw Railway Museum, Poland, and for the Oseberg Viking ship in the Museum of Cultural History in Oslo, Norway. The modelling suggested, tentatively, that the lifetime without future conservation of the locomotive surface would be from 6 to 30 years, but that the object could last many hundred (□800) years. To maintain the locomotive in the present condition conservation intervention would be needed every seven to 14 years. Shielding of the locomotive from precipitation could increase its lifetime, and time between conservation interventions, with 40%. One present conservation intervention could increase the lifetime with 20%. The lifetime of the Viking ship was suggested to be from 74 to 234 years. Conservation intervention was suggested every 15 to 66 years. Improvement of the air quality in the museum could increase its total lifetime, and time between conservation interventions, with 6%. One present conservation intervention could increase the lifetime with 26%. The most critical risk factor for the future preservation of the objects, excluding possible risks for sudden catastrophic events, was found to be to rate of any accelerating degradation processes.

Keywords: Cultural heritage objects; Condition modelling; Condition assessment; Conservation; Preventive conservation; Environnemental impact; Dose-response equation; Air quality.

P.S. Negi S.P. Subramani

Wild Edible Plant Genetic Resources for Sustainable Food Security and Livelihood of Kinnaur District, Himachal Pradesh, India

[Abstract] [Full Article - PDF] pp. 657-668

In view of changing food habits of local communities of Himachal Himalaya, a study to document the genetic resources of wild edible plant and traditional recipes was conducted in Kinnaur district of Himachal Pradesh, India. Rituals and cultural beliefs of the local people of Kinnaur plays significant role in conserving biodiversity.

A total of 116 plant species belonging to 42 families were recorded from the study area. Among the four major life forms, herbs contributed the highest proportion of the edible species (57) followed by trees (32), shrubs (26) and climber (1). Fruits (50) are the highly consumed plant parts, followed by leaves (33), seeds (23), bulbs (6), resin/gum (6), roots (5), flowers (4), shoots (4), bark (2) and tubers (2) respectively. Chilgoza nut is the dominant wild edible and also the main source of revenue. This includes 13 threatened species under different Red List categories of IUCN 2000 and 8 species are endemic to Western Himalayas. Allium stracheyi, Angelica glauca, Betula utilis, Bunium persicum, Dioscorea deltoidea, Hippophae spp., Juglans regia, Pinus gerardiana, Prunus armeniaca, Prunus mira and Sinopodophyllum hexandrum are highly exploited species in wild and need to be conserved.

Keywords: Kinnaur; Himachal Pradesh; Wild edible; Genetic Resource, Conservation

M.Z. Haque, M.I.H. Reza, S.A. Rahim, M.P. Abdullah, R. Elfithri, M.b. Mokhtar

Behavioral Change Due to Climate Change Effects Accelerate Tiger Human Conflicts: A Study on Sundarbans Mangrove Forests, Bangladesh

[Abstract] [Full Article - PDF] pp. 669-684

The change in climate has been observed over comparable periods of time. Mangrove ecosystem and its biodiversity are threatened due to climate change. Sundarbans mangrove ecoregion situated in Bangladesh (~62%) and India (~38%) is a bioclimatic zone. Sundarbans is one of the largest reserves for the Bengal tiger (Panthera tigris tigris L) which is the top predator. Therefore, it helps to regulate the number and distribution of prey, which in turn impacts forest structure, composition and regeneration. As climate change affects the flora and fauna in this ecosystem, these may be impaired because of migration of the species. The tigers become stray from forests to human inhabitants and causes tiger human conflicts which often results in retaliatory killings of tiger and human and or livestock. Therefore, the main objective of this study is to identify the effects of climate change towards the salinity intrusion and biodiversity, modification of floral and faunal composition, habitat loss and behavioral change of wildlife, which ultimately identify the factors for accelerating tiger human conflicts. It reviewed related literature through various websites and the secondary data were quoted with necessary modification. The primary data obtained from the office records of Bangladesh Forest Department and a social surveying was conducted on livelihood profile of the people living surrounding the Sundarbans to identify the relations between tiger attacking and their livelihood and living style. We used ArcGIS 9.3 to visualize the tiger habitat and trigger up the causes of root of conflicts between human and tiger. The results reveal the climate change effects in the Sundarbans Mangrove forest through changing its biodiversity composition in terms of loss of wildlife habitats which is responsible for accelerating tiger human conflicts. It suggests, a social and cultural revolution for sustainable alternative livelihood of forest-dependent population i.e., Alternative Income Generation (AIG), modification of the formal legal system, institutional development and in depth research can minimize these issues towards the sustainability of Sundarbans mangrove forest.

Keywords: Climate change; Sundarbans mangrove forests; tiger human conflicts; wildlife habitat; stray tiger.

D. Iskandar, D. Sugandi

Flood Mitigation Efforts in the Capital Region Of Jakarta

[Abstract] [Full Article - PDF] pp. 685-696

A flood is a disaster with such highly negative impacts on the loss of life and property that it has to be mitigated. In this regard, the present research aims to: measure the rainfall volume that causes flood and analyze the efforts of reducing the flood volume caused

by rainfall in the Region of Jakarta. An experimental method was applied to measure rainfall and run-off volumes stored in infiltration wells. The research was conducted in the following stages: analyzing land use and analyzing rainfall and surface runoff volumes. We found that changes in land cover negatively affect the land's ability to absorb rainfall. Land cover formed by vegetation will be different from impermeable land cover, such as houses, offices, pavements, and hotels. To reduce potential flood is achieved by reducing the surface runoff volume. Meanwhile, in order to reduce the runoff volume, an infiltration well that can accommodate 5m3 of water can be constructed for every 100m2 of developed area. With a number of 664,701,800 infiltration wells, as much as 3,323,509m3 of rainfall volume can be collected in those wells. Finally, with these infiltration wells, the Special Capital Region of Jakarta will be free of flood.

Keywords: Rainfall; Flood; Land cover; Impermeable layers; Infiltration wells

M. Gautam, S. Gupta

Population Status and Conservation Requirement of some Endangered Plants Growing in Dayalbagh Educational Institute, Agra

[Abstract] [Full Article - PDF] pp. 697-706

The study area is rich in plant diversity but there is an urgent need of conservation. Some rare and endangered plants are still found abundantly in the region, but without protection these plants may become endangered in the near future. Endangered plant species have been categorized by the IUCN (International union for conservation of nature) as the ones likely to become extinct. When the death rate of the species exceeds its birth rate for a prolonged duration, that species is called endangered and eventually it may become extinct. Such are Adhatoda vasica, Ageratum conysoides, Agave americana, Aloe vera, Ammania baccifera, Alternanthera sessilis, Asparagus adscendens, Cactus, Centella asiatica, Costus speciosus, Chlorophytum tuberosum, Gloriosa superba, Piper longum, Sinopodophyllum hexandrum, Rauwolfia serpentina, Saraca asoca, Strebles asper, Tribulus terrestris, Withania somnifera, Zamia pygmeae. Among these threatened plants 4 species were assessed as Critically Endangered (CR), 7 as Endangered (EW), 2 as Vulnerable (VU), 5 as Least Concern (LC) and 1 as Data deficient (DD) by the IUCN Red List in Uttar Pradesh and in the study area. The extinction and decline in plant diversity is caused by many factors, such as population growth, high rates of habitat modification and deforestation, climate change, pollution, the spread of invasive alien species and over-exploitation. Threatened species are being rehabilitated and restored to a protected area from their former habitats.

Keywords: Threatened plants; Population status; Conservation requirement; Importance Value Index (IVI)

H. Ali, M. Anwar, M.A. Nawaz

Population Density and Habitat Use of Himalayan Ibex (Capra Ibex Sibirica) in Nagar Valley, Gilgit-Baltistan, Pakistan

[Abstract] [Full Article - PDF] pp. 707-714

Monitoring of animal populations and their habitat is necessary to conserve, manage or harvest species and to understand their population trend. Present study determined the population size and habitat use of Himalayan Ibex in Nagar Valley of Gilgit-Baltistan. Vantage point count method was applied to estimate population. During winter, 478 Ibex were observed in 25 groups, with mean group size of (19.12 SD= 8.79) and a population density of 0.32 animals/km2, while during spring 456 Ibex were observed in 24 groups with mean group size of (19 SD= 8.65), and with a population density of 0.33 animals/km2. A sex ratio of 1.24 females/male in winter, 1.33 females/male in spring, 1.36 females/young in winter and 1.25 females/young in spring was recorded. A total of 47 plant species were identified in Ibex

habitat, dominated by herbaceous species. It prefers precipitous habitat with 60º-70 º slopes angle, and closer to escape terrain between 21m-50m distance (69.23%). It also showed preference for southern aspect (53.8%) with less snow accumulation, the majority of Ibex were observed between 2500m and 3500m (53.8%). Major threats to Ibex in study area include poaching, competition with livestock and weak watch and ward system.

Keywords: Himalayan ibex; Habitat preference; Population density; Nagar valley

R.R. Butarbutar, L. Hakim, I.R. Sastrahidayat, Soemarno

Plants as Flagship Species in Tourism Destination: A Case Study at Mount Mahawu Tomohon, North Sulawesi, Indonesia

[Abstract] [Full Article - PDF] pp. 715-728

This study aims to identify the plants as a flagship species in tourism destination based on the perception of tourists. Field survey was conducted in Mt. Mahawu nature-based tourism area in Tomohon, North Sulawesi, Indonesia. Field survey was done by distributed questionnaire to the 196 respondents. Respondent asked to identify the preferred main tourism attraction in Mt. Mahawu and respondent's perception to the plant species diversity which can potentially become tourism destination flagship. Among the numerous natural tourism object in Mt. Mahawu, this research confirms that plants are one of the most interesting tourism attraction in Mt. Mahawu. The important plants species found in the area have become flagships, both in term of tourism interesting object and conservation issues, encompasses Nepenthes maxima Reinw. ex Nees, Blechnum capense (L.) Schltdl., Pinus merkusii Jungh. & de Vriese, Phajus sp., Tabernaemontana pandacaqui Poir, Macaranga minahassae Whitmore, Swietenia macrophylla King, Bulbophyllum lobii Lindl, Euphorbia cotinifolia L. and Shefflera elliptica (Blume) Harms. The conservation effort to preserve such species was important in order to enhance tourism destination competitiveness in Mt. Mahawu.

Keywords: Ecotourism; Biodiversity Conservation; Mount Mahawu; Flagship Species.

G. Romanescu, C. Zaharia, A.V. Sandu, D.T. Juravle

The Annual and Multi-Annual Variation of the Minimum Discharge in The Miletin Catchment (Romania). An Important Issue of Water Conservation

[Abstract] [Full Article - PDF] pp. 729-746

The Miletin catchment is situated in the central-eastern sector of the Jijia-Bahlui depression, a component of the Moldavian Plateau, which spans Eastern Romania. Climatic conditions feature average multi-annual precipitations of 500–550 mm/year, an average evapotranspiration of 650–700 mm/year, and temperatures often exceeding 30°C during the summer and down to -30°C during the winter. Due to these conditions, the local rivers (such as the Miletin) can only have a permanent discharge if strong underground waters feed them. This situation is only found in the case of large rivers, which never dry up. Data recording was performed for a period of 41 years. The lowest (minimum minimorum) discharge was 0 m3/s in the upper sector, and it was recorded in 1968, 1969, 1986, and 1987. The lowest discharge in the middle sector was of 0.001 m3/s, recorded only once in 1990. In the lower sector, downstream from the Halceni pound, the lowest discharge was of 0.002 m3/s, recorded in 2006 and 2008. These lowest discharge levels occurred during the summer and winter. Dry-spells and water collecting, increasingly more common during the last few years, means that the hydrostatic level of the groundwater regularly drops by 1–2 cm each year.

Keywords: Drought period; Drying-up; Economic impact; Minimum discharge; Standard deviation

Letter

J. Gimenez

Egyptian Blue and/or Atacamite in an Ancient Egyptian Coffin

[Abstract] [Full Article - PDF] pp. 747-749

This work deals with the composition of the blue and green pigments used in the wooden sarcophagus studied by Abdelaal et al. and published in 2014 in this journal. From the published data, a degradation of the originally used Egyptian blue pigment is proposed. The presence of chlorine in the pigment deduced from SEM-EDS analyses and the greenish hue observed point to the formation of a certain amount of atacamite (or one of its polymorphs, paratacamite or clionoatacamite) because of the Egyptian blue degradation process named copper chloride cancer.

Keywords: Egyptian blue; Cuprorivaite; Atacamite; Copper chloride cancer; Sarcophagus; Ancient Egypt;

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PLANTS AS FLAGSHIP SPECIES IN TOURISM DESTINATION: A CASE STUDY AT MOUNT MAHAWU TOMOHON, NORTH SULAWESI, INDONESIA

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Abstract

This study aims to identify the plants as a flagship species in tourism destination based on the perception of tourists. Field survey was conducted in Mt. Mahawu nature-based tourism area in Tomohon, North Sulawesi, Indonesia. Field survey was done by distributed questionnaire to the 196 respondents. Respondent asked to identify the preferred main tourism attraction in Mt. Mahawu and respondent's perception of diversity of plant species that could potentially be used as a flagship tourist destination. Among the numerous natural tourism object in Mt. Mahawu, this research explained that plants was one of the most interesting tourism attraction in Mt. Mahawu. The important plants species were found in research area as a tourist flagships, both in term of tourism interesting object and conservation issues, encompasses Nepenthes maxima Reinw. ex Nees, Blechnum capense (L.) Schltdl., Pinus merkusii Jungh. & de Vriese, Phajus sp., Tabernaemontana pandacaqui Poir, Macaranga minahassae Whitmore, Swietenia macrophylla King, Bulbophyllum lobii Lindl, Euphorbia cotinifolia L. and Shefflera elliptica (Blume) Harms. The conservation effort to preserve such species was important in order to enhance tourism destination competitiveness in Mt. Mahawu.

Keywords: *Ecotourism; Biodiversity Conservation; Mount Mahawu; Flagship Species.*

Introduction

Every country has a tourism potential in the form of nature tourism, cultural and culinary history [1-3]. Information about the natural beauty and wealth of the tourism destination would potentially increase attractiveness of the natural attractions that exist in a region or country, as well as a chance to increase the number of tourists visit [4-7]. The various tourism potential being the main attraction or as a flagship product in one country can be explored, managed, developed and packaged into recreation programs [8-11].

Indonesia is one of the countries that are visited by tourists from different countries. Indonesia has numerous tourism attractions which are able to invite foreign to come to Indonesia. It is encompasses the beauty of the landscapes, the diversity of flora and fauna, culture, culinary, religious, and pilgrimage [12-14]. According to Sudarto [15], the main attraction of ecotourism is located on nature. It is consist of flora and fauna (90%) and 10%

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local culture. Several national parks in Indonesia is famous for flora diversity, including endemic plant species. There are also rare plants such as *Amorphophallus titanium* and *Rafflesia arnoldii*. Other plant species found are *Livistona altissima*, *Bulbophyllum* sp., *Dendrobium* sp. and *Cassuarina junghuniana*.

Indonesia is home of numerous mega-fauna such as elephants (*Elephas maximus*), Malayan bear (*Ursus malayanus*), Sumatran tiger, Sumatran rhinoceros (*Dicerorhinus sumatrensis*), Orangutan (*Pongo pygmaeus*), Tapirs (*Tapirus indicus*), One-horned rhinoceros (*Rhinoceros sondaicus*), Banteng (*Bos sondaicus*), Tiger (*Panthera tigris*), Surili (*Presbytis aygula*) and "Owa Jawa" (*Hylobathes moloch*) which are important as tourism object in nature environment [16-17]. The variety of flora and fauna with a diverse ecosystem are the potential special attraction of natural tourism destinations [18-21].

The main attractions which are used to promote tourist destinations and invite tourist to visit the particular destination, known as a tourism flagship. Conceptually flagship tourism is the main tool in promoting the tourism destinations due to its characteristics or uniqueness [22-25]. In China, Panda was used as the flagship; Australia is famous for its Kangaroo; Netherlands is famous for the beauty of tulips; Nottingham United Kingdom is famous for its Oak tree Mayor. In Yaman, Dragon's blood trees that give off a red latex were used as the tourism flagship species [26-27].

North Sulawesi is one of the provinces in Indonesia which abundance nature-based tourism attraction [28-29]. Mount Mahawu is one of the natural attractions which was most visited by tourists, especially domestics tourist. The short distance of the tourism object from the city of Manado (about 30 km) and only 2 km from the capital city of North Sulawesi Province was the significant factor lead to the frequent tourist visitation to Mt. Mahawu. The difficulty climbing level in the Mt. Mahawu is relatively moderate and some places can be reached by using a motor vehicle. The diversity of flora and fauna of Mt. Mahawu could be encouraged to become the interesting attraction for tourists. In such a case, the development of Mt. Mahawu tourism as a competitive tourism destination needs a flagship species as a crucial component to promote mountain tourism destinations. However, there has been no data on plants that can be used as tourism flagships. The purpose of this research are to determine the main touristic attraction in Mt. Mahawu and to identify plants which are able to be tourism flagship spicies to promotes Mt. Mahawi as interested tourism destination.

Methods

Study Site

Tomohon is one of the cities in North Sulawesi province which is about 25 km from Manado. Tomohon consists of 5 districts with an area of 147.21 km^2. The average rainfall of the area ranging from 1,422 mm - 2.364 mm. Monthly average temperature ranging from 21°C to 22.5°C with humidity ranging between 85% - 87%. The topography of Tomohon is hilly and dominated by mountainous [30]. Mt. Mahawu located in the eastern part of Tomohon, close to the Rurukan agrotourism area. Mt. Mahawu has a height of 1,324 meters with a width of 180 meters. Mt. Mahwu consists of two pyroclastic cones on the northern slope.

Mt. Mahawu is one of the potential tourism attractions in North Sulawesi province. The number of tourists in 2012 was calculated about 59,795 people. Type of tourists who visited in North Sulawesi are domestic tourists (54,311 people) and foreign tourists (5,484 people). The number of tourist visits of 15,557 people in 2009 increased to 44,238 persons in 2012. [31-32]

The natural object for tourism was numerous, including flora, fauna and beautiful landscape. The flora encompasess *Ficus celebensis, Pinanga* sp, *Saccharum spontanum, Acanthus* sp., *Sauraria minahasae, Pinanga caesia, Pigafeta filiaris* [33]. According to Tasirin and Hunowu, 2010, there are also rare mammals (i.e. wild boar) and some bird species which

are protected and preserved (i.e Scalybreast kingfisher, Mountain tailorbirds, Crimson-crowned Flowerpeckers, Sooty-headed bulbuls *(Pycnonotus aurigaster)*, Grey-sided Flowerpeckers.

Fig. 1. Map of the study area

Research Methods

The research was conducted from December 2012 until February 2013. Data was collected by distributing of questionnaires and interviews based on a prepared list of questions. The number of respondents was determined by used Slovin estimation equation [34] as follows:

$$n = \frac{N}{1 + N(d^2)} = \frac{4{,}978.75}{1 + 4{,}978.75\,(0.1^2)} = 98.03$$

where: n = the number of tourists that will be taken as respondents
N = population size
d = the standard error m

During 2012, Mt Mahawu was visited by 4,978 people. Therefore, the samples used in this study were 98 multiplied by the length of the study, which equals to a number of 196 respondents. The questionnaire was designed to expore three important issues including the travelers rating on the main attraction tourist, the traveler's perception of the plant species that can become the flagship tourist destination and the presence of plant species in tourist locations.

Based on this three important issues, the questionnaire sheet was divided into 15 questions. Each answer was arranged following the Likert Scale. The range of respons was classified into three categories namely very impressive/important (VI), quite impressive/important (QI) and less impressive/important (LI). The range of value is shown in Table 1.

Table 1. Scoring For Perception of Tourists about Plant Species by Using Three Categories

Category of Perception	Score	∑ (range)	Category of Preference (Importance level)	Score	∑ (range)
Very Impressive (VI)	5	>3.66 – 5.00	Very Important(VI)	5	>3.66 – 5.00
Quite Impressive (QI)	3	>2.33 – 3.66	Quite Important (QI)	3	>2.33 – 3.66
Less Impressive (LI)	1	1.00 – 2.33	Less Important (LI)	1	1.00 – 2.33

The results of the questionnaire answers obtained average value is determined by using the following formula:

$$\text{The overall mean value} = \frac{\text{The total value of all components observed visually}}{\text{Number of observed}}$$

$$\text{The mean value of perception} = \frac{\text{Total score of perception of all respondents in a species}}{\text{Number of respondents}}$$

$$\text{The mean value of preference} = \frac{\text{Total score of preferences of all respondents in a species}}{\text{Number of respondents}}$$

The results were analyzed descriptively. The geographic distribution of the obtained species were analyzed with reference to the data base Germplasm Resources Information Network (GRIN Database). The level of threat of invasive actions are assessed by IUCN (International Union for Conservation of Nature and Natural Resources) and CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora).

Results and discussion

A. Tourism object preference

The results showed that the perception of tourists for the attractiveness of the natural attractions of the mountain Mahawu Tomohon was based on plant species diversity (51.53%) followed by the crater (26.53%), caves (12.25%), arts and culture (6.63%). This means that the tourists are interested in the variety of flora species in Mt. Mahawu. Tourism products which serve as the object of interest or attraction tourist area can be seen in Table 2.

Table 2. Object of Tourism as Products of Interest for Tourists

No.	Object of Tourism	Tourist Perception (People)	Percentage (%)
1.	Plant Species	101	51,53
2.	Crater	52	26,53
3.	Cave	24	12,25
4.	Arts and Culture	13	6,63
5.	Fauna	6	3,06
6.	Culinary	-	-
	Total	**196**	**100,00**

Some countries have a tourism destinations such as Australia, Canada and Norway more highlight the vegetation as a tourist attraction because it has a fantastic aesthetic value which is different from the other places [18-21]. The other research results by Savitri and Iskandar (2012), they are more emphasis on the type of bird as an attraction for tourists. The others tourism attractive is butterflies diversity who used as a tourism product to attraction tourists [35-37].

At the summit of Mt. Mahawu there is a steep crater used as an exciting attraction. In the northern part of the peak of Mt. Mahawu, tourists can see the beauty of Manado bay surrounded by some islands such as Bunaken, Mantehage, Nain and Siladen. Tourist also can see the beauty of Mt. Klabat and Bitung city. In the western part, tourists can see Mt.

Lokon with active crater. In the eastern part, tourists can see picturesque of Tomohon City and some part area of Minahasa City, bay of Amurang and Mt. Soputan. The level of difficulty for climbing Mt. Mahawu is relatively moderate, except for access to mountain peak.

B. Tourism flagship species based on tourists perception

The data obtained in this research show that any tourists had a different perception of each object especially for plants species in Mahawu mountain areas. Tourists gave perception or judgment based on what they had experienced. Generally, tourists perception depends on the psychological ability and the power to see, smell, hear and feel. Based on the results obtained, the perception refers to what is present in the consciousness of thought, included sensory data, illusion, vision, ideas, concepts and images or images that appear visually [38-40].

The attractions of plant species with the highest average value be found in species of *Nepenthes maxima* Reinw.ex Nees (4.42) followed by *Blechnum capense* (L.) Schltd (4.17), *Pinus mercusii* Jungh.& de Vriese(4.07), *Lantana camara* L. (4.04), *Hedychium coronarium* Koenig and *Phaius* sp. with a value of 3.98 both. As a whole the average tourists ratings in the plant species in Mahawu mountain areas is very impressive (Table 3).

Tourism flagship is an excellent product who can used as tourist attractions, the point of interested and conservation value which can be promoted as a tourist destination [22-25]. Plant species that serve as the tourism flagship ranked by tourists (local, domestic and foreign), IUCN and CITES database are *Nepenthes maxima* Reinw. ex Nees followed by *Blechnum capense* (L.) Schltdl, *Pinus merkusii* Jungh. & de Vriese, *Phaius* sp., Tabernaemontana pandacaqui Poir, *Macaranga minahassae* Whitmore, *Swietenia macrophylla* King, *Bulbophyllum lobii* Lindl., *Euphorbia cotinifolia* L. and *Shefflera elliptica* (Blume) Harms.

Nepenthes maxima Reinw. ex Nees is highly desirable species or impressive for tourists because it has biological characteristic. *Nepenthes maxima* Reinw. ex Nees is carnivorous plant. Morphology of this species is very unique and impressive. According to the tourists perception, this species has an unique shape and colour of the sac. It is green and red-spotted irregularly mottled. Surface of the sac looks such as fluffy feathers. Classificated as carnivorous plant could be used as natural insect exterminator. That plant have local name as "Kantong Semar" who is assumpted as an endangered species in Appendix II of CITES assessment. This species is found in almost all Mahawu mountain peaks at an altitude 1,324 m above sea level. Native distribution is from Malesia region.

Species of *Blechnum capense* (L.) Schltdl gives the impression of beauty, seen as a unique visual image on the colour of the leaves. There are green and red. The leaves are thick and shaped like a sword. It is a potentially vulnerable species. In the IUCN assessment, this plant classified on the vulnerable species. This plant have potentially as tourism flagship. They are live at an altitude of 900 to 1,324 m above sea level in the Mahawu mountain areas. Native distribution this plant is from Malesia region then developed in the southern part of Africa, Malawi, Swaziland and Zimbabwe [7, 41- 42].

The other plant species who have potential tourism flagship in Mahawu mountain areas is *Pinus mercusii* Jungh. & de Vriese, who categorized as the Pinaceae family provide morphological beauty about form and colour of the leaves. Elongated spherical form, drooping and green, stem by rough skin colored gray brown to dark brown, not buttressed, no flaking and grooved wide and has a long fiber. In the IUCN assessment, this plant classified on the vulnerable species. Native distribution is Malesia region, China and Indo-China. The wood on this plant used as a raw material for making matches. This plant is due to the flammable nature hance this plant must cautiously handled in the dry season. Generally, this plant was found in mountain areas of Mahawu at an altitude of 700 – 1,300 m above sea level [7, 28, 43].

Table 3. Identification of Plant as Tourism Flagship Based on Tourists Perceptions

No.	Name of Plants Species	Local Name	Mean Value	Description
1.	*Nepenthes maxima* Reinw.ex Nees	Kantong Semar	4.42	Carnivorous Plants. Native to Malesia Region. Endangered. Non invasive species. Appendix II CITES.
2.	*Blechnum capense* (L.) Schltdl	Paku pedang, Paku Munding, Pakis kinca	4.17	Form of the leaves unique. Attractive colours. Native to Malesia Region.Non invasive species. Not endangered. IUCN-Vulnerable.
3.	*Pinus merkusii*Jungh. & de Vriese	Pinus, Tusam	4.07	Leaf shape is attractive and stem buttress. Native to Malesia Region. Non invasive species. Not endangered. IUCN-Vulnerable.
4.	*Lantana camara* L.	Kembang telek, Saliara	4.04	Form of the flower is unique. Attractive colours.Ori.Dist.Northern America. Not endangered. Invasive species.
5.	Hedychium coronarium Koenig	Gandasuli, Mandasuling (Bali)	3.98	White flower color. The smell of flowers typical.Native to Asia Region. Non Invasive species. Not endangered.
6.	*Phaius* sp.	Anggrek Tanah	3.98	Form of the flower is unique. Attractive colours. Native to Asia Region. Endangered. Non invasive species.
7.	*Michelia champaca* L.	Campaka Kuning	3.93	Attractive flower colour.The smell of flowers typical.Ori.Dist.Zimbabwe. Endangered. Non invasive species
8.	*Cyathea contaminans* Copel	Paku pohon	3.92	Unique stem and attractive. Native to Malesia Region. Non invasive species. Not endangered.
9.	*Tabernaemontana pandacaqui* Poir	Jelutung Badak	3.89	Have flowers with attractive shapes and colour. Native to Malesia Region. Non invasive species. IUCN-Vulnerable.Not endangered.
10.	*Macaranga minahassae* Whitmore	Makaranga	3.87	Leaf shape is attractive. Native to Malesia Region. Not endangered. Endemic plants. IUCN-Vulnerable. Non invasive species.
11.	*Centratherum punctatum* Cass.	Bunga Lolipop, kancing lurah	3.85	Form of the flower is unique. Attractive colours.Native to Malesia Region. Not Endangered. Non invasive species.
12.	*Swietenia macrophylla* King	Mahoni Berdaun Lebar	3.84	Have shape and unique leaf colour. Native to Malesia Region. Endangered. IUCN-Vulnerable. Appendix II CITES. Non invasive species.
13.	*Bulbophyllum lobii* Lindl.	Anggrek hutan	3.78	Attractive flowers. Form of the leaves unique. Native to Malesia Region. Endangered. Non invasive species. IUCN-Vulnerable. Appendix II CITES.
14.	*Elmerillia celebica* Dandy	Wasian, Cempaka hutan alus	3.78	Leaves color is beautiful. Typical stem shape. Ori.Dist. Indonesia.Endemic Plants. Non invasive species. Not endangered.
15.	*Fragaria* spp.	Famili Rosaceae	3.78	White flower colour. Fruits such as Strawberry. Ori.Dist. Northern Afrika. Invasive species. Not endangered.
16.	*Euphorbia cotinifolia* L.	Herba Mala	3.77	Have shape and attractive leaf colour. Ori.Dist. Northern America. Invasive species. Not endangered. IUCN-Vulnerable.
17.	*Elmerillia ovalis* Dandy	Cempaka hutan kasar	3.75	Typical stem shape. Ori.Dist. Indonesia. Non invasive species.Endemic plants. Not endangered.
18.	*Schefflera elliptica*(Blume) Harms	Tanganan, Kayu Tulak	3.75	Form of the leaves unique. Native to Asia Region. Non invasive species. Not endangered. Medicinal plants. IUCN-Vulnerable.
19.	*Polianthes tuberose* L.	Bunga sedap malam	3.73	Flower shape is attractive. White flower colour. The smell of flowers typical. Ori.Dist. Indonesia. Cultivated. Not endangered. Non invasive species.
20.	*Litsea elongata* Benth.& Hook.f.	Medang	3.71	Leaf shape is unique and attractive. Native to Asia Region. Not endangered. Non invasive species.
21.	*Pandanus* spp.	Pandan Besar	3.69	Leaf shape andstem shape is typical. Native to Tropical Pasific Islands. Not endangered. Non invasive species.
22.	*Spathodea campanulata* Beauv.	Pohon Hujan	3.69	Flower shape is attractive. Attractive flower colour. Ori.Dist. Tropical Afrika. Not endangered. Invasive species.
23.	*Hemerocallis* sp.	Bunga Daylily	3.69	Form of the flower is unique. Attractive colour. The smell of flowers typical. Native to Asia Region. Non invasive species. Not endangered.
24.	*Hypoestess phyllostachya* Baker	Polkadot	3.59	Leaves color is attractive. Beautiful leaf shape. Native to Malesiana Region. Tanaman konservasi.Non invasive species. Not endangered.
25.	*Acacia decurrens* Willd.	Bunga Akasia	3.58	Attractive flower colour. Native to Australia and Southern Asia Region. Not endangered. Non invasive species.
26.	*Dipteris conjungata*(Kaulf.) Reinw.	Paku-pakuan	3.53	Leaf shape is attractive. Native to Asia Region. Native to Asia Region. Not endangered. Non invasive species.

Another potential tourism flagship species is Phaius sp. This species has purple flowers who gives the impression of beauty for tourists. Phaius sp. growing and life at an altitude of 800 – 1,200 m above sea level in the Mt. Mahawu. Comber explaining that orchids can be grown in a many places such as garbage, land of humus, soil of marshes, sand of rocks, trees and other plant roots [44]. Native distribution is Indonesia region, Australia and Papua New Guinea.

Tabernaemontana pandacaqui Poir also potentially plant has a tourism flagship in Mahawu mountain. This plant classified on the family Apocynaceae giving the impression of beauty, seen from the shape and colour of flowers. In the IUCN assessment, this plant categorized as a vulnerable species. The native region of distribution this plant is Malesia region and then spread to Asia. *Tabernaemontana pandacaqui* Poir can flowering and fruiting throughout the year. In Philippines, the peak of the flowering processing is from March to June and fruiting from September to November. The peak of flowering in Papua New Guinea in March and November to December and fruiting in January and September. The flowers have little or no smell fragrant and usually open during the day. This species can live at an altitude of 900 to 1,324 m above sea level on the Mahawu mountain region.

Macaranga minahassae Whitmore is a kind of pioneer and could survived althought primary forest damaged. It has an attractive leaf shape. This plant has the potentially as a tourism flagship on Mahawu mountain areas. In the IUCN assessment, this plant classified on vulnerable species. Native distribution this plant is Malesia region and then expanded the lowland Burma and Thailand. This species had a genus of more than 300 different species. Macaranga species are used as food plants by the larvae some Lepidoptera species including *Endoclita malabaricus*. This plants could life and grow up at an altitude of 700 to 1,324 m above sea level in the Mahawu mountain areas.

Plants of *Bulbophyllum lobii* Lindl also have a potential tourism flagship. Tourists had perception that it plant have beauty of morphology, seen from the shape of leaves and flowers. This plant classified on Orchidaceae family. In the IUCN assessment, this plant have classified as vulnerable species and potentially as a rare species in CITES Appendix II. Native distribution of this species is Malesia regions and spread widely in Asia-Tropical, Indo-China. This plant grow up in Mahawu mountain areas at an altitude of 1,200 m above sea level. The others plant who had potentially as a tourism flagship in Mahawu mountain is *Euphorbia cotinifolia*. Tourists perception that it plant can categorized on species who give the impression of beauty, seen from the shape and colour of the leaves. This plant classified as a vulnerable species in the IUCN assessment. The original distribution is from the north and south America. This plant is included as a pioneer in the Mahawu mountain areas.

Schefflera elliptica (Blume) Harms is one type of Araliaceae tribe which also has potential flagship tourism in Mahawu area. Tourists perception that *Schefflera elliptica* (Blume) Harms has an unique the shape of the leaves. The upper leaves surface is dark green, the bottom is light green and in the top has a smooth texture and rough in the bottom. The leaves are *palmatus* compound with an ellipse or obovate form. This plant usually used as medicinal plant. In the list of the IUCN criteria, these plants are categorized as vulnerable and potentially not invasive species. Native distribution of this species from region of Asia. In Mahawu mountain this plant growing at an altitude of 900 to 1,324 m above sea level. These plants can life and grow very well at an altitude 2,500 m above sea level.

This results show that the plants species in this research can be potentially as tourism flagship who has conservation values. That can be promoted to foreigners, but it must supported by society, governmental, tourism operators and tourists, [27, 36, 45].

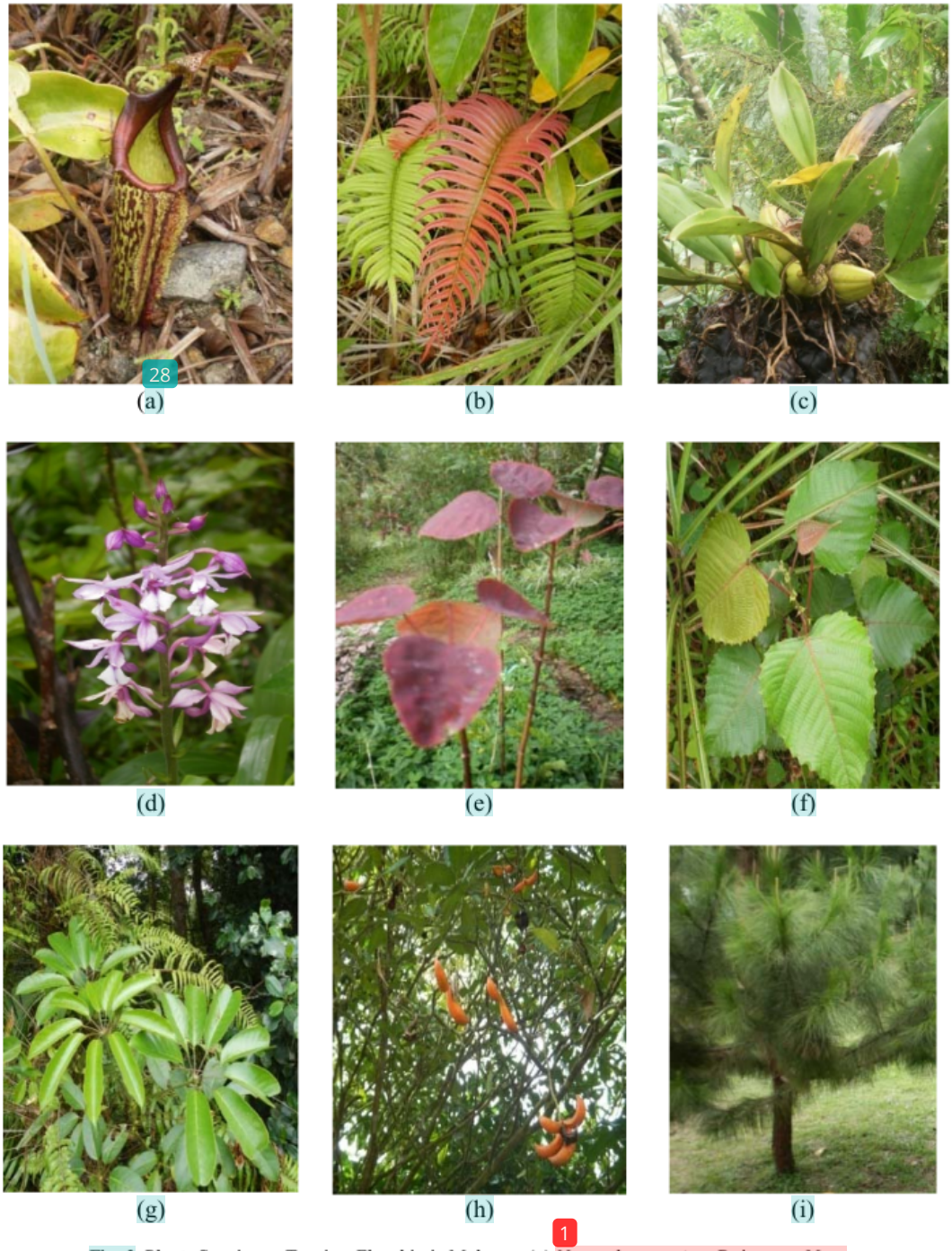

Fig. 2. Plants Species as Tourism Flagship in Mahawu: (a) *Nepenthes maxima* Reinw. ex Nees, (b) *Blechnum capense* (L.) Schltdl, (c) *Bulbophyllum lobii* Lindl., (d) *Phaius* sp., (e) *Euphorbia cotinifolia* L., (f) *Macaranga minahassae* Whitmore, (g) *Schefflera elliptica* (Blume) Harms, (h) *Tabernaemontana pandacaqui* Poir, (i) *Pinus merkusii* Jungh.& de Vriese

C. Importance level of plant species based on tourists

This results show that, respondent had perception there is about 26 plants species which are interesting and important for tourism development in Mt. Mahawu (Table 4). The most interesting and important species is *Nepenthes maxima* Reinw.ex Nees (4.48) and then *Pinus merkusii* Jungh. & de Vriese (4.02), *Cyathea contaminans* Copel. and *Blechnum capense* (L.) Schltd (each species with value of 4.01), *Lantana camara* L. (3.99) and *Hedychium coronarium* Koenig (3.98).

The level of importance plant species as tourism flagship was based on two perspectives of tourists, namely plant beauty and environmental services. Usually, tourists (they have less knowledge about plants and local animals) more interested in things that are seen visually. If have no that species, it will decrease the attractiveness of Mt. Mahawu as tourism destination. This is the same case with some previous research, that is tourists motives to visit some tourism area was related to the desire observed of the plants and animals attractive [11, 13, 28, 40]. Students, teachers and researchers are usually more interested in plants with ecological role in an ecosystem. These tourists category declared that if have no key species who contributed on the tourism destination, it will bring negative impact of the mountain ecosystem [7, 24, 41].

Tourists who assumes that the plant as a flagship species very important (70.66%) and quite important (25.11%). The results showed that existence of *Nepenthes maxima* Reinw. ex Nees in area of Mt. Mahawu was very important for the tourists. Plant species as tourism flagship in Mt. Mahawu make a major contribution in increasing the number of tourists, regional income, to improve the welfare local communities and the development of sustainable nature tourism [12-13].

Table 4. Importance Level of Plant Species Based on Tourists in Mahawu Mountain

No.	Name of Plants Species	Local Name	Mean Value	Description
1.	*Nepenthes maxima* Reinw. ex Nees	Kantong Semar	4.48	Pioner.Climax. Seedling.
2.	*Pinus merkusii* Jungh. & de Vriese	Pinus, Tusam	4.02	Pioner. Stabilization. Climax. Seedling. Saplings. Pole. Mature trees.
3.	*Cyathea contaminans* Copel.	Paku pohon	4.01	Pioner. Stabilization. Climax. Seedling. Saplings. Pole. Mature trees.
4.	*Blechnum capense* (L.) Schltdl	aku pedang, Paku Munding, Pakis kinca	4.01	Pioner. Stabilization. Climax. Seedling.
5.	Lantana camara L.	Kembang telek, Saliara	3.99	Invation. Saplings. Pole.
6.	Hedychium coronarium Koenig	Gandasuli, Mandasuling (Bali)	3.98	Pioner. Seedling.
7.	Phajus sp.	Anggrek Tanah	3.89	Pioner. Climax. Seedling.
8.	Elmerillia celebica Dandy	Wasian, Cempaka hutan alus	3.79	Pioner. Stabization. Climax. Seedling. Sapling. Pole. Mature trees.
9.	*Euphorbia conitifolia* L.	Herba Mala	3.77	Pioner. Seedling.
10.	*Hemerocallis* sp.	Bunga Daylily	3.76	Ecessis. Seedling.
11.	Elmerillia ovalis Dandy	Cempaka Hutan Kasar	3.76	Pioner. Climax. Seedling. Saplings. Pole. Mature trees.
12.	Bulbophyllum lobii Lindl.	Anggrek Hutan	3.73	Pioner. Seedling.
13.	*Swietenia macrophylla* King	Mahoni Berdaun Lebar	3.71	Ecessis. Saplings. Pole.
14.	*Fragaria* spp.	Famili Rosaceae	3.69	Invation. Seedling. Saplings.
15.	*Schefflera elliptica*(Blume) Harms	Tanganan, Kayu Tulak.	3.68	Invation. Climax. Seedling. Saplings. Pole. Mature trees.
16.	*Dipteris conjungata* (Kaulf.) Reinw.	Sejenis Paku-Pakuan	3.67	Pioner. Climax. Seedling.
17.	*Hypoestes phyllostachya* Baker	Polkadot	3.67	Pioner. Seedling.
18.	*Polianthes tuberose* L.	Bunga Sedap Malam	3.66	Ecessis. Seedling.
19.	*Spathodea campanulata* Beauv.	Pohon Hujan	3.66	Invation. Climax. Mature trees.
20.	*Tabernaemontana pandacaqui* Poir	Jelutung Badak	3.66	Pioner. Climax. Mature trees.
21.	*Michelia champaca* L.	Campaka Kuning	3.61	Pioner. Climax. Saplings. Pole. Mature trees.
22.	*Macaranga minahassae* Whitmore	Makaranga	3.60	Pioner. Stabilization. Climax. Seedling. Saplings. Pole. Mature trees.
23.	*Litsea elongata* Benth.& Hook.f.	Medang	3.59	Pioner. Saplings. Pole.
24.	*Centratherum punctatum* Cass.	Bunga Lolipop, kancing lurah	3.54	Pioner. Climax. Seedling.
25.	*Pandanus* spp.	Pandan Besar	3.50	Pioner. Climax. Pole.
26.	*Acacia decurrens* Willd.	Bunga Akasia	3.50	Invation. Pole. Mature trees.

D. Problem of invasive species

There is significant exotic species found in Mt Mahawu. The most important exotic species are *Lantana camara* L., *Fragaria* spp. and *Euphorbia cotinifolia* L. These species can lead decrease of native plant species. The native distribution of *Lantana camara* L. and *Euphorbia cotinifolia* L. have same area, that is Northern and Southern America, and native distribution wild *Fragaria* spp. is Europe, East and Southeast Asia, North America (including Mexico) [47,56]. These species growing in Mt. Mahawu at an altitude of 700 to 1,200 m above sea level. These species has the potential as an exotic species who need attention by manager of the tourism destination. The invasion of exotic species is currently the world's attention because of its ability to degrade land [28, 46-48].

The exotic species occurs because of weak control by manager of the tourism destination. Tourists who came to visit the tourism destination, often bring food such seeds, bulbs and the others, than it can spread and grow uncontrolled, and finally it make negative impact in the development of tourism destination. The uncontrolled spread of the exotic species can bring unstability of ecosystems. The existence of exotic species in the area of tourism destination will make serious problems if this species spread widely and uncontrolled [49-52]. Some of tourism destination in Indonesia receive special attention because of the occurrence of exotic species. In Baluran National Park, *Acacia nilotica* that dominate the grassland vegetation, Alas Purwo National Park in Banyuwangi with *Cassia tora* and *Euphatorium inulifolium* species have impact of Banteng population; Bali Barat National Park with grass *Desmostachys bipinnata* become the significant exotic species [53-55].

Conclusions

Plants species in Mt. Mahawu can be managed as a potential flagship species. The potential flagship species was *Nepenthes maxima* Reinw, ex Nees, *Blechnum capense* (L.) Schltdl., *Pinus merkusii* Jungh.& de Vriese, *Phaius* sp., Tabernaemontana pandacaqui Poir, *Macaranga minahassae* Whitmore, *Swietenia macrophylla* King, *Bulbophyllum lobii* Lindl, *Euphorbia cotinifolia* L. and *Shefflera elliptica* (Blume) Harms.

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