CHARACTERISTICS AND DISTRIBUTION OF GREAT ARGUS (*Argusianus argus*) DISPLAY COURTS IN THE SORAYA RESEARCH STATION, ACEH, INDONESIA

Feri Sandria S[*], Aida Fithri[*], Saida Rasnovi[*]

**Department of Biology, Faculty of Mathematics and Natural Sciences, Syiah Kuala University, Banda Aceh, Indonesia, ferisandrias@leuser.or.id, saida_rasnovi@usk.ac.id, aida_fithri@usk.ac.id*

Email Correspondence: aida_fithri@usk.ac.id

Received : April 29, 2026 Accepted : June 23, 2026 Published : June 30, 2026

Abstract: The Great Argus (*Argusianus argus*) is a ground-dwelling pheasant species whose reproductive behavior is characterized by the establishment and maintenance of display courts used during courtship. Information on the distribution and habitat characteristics of these display courts remains limited, particularly in Sumatra. This study aimed to assess the distribution and characterize the habitat conditions associated with Great Argus display courts at the Soraya Research Station (SRS), Aceh, Indonesia. Field surveys were conducted from April to July 2024 to locate display courts and evaluate their surrounding habitat characteristics. Vegetation data were collected using 40 sampling plots (20 × 20 m) established around the identified display courts. A total of 10 display courts were recorded within an approximately 500-ha study area. Display courts were located at elevations ranging from 120 to 207 m above sea level and on slopes of 2–19°, indicating a preference for relatively flat to gently sloping terrain. The mean display court perimeter and area were 26.8 m and 58.07 m², respectively. Environmental conditions surrounding the display courts were characterized by a mean air temperature of 27.0°C, soil temperature of 27.3°C, light intensity of 378.4 cd, relative humidity of 76.5%, and soil pH of 6.6. Vegetation analysis revealed a high level of tree species diversity, with a Shannon–Wiener diversity index (H′) of 4.43. The highest Importance Value Index (IVI) values were recorded for *Streblus elongatus* and *Artocarpus* sp., indicating their dominance within the vegetation community surrounding several display courts. The occurrence of display courts in areas with high tree diversity and specific topographic conditions suggests that habitat structure may influence display court establishment by Great Argus. These findings provide important ecological information for understanding habitat requirements of the species and may contribute to the development of conservation and habitat management strategies for Great Argus populations in Aceh and other parts of Sumatra.

Keywords: *Argusianus argus*; display court; habitat characteristics; vegetation diversity; habitat selection; conservation.

Abstrak: Kuau raja (*Argusianus argus*) merupakan salah satu spesies burung dari famili Phasianidae yang memiliki perilaku unik berupa pembuatan arena kawin (*display court*) sebagai tempat untuk menarik pasangan selama musim reproduksi. Penelitian ini bertujuan untuk mengkaji sebaran dan karakteristik arena kawin kuau raja di Stasiun Penelitian Soraya (SPS), Aceh. Penelitian dilaksanakan pada April hingga Juli 2024. Metode yang digunakan meliputi metode jelajah untuk mengidentifikasi dan memetakan sebaran arena kawin serta metode *purposive sampling* untuk menganalisis vegetasi di sekitar arena kawin. Sebanyak 40 plot pengamatan berukuran 20 × 20 m ditempatkan di sekitar arena kawin yang ditemukan. Hasil penelitian menunjukkan bahwa terdapat 10 arena kawin yang

tersebar pada area seluas sekitar 500 ha dengan kisaran ketinggian 120–207 m di atas permukaan laut dan kemiringan lereng 2–19°. Kuau raja cenderung membangun arena kawin pada lokasi dengan topografi datar hingga landai. Rata-rata keliling arena kawin mencapai 26,8 m dengan luas rata-rata 58,07 m². Kondisi lingkungan di sekitar arena kawin ditandai oleh suhu udara rata-rata 27,0°C, suhu tanah 27,3°C, intensitas cahaya 378,4 cd, kelembapan relatif 76,5%, dan pH tanah 6,6. Analisis vegetasi menunjukkan bahwa keanekaragaman jenis pohon di sekitar arena kawin tergolong tinggi, dengan nilai indeks keanekaragaman Shannon–Wiener (H') sebesar 4,43. Jenis pohon yang memiliki Indeks Nilai Penting (INP) tertinggi pada beberapa arena kawin adalah Damli (*Streblus elongatus*) dan Cempedak Air (*Artocarpus* sp.). Hasil penelitian menunjukkan bahwa keberadaan arena kawin kuau raja berkaitan erat dengan kondisi habitat, terutama struktur vegetasi dan karakteristik topografi. Temuan ini dapat menjadi dasar ilmiah dalam upaya konservasi dan pengelolaan habitat kuau raja, khususnya di Stasiun Penelitian Soraya, Aceh.

Kata kunci: kuau raja, *Argusianus argus*, arena kawin, karakteristik habitat, sebaran, konservasi.

Recommended APA Citation:

S, F. S., Fithri, A., & Rasnovi, S. (2026). Characteristics and Distribution of Great Argus (*Argusianus argus*) Display Courts in the Soraya Research Station, Aceh, Indonesia. *Elkawnie*, *12*(1), 220-239. https://doi.org/10.22373/ekw.v12i1.28419

Introduction

The Great Argus (*Argusianus argus*) is a large ground-dwelling pheasant species. Males typically measure 85–95 cm in body length, while their elongated tail feathers can reach up to 2 m, making them among the longest-tailed phasianids globally. Females are smaller, averaging approximately 70 cm in length. The most distinctive feature of the male is this elongated tail, which is adorned with numerous eye-like ocelli that play a critical role in courtship rituals (Firkins & Kelley, 2022). The species exhibits pronounced sexual dimorphism; males possess a conspicuous chromatic display characterized by iridescent green, blue, and brown plumage that serves as a vital intersexual signal during courtship displays. Conversely, females exhibit a cryptic, subdued brown plumage, a phenotypic trait that optimizes camouflage against the forest floor substrate during the nesting period (Eliason et al, 2023; MacKinnon & Phillipps, 2017).

Geographically, the Great Argus is restricted to the Sundaic region of Southeast Asia, occurring primarily in the lowland and montane forests of southern Myanmar, southern Thailand, Peninsular Malaysia, Sumatra, and Borneo (BirdLife, 2020). The species thrives in dense forest interiors, where its cryptic plumage provides effective concealment, and food resources such as fruits, seeds, and invertebrates are readily available (BirdLife, 2020). Ecologically, *Argusianus argus* is strongly associated with intact lowland tropical rainforest ecosystems and exhibits a marked preference for primary or minimally disturbed forests. Studies conducted in Indonesia indicate that the species has very high habitat specificity and fidelity toward mixed dipterocarp forests, making it an important biological indicator of forest integrity and ecosystem health. Its occurrence is closely linked

with landscapes that maintain complex vegetation structure, continuous canopy cover, and minimal anthropogenic disturbance, while fragmented or degraded forests support substantially lower populations (Simamora et al., 2021; Nordin et al., 2025: Rahmilija et al, 2026). Recent genetic studies have further clarified its taxonomy, demonstrating that the Bornean subspecies (*A. a. grayi*) is genetically distinct from the Sumatran subspecies (*A. a. argus*), exhibiting a genetic divergence ranging from 3.26% to 3.80% based on cytochrome b gene sequences (Ericca et al., 2022).

Globally, the distribution of the Phasianidae, including the Great Argus, has become increasingly fragmented, with populations largely confined to protected areas due to catastrophic habitat loss, forest degradation, land-use conversion, and infrastructure development (Savini, et al.,2021; Shwe et al., 2021; Ong-In & Savini, 2023). Consequently, the Great Argus is currently classified as Vulnerable (VU) on the IUCN Red List of Threatened Species, a status driven primarily by rapid deforestation and intense hunting pressure from the illegal wildlife trade (BirdLife, 2020; Junaid, 2026). In Indonesia, the species is legally protected under the Regulation of the Ministry of Environment and Forestry No.P.106/MENLHK/SETJEN/KUM.1/12/2018, and international commercial trade is strictly regulated via its listing in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (CITES, 2026).

Recent behavioural studies have demonstrated that the ocelli displayed by male Great Argus are not merely decorative patterns but function as sophisticated visual signals capable of creating a three-dimensional optical illusion during courtship displays. The gradual shading pattern and reflective highlights on the feathers enable female birds to perceive the ocelli as convex structures, thereby increasing the visual salience of the display. This unique adaptation is believed to enhance female attention and may contribute to sexual selection, highlighting the remarkable evolutionary specialization of the species' courtship behaviour (Firkins & Kelley, 2022). Site selection and display success are tightly coupled with reproductive fitness, ongoing habitat degradation poses an imminent threat to their mating dynamics, emphasizing the critical importance of evidence-based habitat protection. During the breeding season, males establish exclusive display territories on relatively flat areas of the forest floor, where vegetation and leaf litter are carefully cleared to create display courts. Within these sites, males perform elaborate visual displays accompanied by loud vocalizations to attract females. Gentle slopes and open forest-floor conditions facilitate these courtship performances, explaining the species' preference for particular microhabitats within primary forests. Consequently, alterations in forest structure may directly interfere with courtship behaviour, territorial establishment, and ultimately reproductive success (Dawrueng et al., 2017).

The Soraya Research Station (SRS), situated within the Leuser Ecosystem, represents one of the most critical biodiversity strongholds in Sumatra and provides an ideal, contiguous habitat for the Great Argus. Despite its ecological significance, empirical studies examining the spatial distribution and specific microhabitat characteristics of Great Argus display courts within SRS remain virtually non-existent. Because of its high sensitivity to environmental change, narrow habitat requirements, and close association with intact tropical forests, the Great Argus is widely regarded as an important umbrella and indicator species for rainforest conservation. Monitoring its population dynamics and habitat occupancy can provide valuable information regarding ecosystem quality, landscape connectivity, and the effectiveness of forest conservation strategies. Consequently, protecting primary forests and minimizing anthropogenic disturbance are essential measures for maintaining viable populations of *Argusianus argus* and preserving the ecological integrity of tropical rainforest ecosystems across Southeast Asia (Dawrueng et al., 2017; Simamora et al., 2021). Understanding the spatial distribution and vegetation architecture of these display courts will provide crucial insights into the precise habitat features preferred by males. Ultimately, this baseline data will establish a vital scientific foundation for developing targeted conservation and management strategies for the Great Argus within both the Soraya Research Station and the broader Leuser Ecosystem landscape.

Material and Methods

Study Area

The study was conducted between April and July 2024 at the Soraya Research Station (SRS), Aceh, Indonesia (Figure 1). The research station is located within the Leuser Ecosystem, one of the largest remaining tropical forest landscapes in Southeast Asia and an important habitat for the Great Argus (*Argusianus argus*).

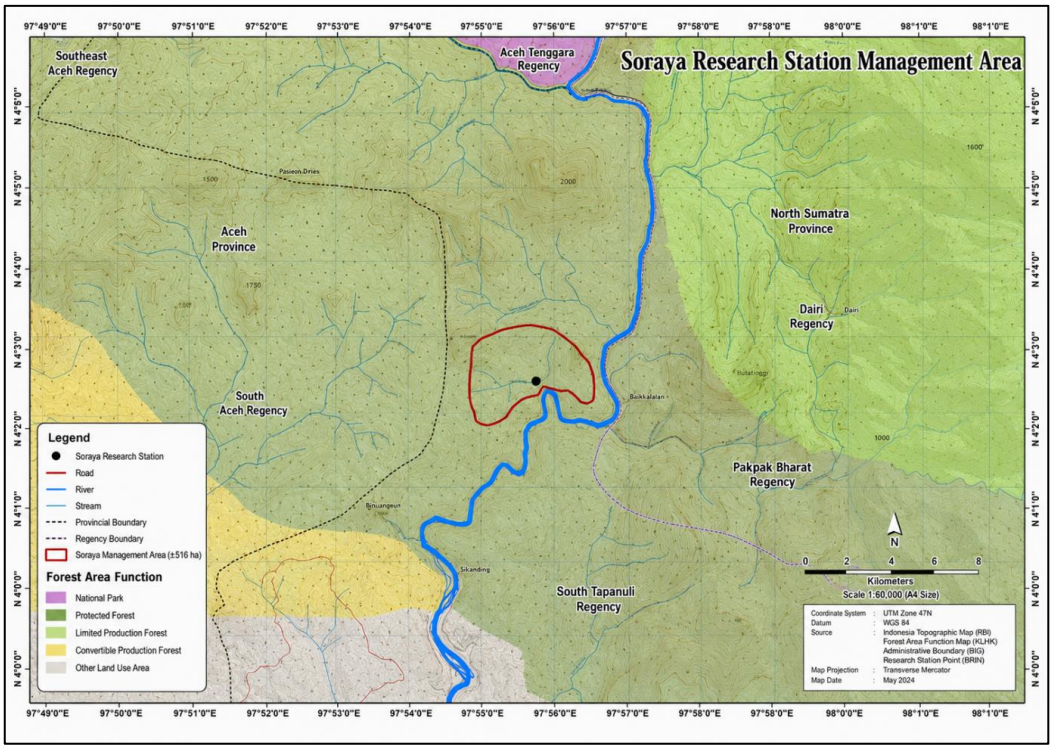


Figure 1. Location of the study area at the Soraya Research Station (SRS), Aceh, Indonesia.

Survey Procedures and Measured Parameters

The occurrence of Great Argus (*Argusianus argus*) display courts was surveyed using an exploratory method along established trails within the Soraya Research Station (SRS). The geographic coordinates of each display court encountered were recorded, and several environmental variables were measured, including light intensity, air temperature, relative humidity, elevation, slope, court diameter, and surrounding vegetation characteristics. To assess habitat conditions associated with display courts, vegetation sampling was conducted using 40 plots measuring 20 × 20 m, which were established around the identified display courts, with each display court serving as the central reference point for plot placement (Figure 2). Within each plot, data were collected on tree species composition, tree height, and diameter at breast height (DBH) to characterize the forest structure and vegetation composition surrounding the display courts.

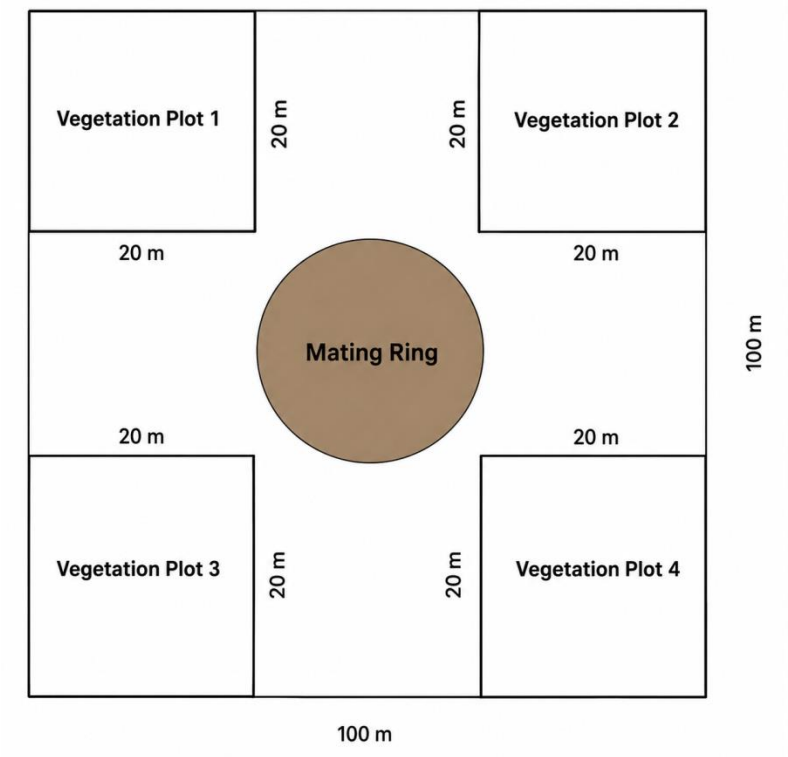


Figure 2. Schematic representation of vegetation plot placement around Great Argus (*Argusianus argus*) display courts at the Soraya Research Station, Aceh, Indonesia.

Data analysis

To evaluate the habitat characteristics and environmental preferences of the Great Argus (*Argusianus argus*) display courts at the Soraya Research Station (SRS), data will be analyzed using spatial, descriptive, and structural vegetation approaches.

Distribution and Characteristics of Display Courts

The environmental characteristics associated with *Argusianus argus* display courts were analyzed using descriptive and spatial approaches. Descriptive statistics were applied to summarize the environmental variables measured at each display court, including light intensity, air temperature, relative humidity, elevation, slope, and court diameter. For each variable, measures of central tendency and dispersion, including mean, standard deviation, minimum, and maximum values, were calculated to characterize habitat conditions surrounding the display courts. Spatial analysis was conducted by mapping the geographic coordinates of all identified display courts using Geographic Information System (GIS) software to examine their spatial distribution and their relationship with topographic features within the study area.

Vegetation Analysis

Vegetation data collected from the 40 sampling plots established around the display courts were analyzed to assess forest structure and composition. Species composition, tree density, tree height, and diameter at breast height (DBH) were quantified to characterize the surrounding habitat. Species density, frequency, dominance, and Importance Value Index (IVI) were calculated to determine the ecological importance of each species. Vegetation diversity was assessed using the Shannon–Wiener diversity index (H′). The results were used to describe the habitat characteristics associated with the occurrence of *A. argus* display courts at the Soraya Research Station.

Shannon–Wiener Diversity Index (H′)

Plant species diversity was assessed using the Shannon–Wiener Diversity Index (H′), which considers both species richness and species evenness within the community (Brower & Zar, 1989). The index was calculated as follows:

$$H' = \sum_{i-1}^{S} p_i \, Ln(p_i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

H′ : Shannon–Wiener diversity index

S : Total number of species

P_i : Proportion of individuals of species *i* relative to the total number of individuals sampled

This index was used to assess plant species diversity and to characterize the ecological complexity of the vegetation associated with Great Argus (*Argusianus argus*) display courts

The Importance Value Index (IVI)

The Importance Value Index (IVI) was calculated for each plant species occurring in the vegetation surrounding the display courts to assess its relative ecological importance within the plant community. The IVI integrates three vegetation parameters: relative density, relative frequency, and relative dominance, thereby providing a comprehensive measure of species dominance and contribution to community structure (Cottam & Curtis, 1956). The IVI was calculated using the following formula:

$$IV\ I = RF + RD + RDo \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where:

Relative Frequency (RF) = the frequency of a species relative to the total frequency of all species recorded;

Relative Density (RD) = the density of a species relative to the total density of all species recorded;
Relative Dominance (RDo) = the dominance of a species, measured based on basal area, relative to the total dominance of all species recorded.

The Importance Value Index (IVI) was used to identify dominant plant species within the vegetation community surrounding the display courts and to evaluate their ecological significance. This index provides insights into vegetation structure and species composition, which may influence habitat suitability and display court site selection by the Great Argus (*Argusianus argus*).

Results and Discussion

Distribution of Display Courts

Male Great Argus (*Argusianus argus*) exhibit a distinctive reproductive strategy characterized by the establishment and maintenance of display courts, which serve as specialized sites for courtship activities. The use of display courts is a defining characteristic of the species and distinguishes it from many other ground-dwelling forest birds. Within these arenas, males produce advertisement calls that function to attract females and signal ownership of the display site. These vocalizations play an important role in reproductive communication and contribute to maintaining territorial exclusivity around the display court (Clink et al., 2021).

Display courts are cleared patches on the forest floor, typically ranging from 2–10 m in diameter, where males perform elaborate courtship displays. In the lowland forests of Sumatra, these courts are commonly located in relatively open and flat areas with sparse understory vegetation, conditions that likely enhance display visibility and facilitate female mate assessment (Rafi et al., 2017). Consequently, display courts function as both physical and behavioral arenas in which males exhibit ornamental traits and courtship behaviors that may signal individual quality and reproductive fitness to prospective mates (Winarno & Harianto, 2018). An example of a courtship display performed by a male Great Argus at the Soraya Research Station is presented in Figure 3.

Surveys conducted across approximately 500 ha within the Soraya Research Station (SRS) identified 10 Great Argus display courts. These courts were distributed at elevations ranging from 120 to 207 m above sea level and were consistently associated with low to moderate slopes (3°–19°) (Figure 4). The spatial distribution of display courts exhibited a clustered pattern, suggesting that males preferentially establish display sites in habitat patches that meet specific environmental requirements. Such clustering may be influenced by topographic conditions, vegetation structure, and canopy characteristics that enhance courtship performance and site suitability.

The clustered distribution of display courts is consistent with the exploded lek mating system described for Great Argus populations elsewhere, in which males are spatially aggregated while maintaining individual display territories and

communicating through vocal interactions (Foley, 2023). This pattern indicates that suitable display court habitat is not evenly distributed throughout the Soraya Research Station. Therefore, both habitat characteristics and social behavior are likely important factors shaping the spatial distribution of display courts across the landscape.



Figure 3. Courtship display performed by a male Great Argus (*Argusianus argus*) at a display court in the Soraya Research Station (SRS), Aceh, Indonesia.

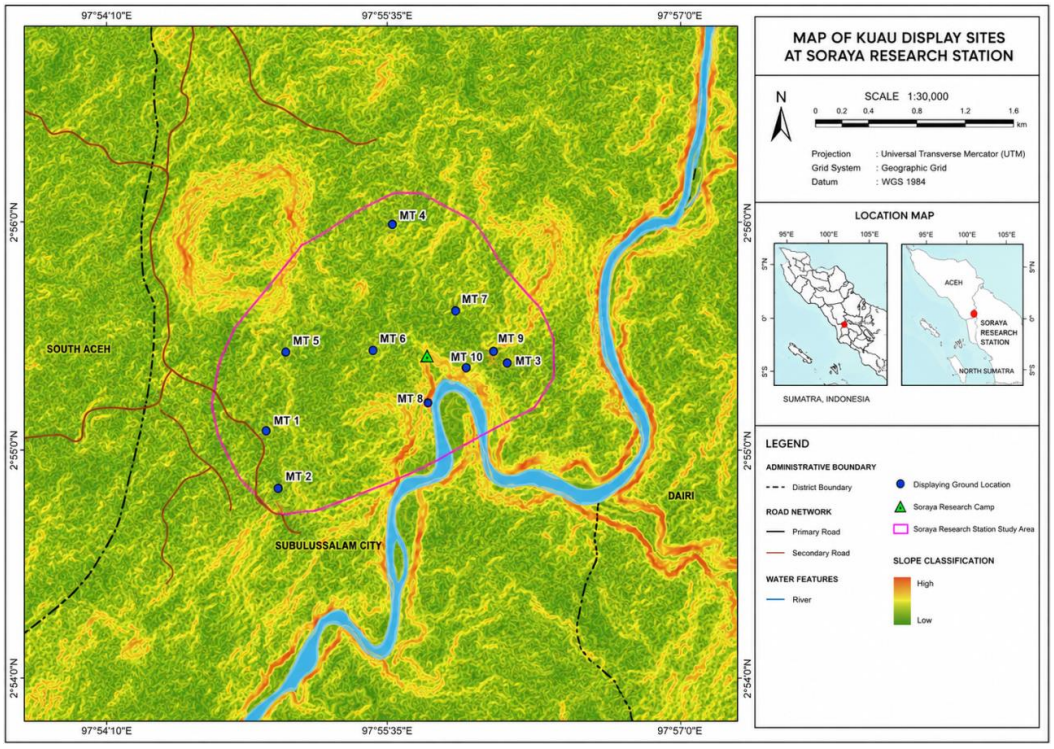


Figure 4. Map showing the spatial distribution of Great Argus (*Argusianus argus*) display courts within the Soraya Research Station (SRS), Aceh, Indonesia

Characteristics of Display Courts

Of the ten display courts identified during the survey, eight were classified as active and two as inactive. Clear differences were observed between these two categories. Active display courts were characterized by a clean forest floor with little or no understory vegetation, indicating recent or ongoing use by male Great Argus. In contrast, inactive display courts were covered by accumulated leaf litter and regenerating understory vegetation, suggesting that they had been abandoned for an extended period (Figure 5).

Analysis of display court characteristics showed a mean perimeter of 23.92 m and an average area of 50 m². Display courts were located at elevations ranging from 120 to 207 m above sea level, with a mean elevation of 159.8 m. Slope values ranged from 3° to 19°, indicating that display courts were generally established on relatively flat to gently sloping terrain. Environmental measurements recorded at display court sites included a mean air temperature of 27.33°C, an average light intensity of 378.4 cd, relative humidity of 76.5%, and soil pH values ranging from 5 to 7 (Table 1).

These findings indicate that Great Argus preferentially establish display courts under specific microhabitat conditions characterized by moderate light availability, high humidity, and gentle topography. Such environmental conditions may facilitate court maintenance and improve the visibility and effectiveness of courtship displays. Furthermore, the marked differences between active and

inactive display courts suggest that regular maintenance by males is essential for preserving the structural conditions required for successful courtship activities.

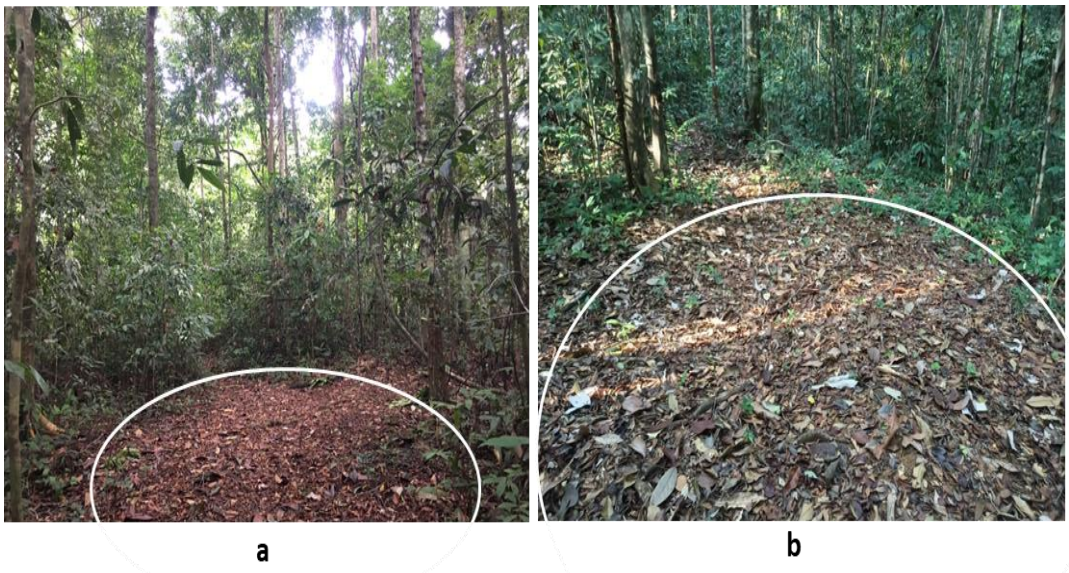


Figure 5. Active (a) and inactive (b) Great Argus (*Argusianus argus*) display courts at the Soraya Research Station (SRS), Aceh, Indonesia.

Table 1. Ecological Characteristics of Great Argus (*Argusianus argus*) Display Courts at the Soraya Research Station (SRS), Aceh, Indonesia.

Court Display ID	Circumference (m)	Radius (m)	Area (m^2)	Elevation (masl)	Slope (°)	Air Temperature (°C)	Soil Temperature (°C)	Light Intensity (lux)	Humidity (%)	Court Display Status
DC 1	32	5,1	81,5	187	6	28	26	797	67	Active
DC 2	32	5,1	81,5	207	7	27	26	456	83	Active
DC 3	25	3,9	49,7	164	7	26,5	27	234	94	Active
DC 4	26	4,1	53,8	179	4	28	28	239	76	Active
DC 5	28	4,4	62,4	160	19	31	29	385	74	Active
DC 6	28	4,4	62,4	133	2	28,6	28	337	74	Active
DC 7	28	4,4	62,4	138	10	27	27,9	407	79	Active
DC 8	24	3,8	45,8	120	3	27	26,9	322	81	Active
DC 9	24	3,8	45,8	140	6	27	27,6	466	68	Inactive
DC 10	21	3,3	35,1	170	12	27	26,9	141	69	Inactive
Mean	**26,8**	**4,2**	**54,7**	**159,8**	**7,6**	**27,7**	**27,4**	**378,4**	**76,5**	—

DC: display court code

The Great Argus (*Argusianus argus*) is commonly associated with ridge habitats, where display courts are often concentrated (Nijman, 1998). In the present study, display courts were recorded at elevations ranging from 120 to 207 m above sea level. This range is considerably higher than that reported by Rahmilija (2022) in Bukit Barisan Selatan National Park, where Great Argus occurrence was primarily recorded between 21 and 78 m above sea level. These differences suggest that display court distribution may vary among sites according to local habitat conditions rather than elevation alone.

The higher-elevation distribution of display courts at the Soraya Research Station may be related to vegetation structure. Lower-elevation areas within the station are characterized by dense understory vegetation and thick ground cover, conditions that may reduce habitat suitability for display activities. Male Great Argus require relatively open forest-floor conditions to effectively perform visual courtship displays; consequently, habitats characterized by low understory vegetation density are more likely to be selected for the establishment and long-term maintenance of display courts.

In addition to vegetation structure, terrain slope appears to be an important factor influencing display court placement. Display courts were located on sites with slopes ranging from 3° to 19°, with a mean slope of 7.6°. This finding is consistent with Rahmilija (2022) who reported a greater probability of Great Argus occurrence in areas with slopes below 15°. As a predominantly terrestrial species, *A. argus* may benefit from relatively gentle slopes that facilitate movement, display court maintenance, and courtship performance. Collectively, these results suggest that the distribution of display courts at the Soraya Research Station is influenced by a combination of vegetation structure and topographic characteristics, particularly the availability of open understory habitats on gently sloping terrain.

Vegetation Analysis

Species Diversity and Vegetation Structure

Vegetation structure is widely recognized as a fundamental ecological indicator of habitat quality and an important determinant of habitat suitability for a wide range of wildlife species, including birds. Because vegetation structure is closely linked to landscape characteristics, anthropogenic landscape modification can substantially alter habitat structure, vegetation composition, and resource availability. These changes may reduce habitat suitability for birds and ultimately influence patterns of bird diversity (Withaningsih et al, 2025; Aisyah et al, 2026). Understanding vegetation structure is therefore essential for evaluating habitat characteristics associated with species that exhibit specialized habitat requirements, such as the Great Argus. Vegetation surveys conducted around Great Argus display courts at the Soraya Research Station (SRS) recorded a total of 355 individual trees representing 123 species from 38 plant families. These data were obtained from 40 vegetation plots established around the 10 identified display courts.

Tree height distribution revealed a structurally diverse forest community. The majority of trees belonged to the 16–20 m height class, comprising 89 individuals (25.1%), followed by the 20–25 m class with 79 individuals (22.3%) and the 11–15 m class with 56 individuals (15.8%). The tallest trees recorded in the study area reached heights of 56–60 m, whereas the shortest trees ranged from 6 to 10 m and were represented by 14 individuals (Figure 6). The wide range of tree heights reflects the heterogeneous forest structure surrounding the display courts and may

contribute to variation in microhabitat conditions associated with display court establishment.

Tree diameter measurements indicated that all sampled trees had a diameter at breast height (DBH) greater than 20 cm. The most abundant diameter class was 75–100 cm, accounting for 27.3% of all recorded trees, followed by the 51–74 cm class, which represented 25.6% of individuals. The largest tree recorded had a DBH of 325–350 cm, represented by a single individual, whereas the smallest trees belonged to the 25–50 cm diameter class (Figure 7). The presence of numerous medium- and large-diameter trees suggests that the display courts were located within relatively mature forest stands characterized by well-developed vegetation structure.

Analysis of plant family composition showed that Dipterocarpaceae was the most dominant family, accounting for approximately 12% of all recorded species (Figure 8). This finding is consistent with previous studies indicating that Great Argus is closely associated with lowland dipterocarp forests, where members of the Dipterocarpaceae constitute a major component of the forest canopy (Davison, 1981). Several other plant families recorded within the study area, including Annonaceae, Euphorbiaceae, Ebenaceae, Fabaceae, Sapotaceae, and Moraceae, have been identified as important food sources for Great Argus (Rahmilija, 2022; Rahmilija et al, 2026). The occurrence of these plant families may contribute to habitat suitability by providing food resources and maintaining the structural complexity required by the species.

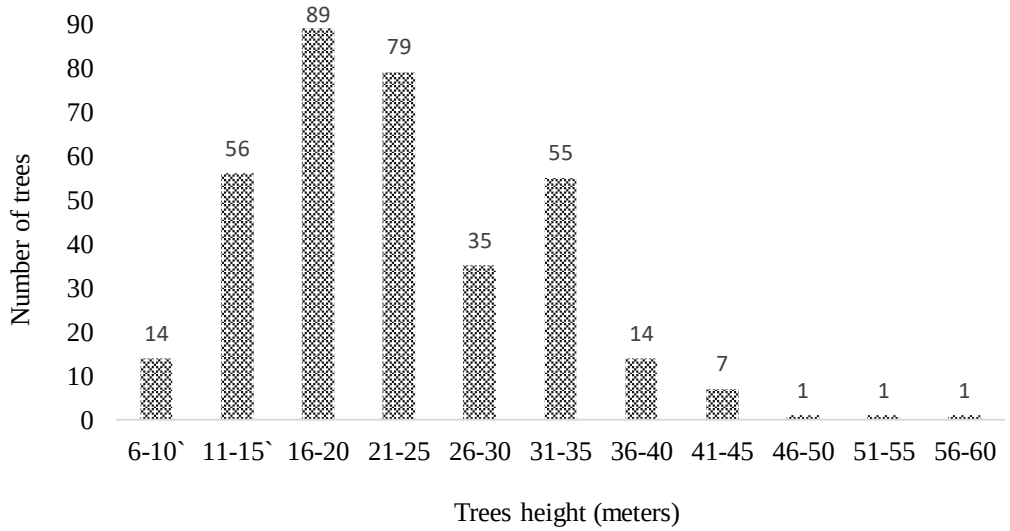


Figure 6. Distribution of tree height classes surrounding Great Argus (*Argusianus argus*) display courts at the Soraya Research Station, Aceh, Indonesia.

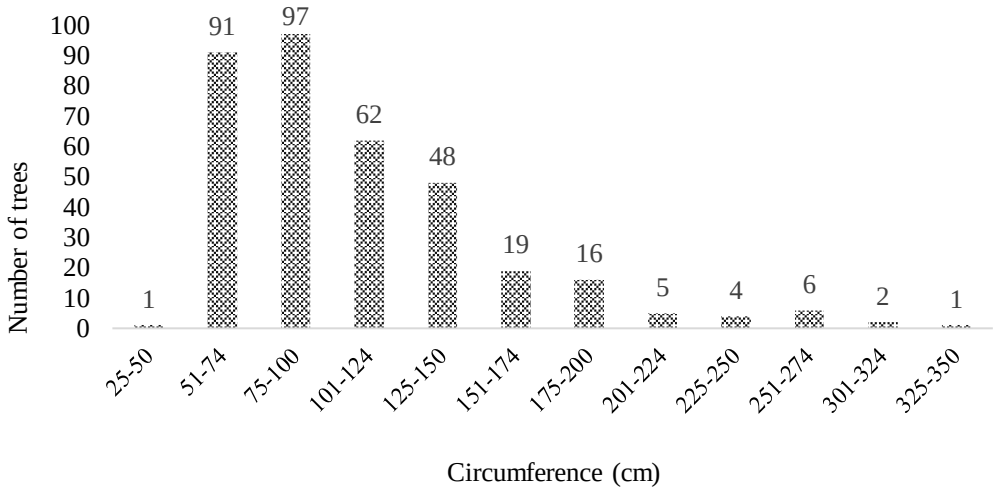


Figure 7. Distribution of tree diameter classes in the habitat surrounding Great Argus (*Argusianus argus*) display courts at the Soraya Research Station (SRS), Aceh, Indonesia

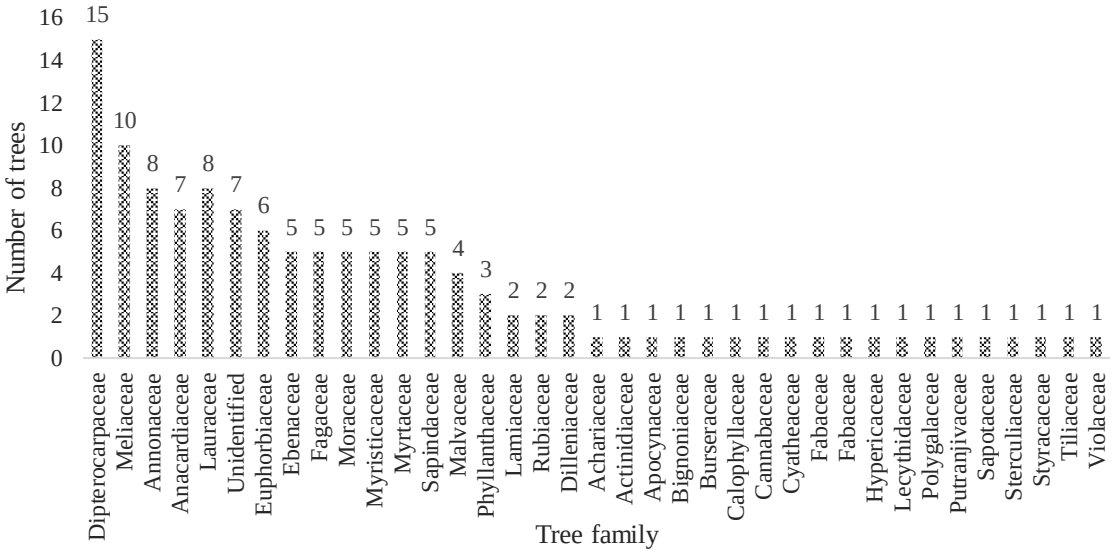


Figure 8. Composition of tree families in the habitat surrounding Great Argus (*Argusianus argus*) display courts at the Soraya Research Station (SRS), Aceh, Indonesia.

The predominance of large trees surrounding the display courts at the Soraya Research Station (SRS) is consistent with the characteristics of the Great Argus *(Argusianus argus)* as a habitat specialist that is sensitive to disturbance and tends to be confined to primary forests (Ramadhanti et al., 2025). Such primary forest conditions also tend to produce a more open forest floor, as similarly demonstrated in a close relative within the family Phasianidae, the Capercaillie (*Tetrao urogallus*), which preferentially selects lek sites with thinner understorey layers over those with denser undergrowth, as such conditions facilitate male movement during courtship displays (Drozdowski et al., 2021). A similar pattern is presumed to apply to the Great Argus, which requires unobstructed spaces for the maintenance of display courts and mating activities. The establishment of display courts within

habitats characterized by large trees and an open understorey at SRS likely reflects the species' preference for open and accessible forest-floor environments that enhance the effectiveness of visual courtship displays.

Tree species diversity surrounding Great Argus display courts at the Soraya Research Station was assessed using the Shannon–Wiener Diversity Index (H′). The analysis revealed varying levels of species diversity among display court sites. Six display courts exhibited moderate species diversity, with Shannon–Wiener index values ranging from 2.54 to 2.99. In contrast, the remaining four display courts were characterized by high species diversity, with H′ values ranging from 3.24 to 3.61.

Overall, the vegetation surrounding Great Argus (*Argusianus argus*) display courts at the Soraya Research Station exhibited an exceptional level of species diversity and structural complexity. This high biodiversity is quantitatively demonstrated by an average Shannon–Wiener diversity index of 4.43 (H' > 3), which strongly indicates that the surrounding forest habitat remains highly intact and capable of supporting a rich plant community. In forest ecology, such elevated tree species diversity is indicative of a structurally complex ecosystem that offers a vast array of ecological niches and critical resources—including heterogeneous food availability, adequate shelter, and favorable microclimatic conditions. These optimal habitat characteristics are considered paramount for the survival and reproductive success of Great Argus populations, as they directly facilitate the selection and long-term maintenance of male display sites (Ramadhanti et al., 2025). Furthermore, the presence of specific plant taxa known to be ecologically important for the species suggests that the forest envelope around these courts retains pristine ecological conditions. Ultimately, these findings underscore that the Soraya Research Station serves as a crucial habitat refuge, playing a vital role in sustaining Great Argus populations within the broader Leuser Ecosystem

Table 2. Shannon–Wiener Diversity Index (H′) of Tree Species Surrounding Great Argus (*Argusianus argus*) Display Courts at the Soraya Research Station (SRS), Aceh, Indonesia.

Display Court ID	Number of Trees	Shannon–Wiener Diversity Index (H′)	Diversity Category
DC 1	66	3,61	High
DC 2	39	2,54	Moderate
DC 3	21	2,91	Moderate
DC 4	36	3,24	High
DC 5	29	3,11	High
DC 6	31	2,79	Moderate
DC 7	49	3,39	High
DC 8	29	2,71	Moderate
DC 9	22	2,75	Moderate
DC 10	33	2,99	Moderate
Overall	**355**	**4,43**	**High**

DC: display court code

Importance Value Index (IVI)

The Importance Value Index (IVI) is a widely used ecological metric for assessing the relative importance and dominance of plant species within a community. Species with higher IVI values generally play a greater role in determining community structure and ecosystem functioning. Analysis of vegetation surrounding Great Argus *(Argusianus argus*) display courts at the Soraya Research Station, Aceh, revealed that the species with the highest IVI values were *Streblus elongatus* (8.28), *Shorea multiflora* (8.11), and *Elateriospermum tapos* (8.03) (Table 3).

The dominance of these tree species provides important ecological insights into habitat characteristics associated with display court selection by Great Argus. From a structural perspective, *Streblus elongatus* and *Shorea multiflora* are large canopy trees that commonly reach heights of 20–40 m and possess substantial trunk diameters. Their presence contributes to the formation of a relatively closed upper canopy while maintaining a more open forest floor. Such conditions are likely to facilitate courtship displays by providing sufficient light penetration for visibility while limiting the growth of dense understory vegetation. The mean light intensity recorded around display courts (378.4 cd) suggests that these sites provide adequate illumination for visual courtship displays without promoting excessive understory development. By suppressing shrub growth through canopy shading, dominant tree species may contribute to the maintenance of the open forest-floor conditions required for display court establishment and courtship activities, consistent with the species' characterization as a habitat specialist confined to primary forest conditions (Ramadhanti et al., 2025). In addition to their structural role, several dominant tree species may contribute to habitat suitability through the provision of food resources. *Elateriospermum tapos* and *Artocarpu*s sp. produce fruits that are rich in carbohydrates and constitute potential food sources for Great Argus, alongside insects and other forest-floor invertebrates (McGowan & Kirwan, 2020).

The availability of food resources in close proximity to display courts may reduce foraging distances and associated energy expenditure, thereby allowing males to allocate more time and energy to court maintenance and reproductive displays. This observation is consistent with the hypothesis that display court quality, as a signal of male fitness, is influenced by the quality of the surrounding habitat (Rafi et al., 2017). Several of the dominant tree species identified in this study are also known to be ecologically important for other wildlife species within the Leuser Ecosystem. For example, *Elateriospermum tapos* and *Artocarpus spp.* are utilized by the Sumatran orangutan *(Pongo abelii)* as food resources and nesting substrates (Mahyana, 2019; Mahyana et al., 2023). The occurrence of these species may therefore indicate habitats with high ecological value and biodiversity significance.

Overall, the habitat characteristics observed at the Soraya Research Station indicate that the area provides highly suitable environmental conditions for the

Great Argus. This conclusion is strongly supported by the elevated plant species diversity recorded around the display courts, which serves as a reliable indicator of relatively intact and undisturbed forest conditions. Recent evidence from Sumatra indicates that the Great Argus exhibits strong habitat specialization, occurring predominantly in primary forests and showing high sensitivity to anthropogenic disturbance and habitat degradation (Ayat & Tata, 2015; Ramadhanti et al., 2025). Similar habitat preferences have been documented in Borneo, where the Great Argus has been identified as a strong indicator species of intact mixed dipterocarp and health forest in West Kalimantan (Simamora et al., 2021). Together, these cross-regional findings reinforce the conclusion that the Great Argus selectively prioritizes primay forest ecosystems for court establishment and reproductive activities.

Table 3. Top 20 Tree Species Ranked by Importance Value Index (IVI) Around Great Argus (*Argusianus argus*) Display Courts at the Soraya Research Station (SRS), Aceh, Indonesia.

Local name	Scientific name	RF	RD	RDo	IVI
Damli	*Streblus elongatus*	3.25	2.11	2.93	8.29
Pepening	*Shorea multiflora*	4.72	1.69	1.71	8.12
Kayu karet	*Elateriospermum tapos*	2.95	2.53	2.55	8.03
Siron Medang	*Endospermum diadenum*	2.95	2.53	1.60	7.08
Tampu licin	*Macaranga diepenhorstii*	2.66	2.11	1.92	6.68
Surin katak	*Parishia* sp.	1.48	2.11	2.92	6.51
Mayang susu	*Rostratum palaquium*	2.36	2.53	1.38	6.28
Medang saho	*Erycibe* sp.	2.66	1.69	1.86	6.20
Tuhi	*Fernandoa macroloba*	1.48	1.69	3.01	6.17
Semaram	*Shorea platyclados*	2.36	2.11	1.35	5.82
Jambu gunung	*Syzygium grande*	1.77	1.69	1.99	5.45
Kuli batu gunung	*Maasia sumatrana*	1.18	1.69	2.25	5.11
Dering merak besar	*Dysoxylum* sp.	1.18	1.27	2.59	5.03
Selupik	*Baccata Balakata*	2.36	1.69	0.80	4.85
Cempedak air	*Artocarpus* sp.	1.48	1.69	1.61	4.77
Seekor burung merak kecil	*Dysoxylum* sp.	1.48	1.27	1.63	4.37
Puin gunung	*Sandoricum koetjape*	1.77	0.84	1.57	4.18
Meranti Biasa	*Shorea* sp.	0.30	0.42	3.35	4.07
Rutih	*Sarjana alstonia*	0.59	0.84	2.47	3.90
Meranti Gembong	*Shorea* sp.	1.77	1.27	0.89	3.92

** RF = Relative Frequency; RD = Relative Density; RDo = Relative Dominance.*

Conclusion

This study provides critical insights into the spatial distribution and habitat characteristics of the Great Argus (*Argusianus argus*) within the Soraya Research Station (SRS) in the Leuser Ecosystem, Aceh. A total of 10 active display courts were identified, preferentially established within lowland forest habitats

characterized by relatively flat to gently sloping terrains (elevations: 120–207 m asl; slopes: 3°–19°). The microclimatic conditions recorded at these sites—including optimal ambient temperature, humidity, and filtered light intensity—appear tailored to support the species highly demanding courtship activities. Structurally, the vegetation enveloping the display courts exhibited exceptional species diversity and complexity, comprising 355 individual trees across 123 species and 38 plant families.

The remarkably high Shannon–Wiener diversity index (H' = 4.43) reflects a highly intact and ecologically mature forest matrix. Dominant tree taxa, specifically *Streblus elongatus*, *Shorea multiflora*, and *Elateriospermum tapos*, yielded the highest Importance Value Index (IVI), suggesting they play a pivotal functional role in maintaining habitat suitability and providing predictable food resources.

Compared to populations in other geographical regions, the display courts at SRS were situated at relatively higher elevations, likely a strategic choice to exploit reduced understory density for enhanced movement and display visibility. Ultimately, the tight coupling between courtship court occurrence and high-quality, continuous forest architecture underscores that intact ecosystems are non-negotiable for the reproductive success and long-term persistence of this Vulnerable species, highlighting the vital importance of strictly protecting the Soraya Research Station landscape.

Acknowledgements

The authors sincerely thank the Forum Konservasi Leuser and the Soraya Research Station for providing logistical support, research facilities, and field assistance throughout this study. Their contribution was essential to the successful implementation of this research.

References

Ayat, A., & Tata, H. L. (2015). Diversity of birds across land use and habitat gradients in forests, rubber agroforests and rubber plantations of North Sumatra. *Indonesian Journal of Forestry Research*, *2*(2), 103–120. https://doi.org/10.20886/ijfr.2015.2.2.103-120

Aisyah, R., Fauzi, I., Alfajri, N., & Janra, M. N. (2026). Keanekaragaman jenis burung di kawasan Danau Kaco, Provinsi Jambi. *Konservasi Hayati*, 22(1). https://ejournal.unib.ac.id/hayati/issue/view/2242

BirdLife, I. (2020). *Argusianus argus* (Vol. 8235).

Clink, D. J., Groves, T., Ahmad, A. H., & Klinck, H. (2021). Not by the light of the moon: Investigating circadian rhythms and environmental predictors of calling in Bornean great argus. *PLoS ONE*, *16*(2), 1–20. https://doi.org/10.1371/journal.pone.0246564

Convention on International Trade in Endangered Species of Wild Fauna and Flora. (2026). *Appendices I, II and III* (Valid from 5 March 2026).

https://cites.org/eng/app/appendices.php

Dawrueng, T., Ngoprasert, D., Gale, G. A., Browne, S., & Savini, T. (2017). Effect of landscape variables on the long-term decline of Great Argus in the rainforest of Southern Thailand. *Bird Conservation International*, *27*(2), 282–293. https://doi.org/10.1017/S0959270916000277

Drozdowski, S., Zawadzka, D., Zawadzki, G., Studnicki, M., & Brzeziecki, B. (2021). Mature stand developmental stage has ceased to constitute the most suitable habitat for the capercaillie in the Augustów Forest, Poland. *Forest Ecosystems*, *8*(1). https://doi.org/10.1186/s40663-021-00327-7

Ericca, C., Tjong, D. H., Roesma, D. I., Novarino, W., Syaifullah, Janra, M. N., & Aadrean. (2022). Taxonomic status of Great Argus (*Argusianus argus)* Sumatra and Borneo based on cytochrome B gene. *Biodiversitas*, *23*(9), 4670–4676. https://doi.org/10.13057/biodiv/d230933

Eliason, C. M., Clarke, J. A., & Kane, S. A. (2023). Wrinkle nanostructures generate a novel form of blue structural color in great argus flight feathers. *iScience*, *26*(1), Artikel 105912.

Firkins, J. M. E., & Kelley, L. A. (2022). Does shading on great argus *Argusianus argus* feathers create a three-dimensional illusion? *Biology Letters*, *18*(11). https://doi.org/10.1098/rsbl.2022.0393

Foley, C. O. N. (2023). *Spatial structure of calling sites in the Great Argus Argusianus argus*. Journal of Asian Ornithology, *39*, 54–58.

Junaidi, A. R. (2026). *Status Burung di Indonesia 2026*. Burung Indonesia. Diakses dari https://burung.org/informasi-burung/status-burung-di-indonesia-2026/ pada [02-07-2026].

Mahyana. (2019). Estimasi Populasi Orangutan Sumatera *(Pongo abelii)* di Stasiun Penelitian Soraya Ekosistem Leuser Kecamatan Sultan Daulat Kota Subulussalam. In *repository.ar-raniry.ac.id* (Vol. 8, Number 5). Universitas Islam Negeri Ar Raniry, Banda Aceh.

Mahyana, Widayati, K. A., & Rianti, P. (2023). Activity Budget and Diet in Sumatran Orangutan *(Pongo abelii)* at Soraya Research Station, Aceh. *HAYATI Journal of Biosciences*, *30*(4), 653–661. https://doi.org/10.4308/hjb.30.4.653-661

McGowan, P. J. K., & Kirwan, G. M. (2020). Great Argus *(Argusianus argus),* version 1.0. In *Birds of the World*. Cornell Lab of Ornithology. https://doi.org/10.2173/bow.grearg1.01

Nordin, N., Ismail, N. A., Khiruddin, F. Z., Daud, U. N. S., Md Ali, N. B., Shuhaily, S. H. J., Arazmi, F. N., Mohd Kharip Shah, A. K., Shukor, A., Nor, S. M., & Mansor, M. S. (2025). Impacts of large-scale hydroelectric dam development on ground-dwelling birds revealed by long-term camera trapping. *Ecological Processes*, *14*(63). https://doi.org/10.1186/s13717-025-00631-y

Ong-In, T., & Savini, T. (2023). Hydropower reservoir reduces Great Argus Argusianus argus density in proximity to its shore. *Bird Conservation*

International, *33*, 1–11. https://doi.org/10.1017/S0959270921000368

Rafi, M., Novarino, W., Rizaldi, ., & Ardiyanto, A. (2017). Aktivitas Kuau Raja (*Argusianus argus* Linnaeus, 1766) Pada Mating Ring di Hutan Konservasi Kalaweit Supayang, Solok, Sumatera Barat. *Metamorfosa: Journal of Biological Sciences*, *4*(1), 58. https://doi.org/10.24843/metamorfosa.2017.v04.i01.p10

Rahmilija, F., Hernowo, J. B., & Prasetyo, L. B. (2026). Contributing environmental factors of habitat suitability for the great argus (*Argusianus argus)* in Bukit Barisan Selatan National Park, Indonesia. Jurnal Manajemen Hutan Tropika (Journal of Tropical Forest Management), 32(1). https://journal.ipb.ac.id/index.php/jmht

Rahmilija, F. (2022). Sebaran dan Kepadatan Kuau Raja (*Argusianus argus*) di Taman Nasional Bukit Barisan Selatan. [Institut Pertanian Bogor]. In *Repository.Ipb.Ac.Id*. https://repository.ipb.ac.id/handle/123456789/114114

Ramadhanti, H., Perwitasari-Farajallah, D., Mulyani, Y. A., & Rianti, P. (2025). Relative abundance, activity pattern and habitat suitability of Great Argus (*Argusianus argus grayi)* in Sungai Wain Protected Forest, Balikpapan, East Kalimantan. *HAYATI Journal of Biosciences*, *32*(2), 507–515. https://doi.org/10.4308/hjb.32.2.507-515

Savini, T., Namkhan, M., & Niti, S., (2021). Conservation status of Southeast Asian natural habitat estimated using Galliformes spatio-temporal range decline. *Global Ecology and Conservation,* 29, e01723. https://doi.org/10.1016/j.gecco.2021.e01723

Shwe, N. M., Sukumal, N., Oo, K. M., Dowell, S., Browne, S., & Savini, T. (2021). Importance of isolated forest fragments and low intensity agriculture for the long-term conservation of the green peafowl *Pavo muticus*. *Oryx*, *55*(2), 311–317. https://doi.org/10.1017/S0030605319000267

Simamora, T. I., Purbowo, S. D., & Laumonier, Y. (2021). Looking for indicator bird species in the context of forest fragmentation and isolation in West Kalimantan, Indonesia. *Global Ecology and Conservation*, *27*, e01610. https://doi.org/10.1016/j.gecco.2021.e01610

Winarno, Djoko, G., & Harianto, P, S. (2018). *Perilaku Satwa Liar*. CV. Anugrah Utama Raharja.

Withaningsih, S., Ramdhani, M. G., Hadi, F., & Parikesit. (2025). Correlations between human-modified landscape structure and bird diversity in Paseh Sub-district, Sumedang District, Indonesia. Biodiversitas, 26(4), 1706–1719. https://doi.org/10.13057/biodiv/d260421