

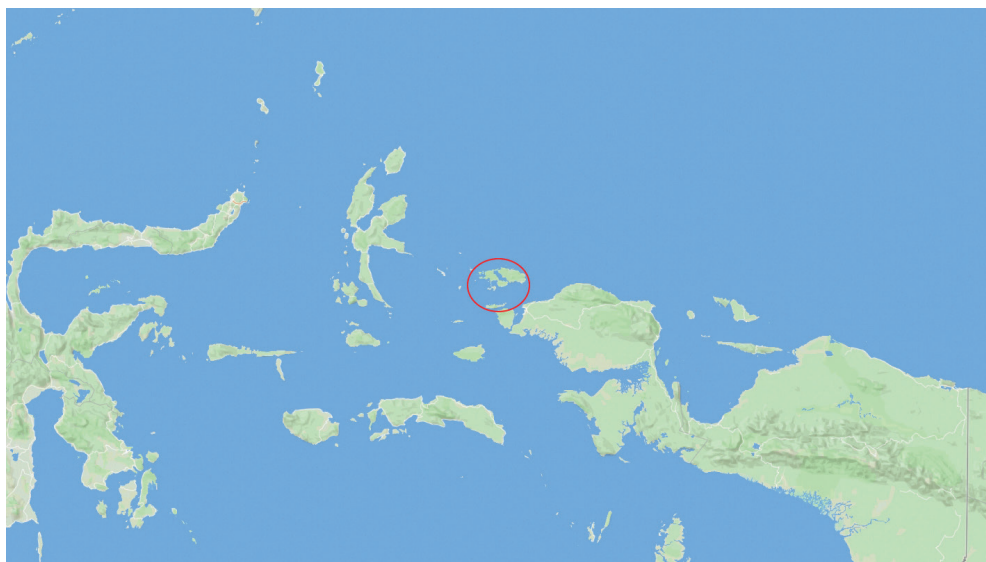
## Wilson's bird of paradise (*Diphyllodes respublica*) data from Batanta (Indonesia: West Papua, Raja Ampat)

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**ABSTRACT:** Our research on *Diphyllodes respublica* in Batanta began in 2009. Over 220 field days including more than 60 nights and early mornings spent in the field, we conducted surveys in the valleys of 21 waterways and additional areas. The species' presence was recorded based on visual observations (presence of males, females and display courts) and acoustic cues, specifically the characteristic calls of males. We found the species at six locations: one at 45 meters, two between 90–120 meters, and three others between 320–420 meters above sea level. The site at 45 meters is of particular interest, because the species has previously been reported only from elevations between 100–1200 meters. We observed aggregate and synchronized courtship displays of males on two occasions. Based on our observations, display courts appear to be inherited and maintained for decades. The display court found at 45 meters in the valley of the Waibin River is at the lowest elevation observed to date. Although we rarely visited areas above 400 meters, based on the six habitat patches we found over the 15 years, we believe the species is not common on Batanta. Two-thirds of its known habitats are located in protected areas. Based on our findings, we recommend the protection of the entire island, the prohibition of deforestation, and the uplisting of *Diphyllodes respublica* from “Near Threatened” to the “Vulnerable” IUCN category.

### Introduction

The Wilson's bird of paradise, *Diphyllodes respublica* (Bonaparte, 1850) (GILL *et al.* 2024), is one of the most beautiful yet little known endemic bird of our planet. It is found only on two relatively small islands in West Papua: Batanta and Waigeo (Fig. 1). The species inhabits hilly and mountainous forests above 100 m up to 1200 m (BEEHLER *et al.* 1986; GIBBS 1993; POULSEN & FRÖLANDER 1994; EASTWOOD 1996, IUCN 2021). Its nesting or chick-rearing behaviour is poorly known (CLIFFORD & BRUCE 2006). Its exact distribution and population size are also unknown (FRITH & FRITH 2020, BIRDLIFE INTERNATIONAL 2023). Over the recent decades, only two articles based on field observations have been published about *D. respublica* one from Batanta (NOSKE *et al.* 2012) and the other from Waigeo (PLANTEMA 2011). Both describe the synchronized courtship display of males and note that the species primarily feeds on fruits and arthropods (PLANTEMA 2011). According to the IUCN Red List of Threatened Species, “This species occurs within a very small range and is likely to have a moderately small population. It is suspected to be declining as a result of habitat loss, but its range is not yet severely fragmented or restricted to few locations. For these reasons, the species is classified as Near Threatened” (IUCN 2021).

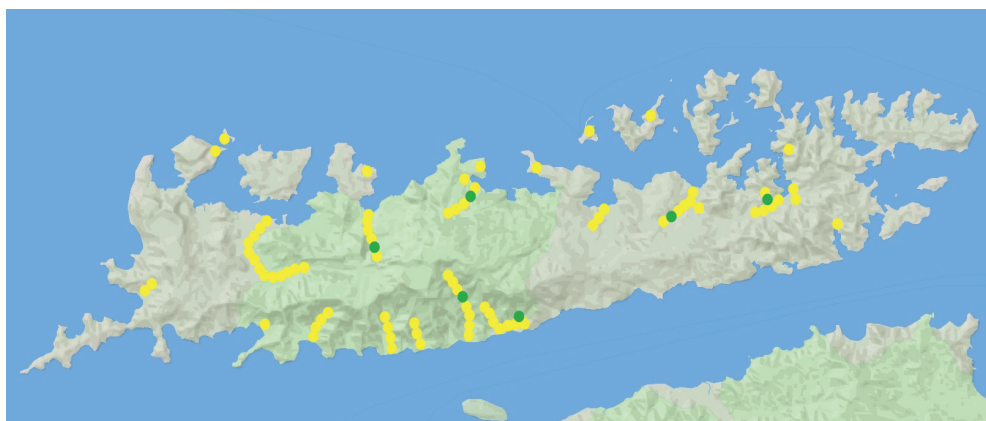


**Fig. 1.** Within the circle are the islands of Waigeo (north) and Batanta (south), the distribution area of *Diphyllodes respública*. Base map © OpenStreetMap, Mapbox, and Mapcarta

### Material and methods

The island of Batanta is located approximately 30 km west of New Guinea. It has an area of 453 km<sup>2</sup>, a length of 60 km, and an average width of 7.5 km. Its considerable elevation above sea level – with the highest point reaching 1184 m – creates a diverse topography and hydrology. The island is almost entirely covered by pristine tropical rainforest, with no large-scale logging activities occurring beyond the vicinity of the settlements. Only small areas – a few hectares in size – near the settlements have been cleared from the primary forest to create cultivable land. These areas are used to grow crops for daily subsistence, as well as for banana, cocoa, chili, and papaya plantations. Timber for construction is harvested using selective logging near the coastline. The felled trees are transported individually to the shore by manual labor. Information about experiences regarding the island, fieldwork and, in particular, insect faunistic collections can be found in the article by Kovács *et al.* (2015).

Alongside our exploration of the Trichoptera fauna of the region, we began collecting data on *Diphyllodes respública* in 2009 with considerable productivity. Field surveys were irregular regarding location and frequency, occurring 20–30 times annually. These surveys primarily took place in the afternoon until dusk, and in the early morning hours, coinciding with the placement and retrieval of UV light traps used for Trichoptera collection. During these activities, we continuously monitored the distinctive call of *D. respública* which allowed for the clear identification of the presence of male individuals. The timing of these surveys matched the ideal periods for bird observations: the males primarily vocalize either at dawn or shortly before sunset in small display courts they use daily. These are typically a few square meters in size, located on the forest floor within the dense undergrowth of the jungle, and are cleared of leaves and debris each morning. Here, males perform their characteristic courtship display, accompanied by their unique calls, to attract females or to confront rival males. In 2014, the second and third authors of this article joined the field research. From that point onward, visits to the southern part of the island became more frequent, while the larger valleys on the northern part continued to be explored, often involving overnight stays in the primary rainforest. From 2014 onwards, field surveys were conducted exclusively in February. In 2021 and 2022, travel to the site was not possible due to the COVID-19 pandemic. Throughout the entire study period, we spent more than 220 field days including over 60 nights and early mornings exploring many parts of Batanta Island, including 21 river valleys, Arefi, Birie, Dajang, Dokri, and Yuvi islands, the area around Minlii Lake, and additional locations (Fig. 2). For conservation reasons, we do not disclose the exact coordinates of the observations to prevent disturbance to the species.



**Fig. 2.** Areas visited over 15 years = ● and *Diphylloides respublica* occurrences = ● in Batanta. Base map © OpenStreetMap, Mapbox, and Mapcarta

## Results

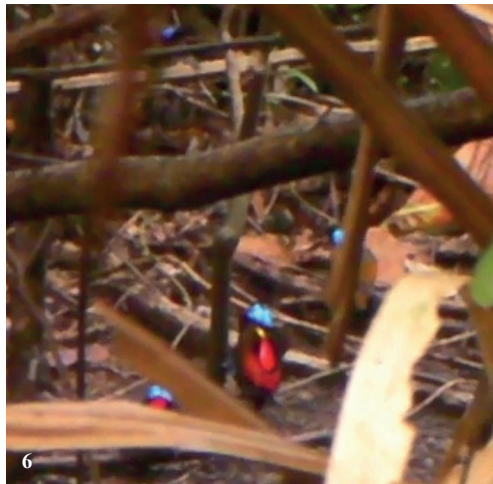
Observations of *Diphylloides respublica* on Batanta Island can be divided into three groups. The first consists of sightings in the mountainous central massif of Batanta, near the village of Wailebet. We accessed this area in 2009 and 2010, guided by local resident Kristian Sauiyai. During the first visit (13 June 2009), we heard calls of at least three individuals and sighted two males, and three females at an elevation of 400 m above sea level (Figs 3–6). On the second visit (29 May 2010), at an elevation of 380 m above sea level, we recorded at least two calls and observed one male. It is worth noting that as early as in 1949, Swedish ornithologist Sten Bergman conducted observations of *D. respublica* in this area with the assistance of locals. At the time, “Wailibit” (= Wailebet) consisted of only five or six huts (BERGMAN 1954), whereas today the settlement comprises over 90 buildings. Later, NOSKE *et al.* (2012) also visited this area. The coordinates provided in their article, “0° 53.95’ S, 130° 39.95’ E” today correspond to a footpath leading into the mountains through a cocoa plantation. It can be concluded that the display courts in this area have been in use by the birds for decades, and according to oral reports from Kristian Sauiyai, these courts were still active in early 2024.

The second group includes *Diphylloides respublica* territories found in the Sarinam River Valley. These were discovered during a systematic search for the species in 2010. Since then, the territories have been monitored several times each month with the assistance of staff from the Papua Paradise EcoResort (PPER). In addition to preserving the area, PPER also introduces the bird to interested guests in limited group tours. Over the past 14 years, *D. respublica* has almost continuously used the Sarinam 1 display court discovered in 2010 (Fig. 7a) and its immediate vicinity (we checked this location 10 times). On two occasions, we noticed that its use and maintenance had ceased temporarily for several weeks or months. One of these interruptions occurred when an irresponsible guide illegally brought a dozen tourists to the site, scaring the birds away. On another occasion, a large tree fell onto the court, altering its structure and light conditions. In both cases, however, the birds eventually returned to the

site. In 2023, the original display court discovered in 2010 was abandoned, and a new court, Sarinam 3, was identified approximately 100 meters away (Fig. 7b). It is possible that this is the same as Sarinam 2 which was found in 2010. Since multiple bird calls were heard in the area during several visits following the 2010 discovery, it is also possible that the bird did not relocate but we identified the court of a different individual. Our observations are summarized in Table 1.



**Fig. 3.** Displaying male *Diphylloides respublica* in the display court, Wailebet, 400 m a.s.l., 2009;  
**Fig. 4.** Two competing *D. respublica* males in the display court, Wailebet, 400 m a.s.l., 2009 (photos: R. Horváth)



**Fig. 5-6.** Two males (below) and two females (above) *Diphylloides respublica* in the display court, Wailebet, 400 m a.s.l., 2009; snapshots from video (video: R. Horváth)

**Table 1.** Observations of *Diphyllodes respublica* at the three display courts in the Sarinam Valley

Date	Locality	a.s.l.	Acoustic	Visual
03.11.2010	Sarinam 1	ca 100 m	min. 3 ♂	1 ♂
05.11.2010	Sarinam 2	ca 90 m		1 ♂
27.02.2011	Sarinam 1	ca 100 m	min. 5 ♂	2 ♂, 3 ♀
12.05.2011	Sarinam 1	ca 100 m	min. 2 ♂	1 ♂, 1 ♀
27.01.2012	Sarinam 1	ca 100 m	min. 3 ♂	1 ♂
21.01.2013	Sarinam 1	ca 100 m		1 ♂
13.01.2014	Sarinam 1	ca 100 m	1 ♂	1 ♂
01.02.2014	Sarinam 1	ca 100 m	1 ♂	1 ♂
20.07.2022	Sarinam 1	ca 100 m	1 ♂	
10.08.2023	Sarinam 3	ca 90 m	min. 2 ♂	1 ♂

The third group includes *Diphyllodes respublica* observations where the bird itself was not seen, but the characteristic calls of the males were heard. In addition to the aforementioned locations, this represents four additional, widely separated habitat clusters. In the cases of the Weras and Warai Rivers, we were unable to locate the display courts. However, in the other two instances, we did: these are the valleys of the Kali Yakut (Fig. 7c) and Waibin (Fig. 7d) Rivers. Among these, the habitat discovered in 2024, near the Waibin River is particularly noteworthy. Although we had visited the area 10 times and camped there three times since 2017, we only detected the species by its calls in 2024, and we were also able to locate its display court. This suggests that the bird's distribution is dynamic and that it colonizes new patches. Another interesting aspect of this habitat is that the display court was found in a completely flat area, at approximately 45 meters above sea level. Our observations are summarized in Table 2.

**Table 2.** Acoustic observations of *Diphyllodes respublica* in four stream valleys

Date	Locality	a.s.l.	Acoustic	Visual
28.10.2010	Valley of Weras	ca 100 m	min. 1 ♂	
03.11.2010	Valley of Weras	ca 120 m	min. 1 ♂	
10.02.2016	Valley of Warai	ca 410 m	min. 3 ♂	
13.02.2016	Valley of Kali Yakut 1	ca 340 m	1 ♂	
16.02.2023	Valley of Kali Yakut 2	ca 320 m	min. 2 ♂	
09.02.2024	Valley of Kali Yakut 2	ca 320 m	min. 3 ♂	
09.02.2024	Valley of Kali Yakut 3	ca 420 m	min. 4 ♂	display court
18.02.2024	Valley of Waibin	ca 45 m	min. 1 ♂	display court

## Discussion

Over the 15 years of research on Batanta Island, *Diphyllodes respublica* was observed and/or heard in only six locations. Based on this, we conclude that the species is not common on Batanta. We did not observe its presence near areas affected by human disturbance or in secondary forests that have regenerated after logging. The species was exclusively found in pristine rainforests, hundreds of meters away from any human intervention. Our observations on Batanta do not support the hypothesis that *D. respublica* is moderately common in secondary forests regenerated after logging (cf. FRITH & FRITH 2020). Ornithologists typically observe these birds near previously known display courts, where the additional calls detected in the area give the impression that the species is “common” (CLIFFORD & BRUCE 2006). We believe that the statement suggesting *D. respublica* is relatively common is incorrect. Due to the aggregated distribution of the species, multiple individuals may be identified at known observation sites, while it is absent from vast areas. In our opinion, the population size of the species is significantly overestimated due to this aggregated distribution (CLIFFORD & BRUCE 2006).



**Fig. 7.** Active *Diphyllodes respublica* display court: a – Sarinam 1, 100 m a.s.l., 2014; b – Sarinam 3, 90 m a.s.l., 2023; c – Kali Yakut, 420 m a.s.l., 2024; d – Waibin, 45 m a.s.l., 2024 (photo: a – T. Kovács, b–d – R. Horváth)

The altitudinal distribution of the identified *Diphyllodes respublica* habitats is as follows: one site at 45 meters above sea level (valley of Waibin), two sites at approximately 100 meters (valley of Sarinam 1, 2, 3 – 90–100 m; valley of Weras – 90–120 m a.s.l.), and three other sites between 320 and 420 meters a.s.l. (Wailebet area – 380–400 m; valley of Warai – 410 m; valley of Kali Yakut 1, 2, 3 – 320–420 m a.s.l.). Among these, the 45 meter elevation is noteworthy because the species had previously been reported only from elevations between 100 and 1200 meters a.s.l. It is worth mentioning that we visited areas above 400 meters a.s.l. only a few times due to their difficult accessibility.

According to our observations, *Diphyllodes respublica* stays mostly at several meters height in the canopy (Fig. 8). It emits its characteristic call mainly there. We observed the species at ground level only when the male was inspecting (a few seconds) or cleaning (1–2 minutes) its display court or when a female visited the court. *Diphyllodes respublica* spent extended time at the court when trying to entice one (or several) females with its dance, occasionally competing with other males. During these occasions, it utilized the sunlight filtering through the canopy to make its vibrant iridescent colours of its plumage visible, highlighting the importance of the court's spatial structure and positioning. Besides the form of the elements of the display gestures (MILES & FUXJAGER 2018), we consider the use of the visible iridescent colours in the courtship display equally important in male competition and female attraction.



**Fig. 8.** *Diphyllodes respublica* male, more than 10 m high in the canopy, Sarinam 1, 100 m a.s.l., 2013 (photo: T. Szitta)

Based on our observations, it is quite common that more than one male *Diphyllodes respublica* individuals emit their calls simultaneously in a given area, signalling their territories to other males and females. On 13 June 2009, we observed the synchronized dance of two males and three females (Figs 5–6, snapshots from video) which NOSKE *et al.* (2012) also reported for a later date, 28 August 2011. These observations indicate that the display court is used by multiple males and females simultaneously, confirming that *D. respublica* is an aggregate displayer as also observed by NOSKE *et al.* (2012). According to our experience at each observation point, 2–4 males form a group to compete for females and mating opportunities.

There is no data on the lifespan of *Diphyllodes respublica* in nature. Based on the species' size and its known relatives, it is presumed to live 5–8 years in the wild, but it may survive up to 30 years in captivity (HAINES 2020). Therefore, it is unlikely that the same individuals have been using the Wailebet and Sarinam courts for the past 14–15 years. This suggests that the ownership of the courts changes (potentially due to shared use), and the display courts are inherited similar to what is seen in the Long-tailed Manakin (*Chiroxiphia linearis*) (cf. TRAINER *et al.* 2002).

We note that the strait (Selat Sagewin) between Batanta and Salawati in the south (where the species has not been recorded) is less than 7 km wide, with the narrowest distance being 3.4 km. The Weilebet *Diphyllodes respublica* population is approximately 5.7 km from the shores of Salawati. It remains unclear whether surveys for the species have been conducted on Salawati. If not, we recommend that such studies be initiated.

On Batanta, two-thirds of the known habitats of *Diphyllodes respublica* are located within protected areas which currently cover less than a quarter of the island's total area (100 km<sup>2</sup>) (FRITH & FRITH 2020). Based on our findings, we recommend protecting the island's entire area and banning deforestation while taking the subsistence activities of the local population into consideration. Additionally, we suggest that *D. respublica* be uplisted from the Near Threatened (NT) to the Vulnerable (VU) IUCN category.

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