Variation in the colour and shape of capitula in Parkia bicolor (Leguminosae) illustrated by two watercolours from southern Nigeria painted by Dorothy Amaury Talbot (1871–1916)

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Variation in the colour and shape of capitula in Parkia bicolor (Leguminosae) illustrated by two watercolours from southern Nigeria painted by Dorothy Amaury Talbot (1871–1916)

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Abstract

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As currently circumscribed, *Parkia bicolor* A. Chev. (*Leguminosae, Caesalpinioideae*, mimosoid clade) includes all the African material of this genus in which the red or reddish capitula have a well-developed fringe formed by long staminodial filaments that extend from the basal sterile flowers; the fertile flowers in each capitulum form a large apical ball, which is either spherical or ellipsoidal. Capitula of different shapes and colours in this widely circumscribed species are illustrated in two watercolour paintings at the Natural History Museum (NMH) in London, both labelled "Mr. & Mrs. P. A. Talbot 1912, 1913. Southern Nigeria". Each painting appears to be a composite based on more than one collection. The Talbots' plant specimens (c. 4,000 numbers) and paintings and sketches (c. 1,000) at the NHM have sometimes been attributed to either Percy Amaury Talbot entirely, or to both Percy and his wife Dorothy together. However, sources including correspondence between the Talbots and botanists at the NHM make clear that Dorothy was responsible for all the artwork and for the majority of their herbarium collections. Descriptions and photographs in addition to Dorothy's artwork suggest that variation in the shape of the capitula is potentially of greater taxonomic significance than differences in colour, but we refrain from drawing any taxonomic conclusions until a comprehensive morphological analysis of *P. bicolor* has been carried out.

Keywords

FABACEAE – *Caesalpinioideae* – *Parkia agboensis* – *Parkia zenkeri* – Botanical art – Dorothy Amaury Talbot – Percy Amaury Talbot

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Introduction

As circumscribed by both Hagos (1962) and Hopkins (1983), *Parkia bicolor* A. Chev. (*Leguminosae, Caesalpinioideae*, mimosoid clade; previously *Leguminosae* subfamily *Mimosoideae*) is a canopy tree from forest in West Africa, western central Africa and the Congo Basin (Hopkins & White, 1984) that shows variation in the size, shape and colour of its "capitula" (i.e. the ball-like flower-heads, each comprising several hundred flowers), in the width and colour of the pods (Hopkins, 1983) and possibly in other characters. Like most species in this genus, *P. bicolor* has quite large, robust, pendent capitula that are pollinated primarily by bats at dusk and after dark (Grünmeier, 1990; Pettersson, 2005).

In mainland Africa, *Parkia* R. Br. almost invariably has red or reddish flowers and the African species belong to pantropical sect. *Parkia* in which the capitula are composed of three types of flower: the apical ball of each capitulum consists of numerous fertile flowers (male, hermaphroditic or a mixture); proximal to this is a constricted band or a depressed ring of modified nectar-secreting flowers; at the base is a variable number of sterile flowers. Each capitulum hangs at the end of a tough peduncle, with the flowers inserted on a receptacle or clinanthium (term originally defined to refer to the *Compositae*; see Beentje, 2016).

In contrast to the other African species (*Parkia biglobosa* (Jacq.) R. Br. ex G. Don from woodland, *P. filicoidea* Welw. ex Oliv. from forest), the sterile flowers in *P. bicolor* are relatively long and numerous, and their elongated filaments often bear tiny, non-functional anthers (Grünmeier, 1990). At anthesis, these staminodia extend well beyond the corollas to form a fringe that hangs or sits over the apical ball of fertile flowers in the pendent capitula. All material from Africa with long staminodia is currently placed in *P. bicolor* but recent DNA studies suggest that this taxon may be too widely circumscribed (Ahossou et al., 2020; Ahossou, 2022).

Two watercolours in BM at the Natural History Museum in London (NHM), both filed as *Parkia bicolor*, show capitula of different shapes and colours. They were painted by Dorothy Amaury Talbot (1871–1916), who, with her husband, the colonial official Percy Amaury Talbot (1877–1945), spent a number of years in south-eastern Nigeria in the early part of the 20th century. In this paper we consider what evidence these watercolours and associated materials in the Museum's herbarium, library and archives provide for variation in capitular characters in this species. Little has been published about the Talbots' botanical work since the era in which they lived and so we give a brief account of their collections, notebooks, artwork and correspondence, all preserved at the NHM. These sources provide the context for the two paintings. Evidence of variation in the size, shape and colour of capitula from other sources is discussed to aid the interpretation of the paintings and provide a starting point for further taxonomic investigations.

Taxonomic background

Parkia bicolor was originally described by Chevalier (1908) from Guinea (Guinea-Conakry) in West Africa and according to its current taxonomy it has two heterotypic synonyms, *P. agboensis* A. Chev., described simultaneously with *P. bicolor* and based on a type from Ivory Coast, and *P. zenkeri* Harms (1911), which has a lectotype from south-western Cameroon (Hopkins, 2023). A fourth name, *P. klainei* Pierre ex De Wild. [nom. nud.] is invalid. In addition to the revisions by Hagos (1962) and Hopkins (1983), all major floristic accounts for central Africa since and including Baker (1930) have put the name *P. zenkeri* into the synonymy of *P. bicolor* (Hopkins, 2023). In West Africa, Keay (1958) followed Baker by citing *P. agboensis* as a synonym of *P. bicolor*, as did Aké Assi (2001) for Ivory Coast, although Hagos (1962) had recognised *P. bicolor* var. *agboensis* (A. Chev.) Hagos & de Wit as endemic to Ivory Coast.

General evidence of variation in the capitula of Parkia bicolor

Colour

Variation in colour has at least three potential components. First is variation in an individual capitulum over time due to changes before and after anthesis and descriptions of colour are only comparable if they are based on the same floral stage. In the bat-pollinated species of *Parkia*, the capitula are functional for a single night but herbarium specimens are usually collected during the day. If material is gathered before anthesis is complete, not all the flowers will have opened fully to display their most vivid colours and if collected the following day, they will have started to fade. Second are differences between individuals of a single species, either within a population or among populations that do not differ in other significant features. Third is variation correlated with other morphological characters that might indicate taxonomic differences at specific or subspecific level.

Some evidence of differences in capitular colour comes from taxonomic publications. According to their protologues, the "upper flowers" (i.e. the apical ball of fertile flowers) in the capitula of *Parkia bicolor* are reddish-brown and the "lower ones" (i.e. basal, sterile flowers) are pale red-yellow, whereas in *P. agboensis* the colour is more uniformly red to yellow-orange (Chevalier, 1908). However, when recognising var. *agboensis*, Hagos (1962: 236) described the capitula as follows: *P. bicolor* var. *bicolor*: "Sterile flowers bluish-red to ashy-purple, fertile flowers red or pink"; *P. bicolor* var. *agboensis*: "Sterile and fertile flowers equal in colour or very nearly so, pink or reddish-pink". The protologue of *P. zenkeri* (Harms, 1911) described the lower part of the capitula (staminodes) as yellow-vermillion or orange-red, and the upper part (fertile flowers) as having

much shorter carmine-red stamens; however, Harms did not compare his new species with *P. bicolor* or *P. agboensis*.

Other evidence comes from field studies and photographs. Grünmeier (1990) described the floral cycle in *Parkia bicolor* based on observations at Korup National Park in south-western Cameroon (Fig. 1), quite close to where the Talbots had been stationed across the border in Nigeria. As commonly seen in other species of sect. *Parkia*, she noted that the sterile flowers start to open first, during the morning prior to anthesis, so the fringe appears before the fertile flowers have fully exserted their corolla lobes and stamens, which typically occurs by mid to late afternoon of the same day. Before the fertile flowers open, the brown tips of their bracts and imbricate calyx lobes are visible among the emerging corollas and stamens; at this stage, the apical ball of flowers appears brown or brownish. Colour could also be affected by the emergence of the anthers, depending on whether or not they are concolourous with the corollas, and then by their dehiscence, which releases yellow pollen over the entire surface of the apical ball. The emergence of the tips of the styles, which are white at Korup (Grünmeier, 1990), might also have a small effect. Floral colours are brightest at anthesis, from late afternoon until they start to fade early the next day, by which time the stamens, styles and staminodes are wilting, the pollen has usually gone and any remaining anthers have darkened. Unpollinated flowers and whole capitula start to drop soon after.

Chevalier's (1908) description of the apical flowers in *Parkia bicolor* from Guinea as reddish-brown most likely indicates that they were not fully open although the pale reddish-yellow ones of the fringe may have been. The more uniform colouration described for *P. agboensis* suggests its capitula were probably observed at or after anthesis, and if this is so, the colour difference between these two entities may be less marked than Chevalier believed. The bluish cast described by Hagos (1962) for the sterile flowers of his *P. bicolor* var. *bicolor* was observed in fallen capitula below a large tree at the Forestry Research Institute of Nigeria (FRIN) in Ibadan (HCFH, pers. obs.) but it was not clear whether this tinge was present at anthesis or only post-anthesis. Keay and Onochie (in field notes of FHI 37286 and FHI 35271 respectively, both at K) reported the fallen capitula from this tree as dark red.

According to Grünmeier (1990) and photographs taken by the film-maker Phil Agland (see Hopkins, 1983), most trees of *Parkia bicolor* at Korup had bicoloured capitula with an orange fringe and bright salmon-red fertile flowers, which turned pale bluish red post-anthesis. The capitulum in Fig. 2A from Korup is slightly pre-anthesis with the fringe bright orange and the fertile flowers appearing pale russet-red and not yet fully open. Grünmeier also mentioned that a minority of trees in the same population had all-red capitula although she did not explicitly state whether they were similar in size and shape. Vande weghe et al. (2016: 359, photo 1046, as *P. filicoidea*) illustrated a capitulum post-anthesis from Gabon in which both the basal fringe and the apical ball are orange-red. They also illustrated as *P. bicolor* a capitulum with the highly unusual combination of a short pinkish fringe and bright yellow fertile flowers (Vande weghe et al., 2016: photo 1045); both morphological and DNA analysis may be required to determine the identity of this plant.

Fig. 1. – The principal localities where the Talbots collected specimens of *Parkia bicolor* A. Chev. in south-eastern Nigeria, and Korup National Park, Cameroon, where Regine Grünmeier studied pollination and floral biology. [QGIS, http://www.qgis.org]

Size and shape

Variation in these characters in *Parkia bicolor* has a strong geographical component although an area of overlap exists in eastern Nigeria and western Cameroon (Hopkins, 1983: fig. 5), and apparently further south into Gabon, where capitula of more than one morphology occur. The shape of a capitulum is determined by the comparative numbers and lengths of the fertile, nectar-secreting and sterile flowers, and by the shape of the clinanthium, which in bat-pollinated species of *Parkia* always has a fairly long, narrowly terete basal part and a swollen, clavate, turbinate, spherical or ellipsoid to oblongoid apex. Capitular size depends on the dimensions of both the flowers and the clinanthium and is often positively correlated with the number of flowers although this is not always the case: for instance, in Amazonia, the capitula of *P. gigantocarpa* Ducke are up to 20 cm long but contain only c. 1,830 flowers, whereas some sympatric species have much smaller capitula comprised of twice as many flowers (Hopkins, 1984).

Herbarium material at K from throughout West Africa shows that the capitula of *Parkia bicolor* are comparatively small (4.5–5.5 cm long at anthesis) and the apical part of the clinanthium is short and clavate to spherical, resulting in a round ball of fertile flowers. The capitulum in Fig. 2B, photographed in Gabon, with both the fringe and apical ball bright red, indicates that this globose shape also occurs sometimes in western central Africa. The tree at FRIN in Ibadan mentioned

Fig. 2. – *Parkia bicolor* A. Chev. **A.** Capitulum approaching anthesis, Korup National Park, Cameroon; **B.** Capitulum at anthesis, Bouvala, Ngounié Prov., Gabon. Images not to scale.
[Photos: **A:** R. Grünmeier; **B:** M. Leal, reproduced from Dressler et al. (2023) with permission of the photographer and the Senkenberg Research Institute, Frankfurt]

above, in which the post-anthesis capitula were dark red with a bluish or purplish cast, were also this shape.

In contrast, the capitula illustrated by Grünmeier (1990) and Vande weghe et al. (2016: photo 1046) from Cameroon and Gabon respectively are larger (5.5–6.6 cm long at anthesis in herbarium specimens at K; (5.1–)7.4(–8.9) cm long in fresh material at Korup, fide Grünmeier), with the apical part an oblongoid to ellipsoid ball. This corresponds to the shape in the lectotype of *Parkia zenkeri* (*Zenker 3498*, K; isolecto-: BM, BR, E, HBG, L, M, MO, S, US, W). Although none of these specimens has capitula at anthesis, several have ones in bud that are rather elongate with long cylindrical necks (formed by un-opened nectar-secreting and sterile flowers) and ellipsoid apical balls, or they have bare clinanthia that are similar in shape but much narrower. Gilbert & Boutique (1952: fig. 10) illustrated this shape for the Congo Basin under the name *P. bicolor*. The number of flowers and capitular size are correlated according to Grünmeier (1990), with these larger, more elongate capitula composed of many more flowers than the smaller, rounder ones.

Thorough investigation of any relationship amongst capitular size, shape and colour will require a more quantitative approach than we present here. However, this preliminary evidence suggests that the relatively small capitula with round apical balls from West Africa and apparently extending into western central Africa can be red, pinkish or orangish at or around anthesis, and sometimes darker red tinged with bluish-purple, at least post-anthesis. We have no reliable evidence to suggest that the fringe and apical ball are other than monochromatic at anthesis, though not necessarily afterwards, and so Chevalier's epithet *bicolor* may be a misnomer in West Africa. In contrast, the larger capitula

with ellipsoid to oblongoid apical balls, mostly from central Africa, are either bicoloured (orange fringe, bright red apical ball) or monochromatic (entirely orange-red or perhaps sometimes entirely red) at or around anthesis; post-anthesis they can be dull orange or have a bluish tinge. Capitular colour clearly varies according to the stage in the floral cycle and perhaps sometimes within populations (Grünmeier, 1990) but no strong geographical pattern is evident, except for the unusual capitula from Gabon illustrated by Vande weghe et al. (2016).

The botanical work of the Talbots in southern Nigeria

Materials relating to the botanical work of Dorothy Amaury Talbot and her husband Percy in Nigeria in the early part of the 20th century are preserved in the herbarium, library and archives of the Natural History Museum in London. Percy was a colonial civil servant who worked initially as a surveyor and then as an administrator, spending much of his later career in southern Nigeria (Meeke, 1947; Hepper & Neate, 1971). One of Percy's maps, centred on the Oban Hills where they made many of their botanical collections, is reproduced in Fig. 3. The Talbots were based in Oban (now in Cross River State) from 1909 to 1912; then in 1912–1913 they were at Eket (now in Akwa Ibom State), east of the Niger delta, in lower lying country than the Oban Hills, and subsequently at Degema in the Niger Delta (now in Rivers State) (Fig. 1). Percy wrote numerous books and journal articles about his African travels and the peoples of southern Nigeria (Meeke, 1947; Hepper & Neate, 1971; Vegter, 1988; British Museum, 2023; RAAI, 2023). Dorothy published an ethnographic study of the Ibibios people of south-eastern Nigeria (Talbot, 1915), considered ground-breaking because of its perspective, but she died aged only 45 of malaria at Degema (Rendle, 1917). In addition to their botanical work, Percy collected zoological specimens, including mammals, birds, reptiles, fishes, insects and shells, also deposited at the NHM (NHM: DF ZOO/200/59/44), and his ethnographic artefacts were donated to the British Museum in London and the Pitt Rivers Museum in Oxford (British Museum, 2023).

Entries in a herbarium acquisitions book at the NHM show that almost 4,000 plant collections were sent by the Talbots to BM, mostly between 1910 and 1916, with the last in 1931. According to Vegter (1988), duplicates were distributed to B, BR, CM, COI, DUP, K, MO, SAM and Z; JSTOR (2023) mentions further material at E, EA, G, NY, P, RSA and WAG. The sheets at BM have very simple pre-printed labels that give a minimum of provenance data, such as "P. A. Talbot, Oban, S. Nigeria 1912", which is usually accompanied by a collection number, either mounted on a separate paper slip that is sometimes a piece of reused paper glued to the sheet, or written on a printed label. Only rarely are precise collection dates and locality details included. A few specimens have small drawings by Dorothy mounted with them.

Sets of both field notebooks and determination books for the Talbot collections are housed in the General Herbarium at BM. The seven field notebooks contain brief collection details and include many pencil sketches by Dorothy and some pressed flowers. Entries in the six determination books are far from complete although some of the material sent to BM was catalogued by Rendle et al. (1913). The Talbots' specimens led to the description of several new genera and many new species, including some eponymous ones (MacLeod, 1912; Rendle et al., 1914).

The Talbots sent a number of watercolour paintings and drawings of the plants they collected during their time in Nigeria to the NHM, starting in about 1911, and others were presented by Norman Carter in 1982; however, we have been unable to find any details about this donor nor have we been able to unravel the precise history of all the artwork. The NHM's Special Collections Library houses five boxes containing c. 80 drawings and paintings, some only partially completed, mounted in modern folio covers (Talbot, 1909–1912; JSTOR, 2023). Another box has numerous unmounted drawings and sketches, some in sketchbooks, some drawn on both sides of the paper, giving a total of c. 1,000 drawings. A handwritten catalogue to this artwork was prepared by Jonathan C. Reid (Reid, 1981), formerly a zoologist at the University of Calabar, south-eastern Nigeria, though how this came about is unknown to us.

The archives at the NHM contain correspondence between the Talbots and Museum staff (NHM: DF BOT), including many friendly letters between Dorothy and Alfred Barton Rendle, who was Keeper of Botany at BM between 1906 and 1930 (Burkill, 1938). A letter in the herbarium from Dorothy to Edmund Gilbert Baker about *Napoleonaea* P. Beauv. includes several beautiful small ink sketches, and Dorothy and Percy clearly had a particular interest in cauliflorous genera. Most letters between Percy and Rendle were written after Dorothy's death and largely concern the possibility of having some of her paintings included in the British Empire Exhibition in London in 1924 and also published as a book. Unfortunately, neither of these plans came to fruition (NHM: DF BOT).

Rendle was obviously well acquainted with the Talbots and in a position to understand Dorothy's contribution to their joint endeavours. It is clear from his obituary of her (Rendle, 1917) and from Percy's letters after Dorothy's death that she was the artist responsible for the drawings and watercolours at BM (Hart, 2014; see also NHM, 2023a). Rendle also credited her with the major contribution to their botanical endeavours in general, though whether this was just in southern Nigeria or also applied to their collections from elsewhere (including

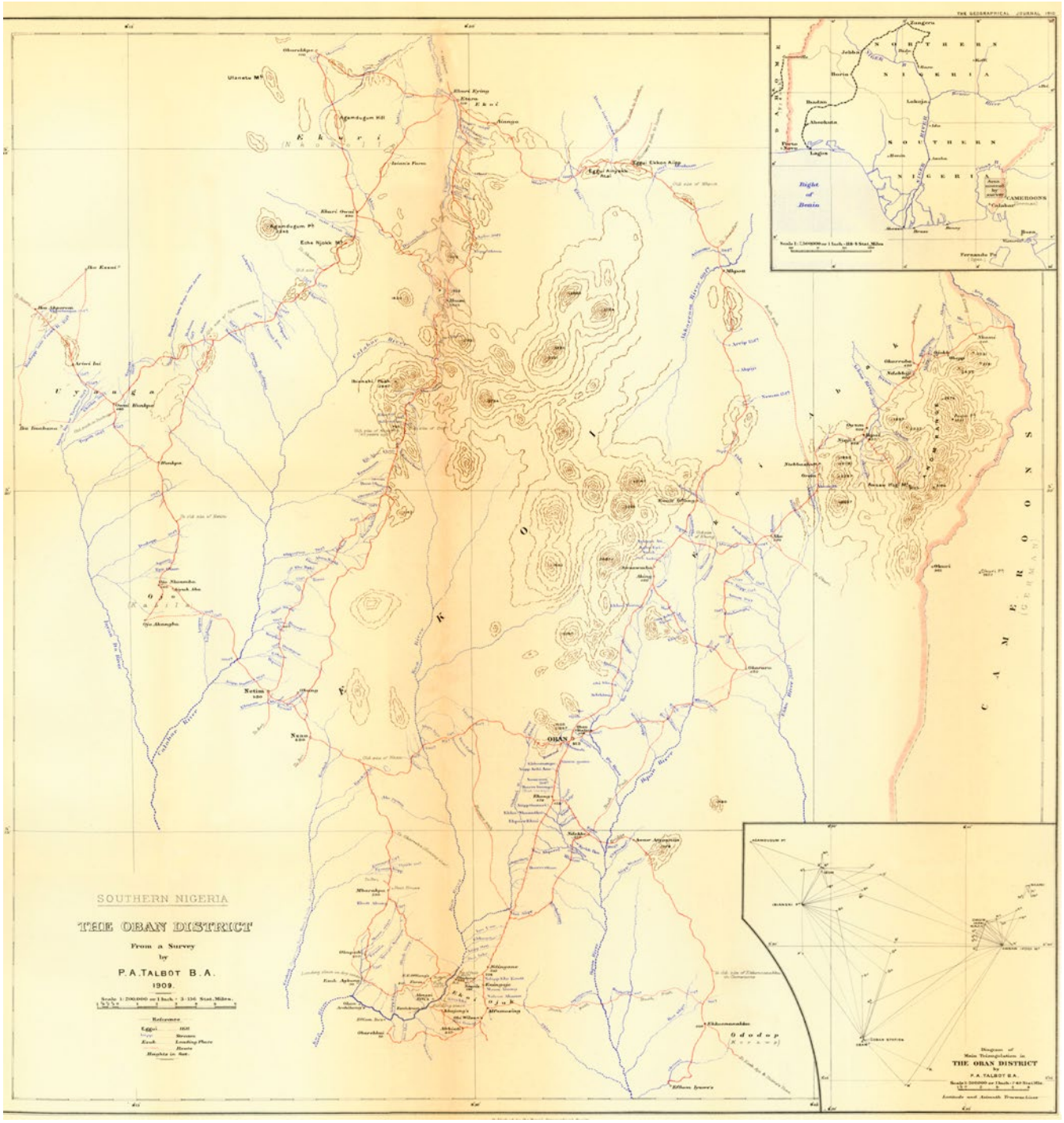

Fig. 3.– Map of the Oban District in south-eastern Nigeria prepared by Percy Amaury Talbot. [Reproduced from TALBOT (1910), courtesy of the Royal Geographical Society, London]

Mt Nimba/Sierra Leone and an expedition to Lake Chad) is not clear. He wrote that "Mr. and Mrs. Talbot have sent at intervals to the Department of Botany, British Museum, the results of their botanical exploration in Southern Nigeria. Mr. Talbot's time has been much taken up with his government work, and the principal labour of making collections fell to Mrs. Talbot and her companion and sister Miss Amaury. Mrs. Talbot also made an extensive series of beautiful coloured sketches which with her notes on the plants have been very helpful when working out the collections" (RENDLE, 1917: 85).

Despite this, the paintings have sometimes wrongly been attributed to Percy. For instance, those available at JSTOR (2023) are described as "watercolour drawings and pencil sketches […] completed by Talbot [sic] between 1909 and 1912, when he [sic] was in Nigeria. […] (Talbot, 1909–1912). One possible reason for the misattribution is that some of the paintings have "P. A. Talbot" written on them, although it is not clear who wrote this, nor when. Dorothy did not sign the artwork herself.

A number of biographical publications and other sources have also credited the botanical work either to the Talbots jointly, or erroneously to Percy alone or almost so. For instance, Rosevear (1967) wrote a fulsome account of Percy's contributions to our knowledge of south-eastern Nigeria in the early 20th century and mentioned his [sic] collections of botanical and zoological specimens, as well as ethnographic artefacts. In his obituary, Meek (1947) listed Percy's posts in Nigeria, his awards and books, with only a brief mention of Dorothy, saying that she ably assisted him. Desmond (1994) credited the plant drawings to Percy though he mentioned Dorothy as a plant collector, Hepper & Neate (1971) stated merely that Dorothy collected with her husband, and Vegter (1988) was even more dismissive of Mrs. Talbot. While Percy was apparently an able botanist according to a letter from Dorothy to Rendle from Oban, dated 21 December 1911 (NHM: DF BOT/404/9/3), it is clear that Dorothy was also.

The story of the Talbots, their botanical collections and Dorothy's illustrations is an example of a competent woman field botanist and artist sometimes failing to receive due credit for her work, as pointed out in the Exhibitions Note to the Talbot collection of illustrations (NHM, 2023a). This may have been partly because Dorothy did much of her botanical work with her more famous husband, although her failure to sign her drawings and paintings, or to put her own name on some collection labels and never first on the labels on which it does appear, must also have been contributing factors.

The Talbots' herbarium material and watercolour paintings of Parkia bicolor at BM

Two watercolours of *Parkia bicolor* by Dorothy Amaury Talbot are mounted on herbarium sheets and preserved at BM [BM013719101, BM013719102] (Fig. 4, 5). It is unusual to find Dorothy's paintings filed alongside corresponding specimens in this way as the majority of her artwork is kept in the Museum's library, separate from the herbarium collection. Each watercolour shows several bipinnate leaves that lack clear details and a compound inflorescence with a capitulum at around the time of anthesis, two or three capitula in bud plus another either pre- or post-anthesis. Together these two illustrations show much of the variation in capitular colour and shape in this species as currently circumscribed. The paintings are reproduced here in the orientation in which they are mounted on the herbarium sheets, with the capitula pointing upwards, although in life they would be pendent.

Both paintings bear printed labels stating "Southern Nigeria. Mr. & Mrs. P. A. Talbot 1912, 1913" and both sheets have "*Parkia cf. zenkeri* Harms" written in pencil at the bottom by Edmund Baker, who was one of the Museum's botanists at the time and an expert on the Leguminosae of Africa (see Baker, 1930). Sheet BM013719101 also states "*Parkia* probably *Parkia africana* R. Br. (Mimoseae)" in the same hand and has small drawings of a fertile and a staminodial flower attached. The name *P. africana* is illegitimate (Mabberley et al., 2022) and refers to *P. biglobosa* but the plant illustrated is not this species because *P. biglobosa* has almost spherical capitula with a depressed nectar-ring and no fringe (Hagos, 1962; Hopkins, 1983). We do not know why these two paintings of *P. bicolor* were incorporated into the herbarium rather than placed with the other watercolours in the Museum's library; it may perhaps have been because they were amongst the first artwork sent by the Talbots but we have no actual evidence for this.

To interpret the two paintings, we looked at them alongside all the material of *Parkia bicolor* at BM collected by the Talbots which we found in the herbarium in June 2022 (Table 1). Images of this material are available on the Museum's Data Portal (NHM, 2023b). The sheets largely comprise leaf material plus some compound inflorescence axes and peduncles (Fig. 6A, D). Most of the associated capitula at anthesis, carefully wrapped in paper, plus others in bud and/or peduncles and some bare clinanthia, are preserved in boxes in the carpological collection (Fig. 6B, E), kept separately from the main herbarium collection. Dorothy's field notebooks (Fig. 7) give a few more details, especially about floral colour, and some of her notes are accompanied by sketches showing the shape of the capitula at around anthesis (Fig. 6C, F) but the data are not sufficiently precise to be certain of collection dates. We are not aware of any other drawings or sketches of *Parkia* made by Dorothy and none are mentioned in Reid (1981)'s unpublished catalogue. The numbers corresponding to herbarium specimens of *Parkia* are blank in the determination books in the Museum's collection, suggesting that perhaps there was some uncertainty about their taxonomic identity.

Comparing specimens and notebook entries with the watercolours, we conclude that both paintings are composites based on more than one collection, although the capitula at anthesis can probably be linked to particular specimen numbers. It is likely that the painting in Fig. 4 was based partly on *Talbot 1350* from Itaiyo River, Oban District (BM013719194; BM001082696 [carpo.] should also belong here but the shape of the clinanthia is not that associated with round-headed capitula, suggesting a mistake in labelling). *Talbot & Talbot 3047* from Eket (BM13719196, BM001082698 [carpo.]) appears to be the best match for Fig. 5 although

Fig. 4. – Watercolour of *Parkia bicolor* A. Chev. by Dorothy Amaury Talbot, mounted upside down, the reddish-purple capitulum at or shortly post-anthesis. Based on a plant from southern Nigeria. [BM013719102; courtesy of the Trustees of the NHM, London]

Fig. 5. – Watercolour of *Parkia bicolor* A. Chev. by Dorothy Amaury Talbot, mounted upside down, the capitulum on the left with an orange basal fringe and red fertile flowers at anthesis. Based on a plant from southern Nigeria. [BM013719101; courtesy of the Trustees of the NHM, London]

Talbot 1467 and *Talbot & Talbot 3061* are also possibilities. Both watercolours contain a few small inaccuracies but despite these, they are invaluable as a source of information from a time when colour photography was unknown in tropical fieldwork.

The capitulum at around anthesis in Fig. 4 has a thick fringe and an oblongoid apical ball of flowers; both parts are darkish red with the apical ball having a purple cast. Although the illustration does not suggest that this purplish tinge is associated with fading post-anthesis, field observations would be needed for confirmation. The colours depicted match those described by Hagos (1962) for his *Parkia bicolor* var. *bicolor*. The capitula in bud are quite shortly and broadly clavate. However, the clinanthium on the right, with most of its flowers fallen, is longer than the whole capitulum with open

Table 1. – List of specimens of *Parkia* R. Br. at BM and K collected by the Talbots in southern Nigeria, indicating the colour of the capitula according to their field notebooks. Question marks [?] indicate specimens in the carpological collection without a number linked to the herbarium sheet to which they most probably belong based on the details in the field notebooks; asterisk [*] for *Talbot 1467* at K means that it does not match the material at BM under this number (see text).
[Abbreviations: DAT: Dorothy Amaury Talbot; PAT: Percy Amaury Talbot]

Based on herbarium labels							Based on field notebooks	
collector(s)	**nº**	**date**	**locality**	**BM**	**BM elements**	**K**	**shape of apical ball**	**colour of capitula**
PAT	s.n.	1909	Oban	BM013719193	**sheet:** leaf	–	–	–
PAT	1350	1912	Oban [Itaiyo River]	BM013719194 BM001082696 [carpo.]?	**sheet:** leaf + old capitula in packet **carpo.:** peduncles + clinanthia + loose flowers	K003039443, K003039444	spherical	fringe: more pinky mauve ball: more mauvy pink old flowers: dull mauve
PAT	1467	1912	Oban	BM013719195 BM001100678 [carpo.]?	**sheet:** leaf **carpo.:** leaflets + capitula in bud	K003039439*	oblongoid-ellipsoid	orange and mauve
PAT & DAT	3047	1912, 1913	Eket, along the rivers	BM013719196 BM001082698 [carpo.]	**sheet:** leaves + infl. axes **carpo.:** capitula in bud and anthesis	K003039441	oblongoid-ellipsoid	fringe: pinky orange nectar zone: jasper ball: pinky red, tiny dash of mauve
PAT & DAT	3060	1912, 1913	Eket, along the rivers	BM013719197 BM001082686 [carpo.]	**sheet:** leaves + twig (old infl. axes?) + part of capitulum in packet **carpo.:** capitula in bud and anthesis	K003039442	spherical	fringe: lovely rose pink, mauve in shadows, tips of stamens almost cerise at edge of frill, longest frill flowers ever found ball: pinky-mauve with darker mauve anthers
PAT & DAT	3061	1912, 1913	Eket, along the rivers	BM013719198 BM001082683 [carpo.]	**sheet:** leaves + peduncles **carpo.:** capitula in bud and anthesis	–	oblongoid	fringe: clear orange nectar zone: rather red ball: brick dust red
PAT & DAT	3694	1915	Degema	BM013719199	**sheet:** leaves + old capitulum	–	not known	pink
PAT & DAT	s.n.	1911, 1912	Oban	–	**sheet:** leaf + infl. axes + capitula in bud (oblong-ellipsoid)	K003039440	–	–
PAT & DAT	s.n.	1911, 1912	Oban	–	**sheet:** leaves + infl. axis + capitula in bud (oblong-ellipsoid)	K003039438	–	–

Fig. 6. – Two collections of *Parkia bicolor* A. Chev. at BM, both from the Eket District, southern Nigeria.
A, D. Herbarium sheets; **B, E.** Mature capitula wrapped in paper plus others in bud, preserved in the carpological collection;
C, F. Corresponding pages from the field notebooks showing a capitulum at around anthesis.
[**A–C:** *Talbot 3060*; **D–F:** *Talbot 3047*; courtesy of the Trustees of the NHM, London]

Fig. 7. – Dorothy Amaury Talbot's field notebooks at BM. [Courtesy of the Trustees of the NHM, London]

flowers, a discrepancy in size that is unlikely to occur within a single compound inflorescence and furthermore, its apical part is ellipsoid, indicating that it is probably from a different collection. Comparison with the sketches in the field notebooks and accompanying information on colour suggests that in the capitulum at around anthesis, the apical ball of fertile flowers should be shorter and more spherical.

The second watercolour (Fig. 5) shows a capitulum at anthesis on the left with a thick orange fringe and, compared with Fig. 4, a longer, more ellipsoidal ball of bright red fertile flowers; this illustration closely matches Harms's (1911) description of *Parkia zenkeri*. In the capitulum on the right, with a yellow-orange fringe and brownish apical ball, the fertile flowers are probably not fully open, but it is unlikely that capitula at these two different stages of development would occur simultaneously in nature. Also, because the apical ball is quite elongated in the two capitula at or near anthesis, those in bud should be more elongated than those depicted, which are typical of plants that have round apical balls at anthesis. The discrepancy strongly suggests that this painting was also based on material from more than one collection and it is very likely that the capitula in bud in Fig. 5 belonged with the capitulum at anthesis in Fig. 4, and that the almost bare clinanthium in Fig. 4 belonged with the capitulum at anthesis in Fig. 5.

Figure 6 shows herbarium material and the corresponding pages from the field notebooks for two collections with capitula of different shapes and colours but we have chosen to illustrate the most informative sketches, rather than the most likely models for the paintings. The sketches in Fig. 6C and 6F are labelled "*Parkia intermedia* Oliv. *forma*" and "*Parkia zenkeri* Harms" respectively, whereas the corresponding herbarium sheets (Fig. 6A, D) were labelled *P. bicolor* and *P. zenkeri* by Baker. *Parkia intermedia* is a synonym of *P. biglobosa* and the obvious staminodial fringe in the sketch means that this identification is incorrect because, as mentioned above, capitula in *P. biglobosa* lack basal fringes. The inconsistencies in naming suggests that Baker's taxonomic concepts in *Parkia* were not clear at first and that initially he considered *P. bicolor* and *P. zenkeri* were distinct, although he subsequently treated them as synonyms (Baker, 1930).

Dorothy's notebook sketches and parallel watercolours show she was aware of the variation in capitular colour and shape in the forest species of *Parkia* in south-eastern Nigeria. Assuming that the labelling of specimens is correct (but see below), the localities mentioned in Table 1 indicate that trees with different sorts of capitula were sympatric in both the Oban and Eket Districts of south-eastern Nigeria.

We have added information to Table 1 about the duplicates at K but comparison with the specimens at BM show that some labelling errors have occurred. For instance, *Talbot 1467* at K has capitula with round apical balls whereas material with this number at BM has oblongoid-ellipsoid capitula. The leaves of the two specimens are not very similar either and *Talbot 1467* (K) is a better match with *Talbot 1350* (BM). Two other specimens at K lack collection numbers; one is a reasonable match for *Talbot 1467* (BM) and the other to *Talbot & Talbot 3047* (BM) although the locality data differ. Similar labelling errors are expected among duplicates in other herbaria.

The published catalogue to the Talbots' collections from the Oban District (Rendle et al., 1913) listed only two specimens of *Parkia* at BM, presumably because the others were collected or received in London after the list was prepared. This catalogue mentioned "*P. zenkeri* Harms", collection no. *1467* (BM013719195) from Cameroons [sic]; BM001100678 [carpo.] may also belong to this gathering despite its label bearing the date 1911. *Parkia filicoidea* Welw. [sic] is mentioned in the catalogue with the locality Lake Chad but with no collection number. At that time, large leafleted forms of *P. biglobosa* were confused with *P. filicoidea* and this entry almost certainly refers to *P. biglobosa*, based on locality. No corresponding material was located at BM in June 2022 and no mention of *Parkia* was made in the list of plants, again compiled by Rendle et al. at BM, included by MacLeod (1912) in her account of an expedition to Lake Chad with the Talbots, so probably no specimen was collected. Rendle et al. (1914) gave an account of the new species that the Talbots found in the Eket District but this did not include a general list of material from that locality.

In conclusion, despite the differences in capitular colour shown in Dorothy Amaury Talbot's two watercolours of *Parkia bicolor*, it appears from other sources that variation in colour alone may not provide definitive evidence of taxonomic significance. The shape of the capitula, as seen in Dorothy's sketches rather than her paintings, is more likely to be taxonomically important and could be used to divide the species into two entities. However, because the microsatellite data of Ahossou et al. (2020) identified four discrete populations within this species, investigation of variation in other morphological

characters and in ecology is now necessary to make a case for dividing this broadly circumscribed taxon into several, more narrowly defined species.

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