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REGULAR PAPER

Modern vegetation at the Klasies River archaeological sites, Tsitsikamma coast, south-eastern Cape, South Africa: a reference collection

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Background and aims – The Klasies River cultural landscape, on the Tsitsikamma coast, south-eastern Cape, South Africa, features prominently in modern human origins research. The archaeobotanical information for the Klasies River landscape and its immediate environment is sparse. The aim of this study is the collection of a taxonomically valid and comprehensive reference database of modern botanical specimens as an aid to identifying macro- and micro-botanicals such as seeds, charcoal, phytoliths, parenchyma and pollen in the Klasies River archaeological deposits. This is an essential step in providing context for the identification of past vegetation and its usage by Stone Age populations.
Methods – Herb, shrub, tree, grass, fern and geophyte voucher specimens were collected in 24 areas in the vicinity of the Klasies River sites, and further inland within a 5km radius, between 2013 and 2015. The collecting was done at different times of year so that all stages of the flowering, fruiting and seeding cycles for most plants could be sampled.
Key results – A total of 268 species, in 196 genera and 78 families were collected. Only 69 of these 268 species currently appear on the relevant database grid of the Integrated Biodiversity Information System (SIBIS), the South African National Biodiversity Institute (SANBI). Our work clearly indicates the need for thorough and systematic collecting at archaeologically significant sites in the Cape region to provide further environmental proxies for the interpretation and contextualisation of the development of anatomically modern human behaviour.
Conclusions – The Klasies River landscape, although located within the broad Fynbos Biome, cannot be classified as such, as relatively few fynbos species are represented in the core area surrounding the sites. The vegetation is in fact a complex mosaic of thicket, forest and coastal vegetation. This densely interdigitated vegetation provides a wide variety of useful resources.

Key words – Klasies River archaeological sites, Tsitsikamma region, southern Cape, south-eastern Cape, thicket, forest, coastal vegetation, fynbos, medicinal plants, edible plants.

INTRODUCTION

The Klasies River cultural landscape is situated on the Tsitsikamma coast, south-eastern Cape, South Africa, about 90 km west of Port Elizabeth (fig. 1). This landscape, a National Heritage site, consists of a 2 km stretch of coast between the mouth of the Klasies River (known locally as the Kaapserivier) to the west and Druipkelder Point to the east and includes buffer zones into the intertidal zone and coastal platform towards the south and north respectively. There are five major archaeological features on this landscape: Main Site (figs 1 & 2) occurs closest to Klasies River mouth and consists of a complex of caves (Caves 1, 1A, 1B, 1C & 2). Caves 3 and 4, not yet investigated archaeologically, occur further to the east, with Cave 5, the eastern most feature, close to Druipkelder Point. Various parts of the Klasies River landscape have been excavated since the 1960s by Singer & Wymer (1982), Deacon (1986, 1989, 1995) and Binneman (1995), with Sarah Wurz, University of the Witwatersrand, starting a new project in 2014. The excavations at Main Site

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and Cave 5 have revealed MSA and LSA occupation of the sites from the first part of the Late Pleistocene to the Late Holocene. Acheulean bifaces and MSA artefacts have been noted in the deflation hollows of the fossilized Geelhoutboom dune on the plateau above the cave sites (fig. 1, Laidler 1947, Deacon & Geleijnse 1988).

Main Site was intensively occupied by coastal foragers between c. 120 000 and 55 000 years ago and thus preserves an extraordinarily comprehensive record of cultural adaptation within the context of one of the earliest MSA coastal economies that has been recorded (Singer & Wymer 1982, Deacon 1989, Deacon & Geleijnse 1988, Wurz 2002, 2012). Cave 5 also preserves evidence of a pulse of occupation contemporaneous with ca 120 000 year old layers at Main Site (Singer & Wymer 1982). Some of the earliest and most extensive fossil evidence for early anatomically modern humans occurs at Main Site (Singer & Wymer 1982, Deacon 2008, Grine et al. 2017). From around c. 4800 BP–2300 BP (Nami et al. 2016), coastal dwellers again occupied Main Site, and also Cave 5 (Singer & Wymer 1982), demonstrating that this landscape has provided a favourable habitat over a long period of time. Several studies have already been undertaken to provide insight into the palaeo-environmental aspects of these Stone Age occupations, for example, the analyses of the large mammal fauna, microfauna, shellfish and isotopes (e.g. Klein 1976, Singer & Wymer 1982, Deacon et al. 1986, Avery 1986, 1987, Deacon et al. 1988, Thackeray 1988, Van Pletzen 2000, Langejans et al. 2012). More recently Late Pleistocene speleothems from Cave 1C have been studied (Braun 2014). Several on-going research projects are referred to below as unpublished research (unpubl. res.).

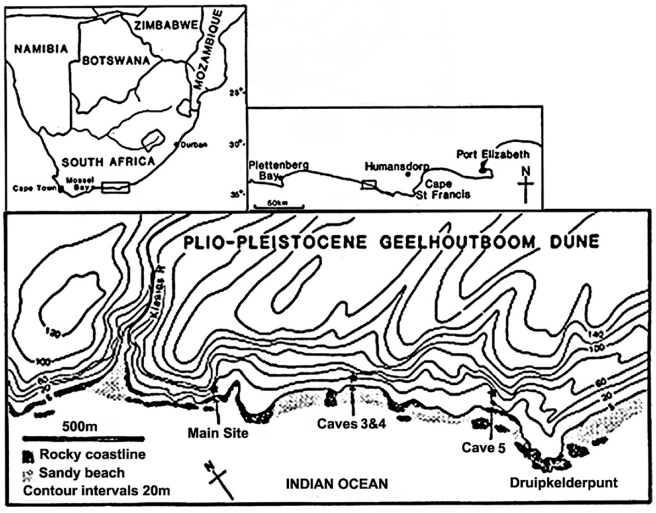

Figure 1 – Locality of the Klasies River archaeological sites, Tsitsikamma coast, South Africa. Adapted from Deacon & Geleijnse (1988).

Archaeobotanical information for the Klasies River landscape and its immediate environment is sparse, although preliminary studies of small charcoal samples were undertaken (Deacon et al. 1986, M.L. Tusenius, University of the Witwatersrand, South Africa, pers. comm.), and more recently, the first seeds (Zwane, Witwatersrand University, Johannesburg, SA, unpubl.res.), and parenchyma (C. Larbey et al., Cambridge University, UK, unpubl. res.) have been identified. Besides obtaining data on past vegetation, archaeobotanical analyses at other sites, for example Sibudu Cave, have shown that they have much potential to provide unexpected, nuanced interpretations of populations' behaviour and adaptation (e.g. Wadley 2015). Plants provide micronutrients, not available anywhere else, which are essential to human diet and health – humans cannot live without plants as food and medicine. Seeds, fruit, leaves, roots, tubers, bulbs, gum, buds, flower stalks, internodes, nectar (De Vynck et al. 2016a), plus shoots, bark, cambium, sap, pollen, pods, and galls were, and still are, all utilised. Deacon (1989, 1992, 1993) suggested that a long history of ethnographically known plant exploitation may have been evident at Klasies River since the Late Pleistocene. He interpreted carbonised material observed in blackened layers at the site as altered plant remains (Deacon 1993, 1995). Deacon (1993) also suggested that when above-ground food resources were limited, plants with underground storage organs (USOs) would have been important sources of carbohydrates (see De Vynck et al. 2016a, 2016b, Singels et al. 2016). USOs may not have been the only carbohydrate resource at Klasies River or elsewhere as grasses may also have been an important food resource (e.g. Henry et al. 2014, Eoin 2016).

One of the goals of the current excavation project at Klasies River is to expand archaeobotanical investigation for both the LSA and MSA deposits. In archaeological reports, the botanical context provided for the Klasies cave sites is noted as fynbos, either as a vegetation type or as a

Figure 2 – Panorama of Main Site, situated in the complex Klasies River coastal landscape.

biome (e.g. Klein 1976, Faith 2011, Henry et al. 2014) or as a complex forest-scrub and forest-grassveld-macchia mosaic (Butzer 1978), with some reference to Afromontane Forest (Deacon 1993). With the exception of specimens collected for wood samples by Tusenius in 1984 and 1985, no systematic sampling of the composition of the vegetation has been undertaken at the Klasies River cultural landscape and its immediate environment. An essential step in providing comparative material and context for past vegetation and its usage by the Stone Age populations is to produce a taxonomically valid and comprehensive botanical database.

In this paper we report on the collection of 90–95% percentage of the modern botanical species in close proximity to the Klasies River Main Site and Caves 3 and 4, and we describe and characterise the present vegetation within the regional biophysical context (tables 1 & 2). We also indicate which of the taxa collected are edible and/or medicinal or have other uses (tables 1, 3 & 4), and we emphasise the high prevalence of useful species collected. The latter topic is, however, to be covered more comprehensively in another paper (Y. van Wijk & R. Rust, Rhodes University, South Africa, unpubl. res.). The vegetation we sampled in detail in close proximity to the Klasies River sites is a complex mosaic of predominantly thicket, forest and coastal vegetation, with a few fynbos elements.

BIOPHYSICAL CONTEXT

Klasies River falls within the Cape Fold Belt geomorphic province where the dominant bedrock comprises quartzitic sandstones of the Peninsula Formation of the Table Mountain Group (TMG). These, together with other formations of the TMG and some narrow bands of Bokkeveld Group shales, form the Tsitsikamma coastal plateau, a narrow (50–13 km) relatively level plain ranging from c. 150–260 m in altitude and located between the coast and the Tsitsikamma Mountains. The plateau is massively incised by the narrow gorges of short rivers such as the Klasies and Tsitsikamma rivers, locally named Kaapserivier and Kamrivier, hence Kaapsedrif and Kamsedrif occurring between the mountains and the coast (fig. 3). Periods of lower sea levels in the past, for example, between 100000 and 55000 BP, would have had significant impacts on the vegetation and past resources as the coast would have been between 2 and 5 km away (Langejans et al. 2012). At present, the coastal margin, including the c. 100–150 m coastal cliffs, is mantled by a 2–3 km wide coastal band of Cenozoic (Algoa Group) sediments of a coastal and aeolian origin (Le Roux 2000). These sediments include the Nanaga Formation –Pliocene to Early Pleistocene aeolian deposits, e.g. those of the Geelhoutboom fossil dune (Deacon & Geleijnse 1988) – as well as the unconsolidated windblown sand of the vegetated dunes of Holocene age (Le Roux 2000). The sea-land contact zone at present is deeply indented and fractured with ragged rocks forming small points, tunnels, and narrow bands which are vegetated right to the edge of the rocks. Rock outcrops alternate with small sandy bays, often covered in a thick layer of rounded quartzite cobbles of varied size and colour, which were utilised for tool-making in the past (Singer & Wymer 1982).

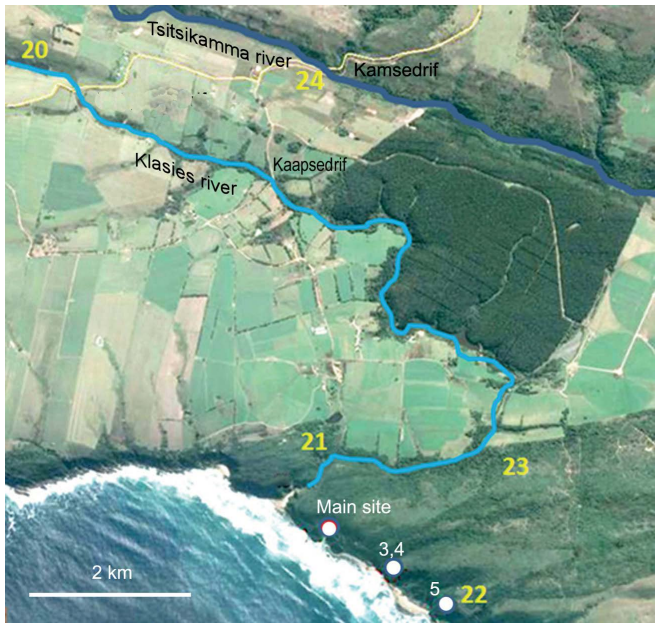

Figure 3 – Greater collection area within 5 kilometres of Main Site: 20 Fynbos remnant, 21 Forest remnant, 22 above cave 5, 23 on plateau, 24 Kamsedrif.

Seasonal temperature variation is low and this equable climate is a consequence of the stabilizing effect of the warm Agulhas Current. Between 1959 and 2001, the annual average minimum and maximum temperatures recorded at Cape St Francis, some 60 km east of Klasies River, were between 9 and 18°C in winter and between 18 and 23°C in summer (Du Plessis 2015). Because of the cooling effect of the onshore winds bringing mist and sea-spray, temperatures are lower in the vicinity of the sites than up on the plateau and inland (Lubke 1985). As is typical of the Cape south coast, rainfall is all year round with small peaks during autumn and spring (Weldon & Reason 2014). The average annual rainfall on the southern slopes of the nearby Tsitsikamma mountains is between 875 and 1,375 mm (Hosking & du Preez 1999) and at Storms River weather station 25 km west of Klasies River it is 810 mm (Grey et al. 1987). This is optimal for Afrotemperate forest and more than enough to sustain thicket. The prevailing winds are from the west-southwest in winter, but in summer the frequency and strength of east-southeast winds increases (Elkington 2012, Lubke 1985).

The Klasies River sites are located in the broad Eastern Fynbos and Renosterveld bioregion of the Cape Floristic Region's Fynbos biome (Mucina & Rutherford 2006). However, as is typical of this bioregion, Fynbos and Renosterveld interdigitate and form mosaic structures with three other biomes, namely Forest, Subtropical Thicket and Grassland (Cowling 1982, 1984, Cowling & Potts 2015). There are species-based botanical assessments relevant to the broader area which encompasses Klasies River, such as that of the southern Cape forests (Geldenhuys 1993, 1993), the Tsitsikamma National Park to the west (Hanekom et al. 1989) and the Oyster Bay dunes to the east (Cowling 1984). Several national or regional vegetation maps, mainly at relatively crude scales do exist for the area (e.g. Acocks 1988, Cowling & Heijnis 2001, Mucina & Rutherford 2006, Vlok et al. 2008),

but all are too coarse to realistically depict vegetation patterns in the immediate Klasies River area.

In general, vegetation of the Algoa Group sediments along the coastal margin comprises a complex array of vegetation types whose distribution is governed by exposure to salt laden winds, exposure to recurrent fire, soil formation and aspect. However, owing to heavy infestations of alien trees (*Acacia longifolia* (Andrews) Willd., *A. saligna* (Labill.) Wendl.), especially on the inland slopes of the dune cordon, it is difficult to discern the original vegetation composition. The Nanaga sands support a complex mosaic of forest, thicket, grassland and fynbos, as is the case further east of Klasies River (Cowling 1984, Hoare et al. 2006). In wind- and fire-protected sites such as incised drainage lines leading to the coast, the vegetation is Southern Coastal Forest, a subtropical type with a relatively rich tree flora. Conspicuous species include *Sideroxylon inerme*, *Ekebergia capensis*, *Olea capensis* subsp. *capensis*, *Canthium inerme*, *Pterocelastrus tricuspidatus*, *Gymnosporia nemorosa*, *Cassine peragua*, *Acokanthera oppositifolia* and *Searsia chirindensis*.

Drier and more exposed sites support patches of dune thicket, which may occur in large blocks, such as the wind-exposed slopes along the coast, or as clumps in a matrix of grassland or fynbos. The composition is similar to the dune thickets described by Cowling (1984). Dominant species are *Sideroxylon inerme*, *Pterocelastrus tricuspidatus*, *Euclea racemosa*, *Putterlickia pyracantha*, *Tarchonanthus littoralis* and *Searsia glauca*. The younger (Holocene) dunes support a mosaic of dune fynbos and thicket, a community that has been well described by Cowling (1984) in the Cape St Francis area.

Along the coast, either on hummock dunes or on harder surfaces exposed to salt-laden winds is an azonal community of low herbs and shrubs, many of which are succulent. This community forms part of Mucina & Rutherford's Cape Seashore Vegetation (2006). The vegetation of the coastal plateau

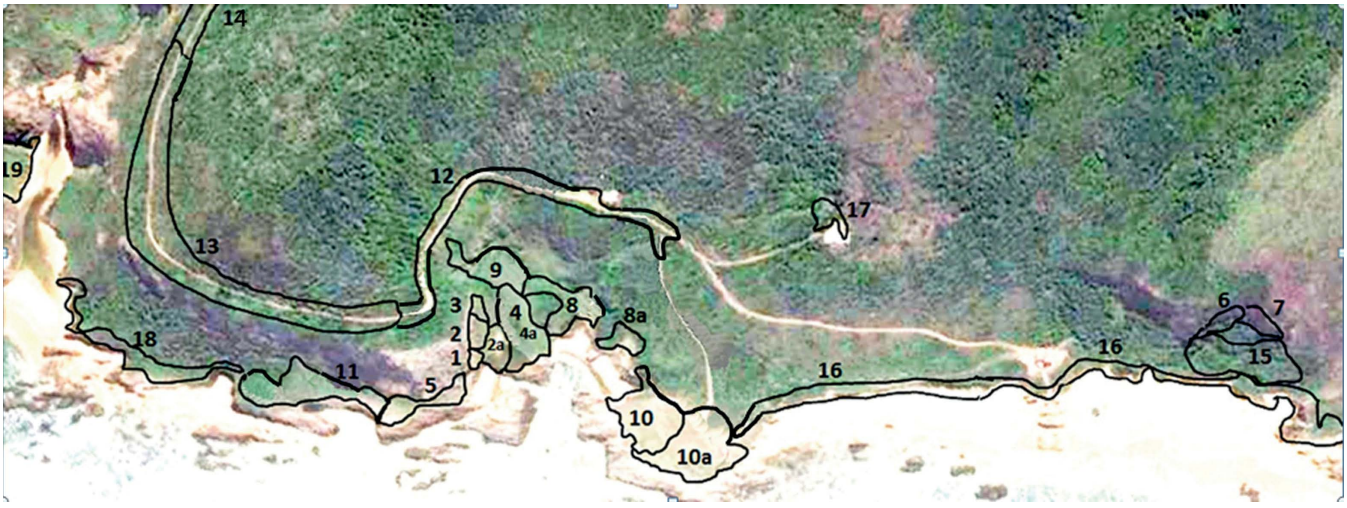

Figure 4 – Core collecting areas numbered and described.

1 at entrance to Cave 1a – badly worn and trampled, succulents and grass
2 rubble berm on lower eastern edge of Cave 1c – disturbed and unstable
2a low veg in slight depression and wash-away to east of area 2 – fresh water seep present
3 high northern end of berm beside Cave 1c – milkwood forest & thicket from 20 cm to 2 m
4 concave slope rising to the north – grassy species-rich wind-sheared vegetation
4a Similar to 4 but including wind-sheared 'Lilliputian' forest & thicket species
5 steeply sloping area between shore & cliff to cave 1b – low grassy wind-sheared thicket
6 immediately at entrance to Cave 3 – dense thorny thicket & forest
7 immediately at entrance to Cave 4 – thorny thicket, succulents and herbs
8 mixed species-rich grassy veg - thicket in lee of wind, sloping up to cliffs on north-west
8a dense vegetation, mostly thicket & forest up to 2.5 m
9 long valley sloping steeply up west, grassy, succulents, geophytes, thicket in lee of wind
10 grassy flats between cliffs and seashore – low grass, succulent, coastal / littoral
10a similar to 10 but with more low shrubby and succulent species / littoral
11 from the edge of rocks above sea-shore – from low grassy scrub to thicket 1 m
12 along both sides of entrance track sloping south – dense coastal thicket
13 along both sides of entrance track sloping west – thicket, forest, lianas
14 along both sides of entrance track sloping north – thicket, + few fynbos spp.
15 small coastal forest patch below caves 3 & 4 – sheltered by fore-dune with thicket
16 narrow band on edge of beach & fore-dune –low coastal veg., thicket at eastern end
17 small patch of 3–4 m forest and thicket, some disturbed grassy area
18 along footpath above rocky edge to seashore – thicket to 1.5 m+, below forest patch
19 small beach & cliff on west bank of Klasies River - cliff & estuarine vegetation.

is included in the Tsitsikamma Sandstone Fynbos of Rebelo et al. (2006). Remnant patches of fynbos on well-drained plateau areas suggest dominance by overstorey proteoid shrubs with a lower stratum of ericoid shrubs, restiods and grasses. Geophytes are conspicuous after fire. Almost all of this earlier vegetation on the plateau has, however, been replaced by pastures, pine plantations and dense stands of alien trees.

MATERIALS AND METHODS

The first botanical reference material was collected by Tusenius in 1984/1985 and consisted of woody taxa to be used as a comparative collection for the identification of charcoal remains from the Deacon excavations. During the present excavation project, the existing wood reference material has been expanded to a comprehensive collection of representative modern specimens of herbs, shrubs, trees, ferns, grasses and geophytes by van Wijk, Rust, Tusenius, Larbey, Novello and Cowling (table 1 & electronic appendix), to compile a reference database as an aid to identifying macro- and microbotanicals such as seeds, charcoal, phytoliths, parenchyma and pollen in the Klasies River archaeological deposits.

Specimens were collected as widely as possible in the immediate core area, close to Main Site and to Caves 3 & 4 in collecting areas 1 to 19 (fig. 4). Additional collections were made further inland within a 5 km radius of Main Site in areas 20 to 24 (fig. 3). These included a patch of Fynbos and a relatively intact forest section on the western slope above the Klasies River itself (collecting areas 20 & 21 respectively in fig. 3). Wood specimens were also collected inland above Cave 5 by Tusenius in 1984, and Cowling subsequently collected in that area in 2015 (collecting area 22 in fig. 3).

The ideal is to collect at different times of the year at each site, and to collect all stages of the flowering, fruiting and seeding cycle for most plants, but unfortunately this is seldom possible due to time constraints and the difficulty of access to many sites. In this study however, four week-long collecting seasons at different times of the year by Van Wijk between 2013 and 2015 made it possible to collect duplicate specimens in flower or bud for pollen sampling, and in seed or fruit for identification of charred seed remains. Collecting took place in November, December, February, March and May with unfortunately no collecting in the winter and early spring. However, due to year-round rainfall and a temperate climate, flowering and fruiting of woody plants appear to take place all year round – depending more on rainfall than on the seasons (Y. van Wijk, Rhodes University, South Africa, pers. comm., see also Pierce & Cowling 1984). On the other hand, many herbaceous plants, especially geophytes, showed a more seasonal cycle with most phenological activity in the cooler months (De Vynck et al. 2016b).

The 2015 collection of underground tubers, bulbs, and roots specifically made for research on parenchyma in archaeological contexts (C. Larbey et al. Cambridge University, UK, unpubl. res.) in which 34 species were located, was successful only because these geophytes had been seen and collected in flower or seed previously. In terms of the wood collection, an attempt was made to collect as many of the woody taxa currently growing in the vicinity of the cave sites as possible. Emphasis was also placed on getting examples of the same taxa from different ecological micro-niches so that any microscopic anatomical variability due to environmental conditions may be observed. Sampling for the wood collection is an on-going project.

Leafy voucher specimens for the woody taxa collected in the 1980s, as well as charred specimens of the associated wood samples, are lodged at Iziko:SA Museum, Cape Town. All ethnobotanical and vegetation survey specimens collected by Van Wijk, Rust and Tusenius from 2013 to 2015 were pressed to serve as voucher specimens for reference purposes. Most of these specimens were photographed before pressing and images have been, or will be, submitted to iSpot for confirmation of identification, and to help assemble an image database for the area. Additional special samples were collected in flower or bud in 2013 and 2014 for future pollen research, and in seed for identification of charred seed remnants recovered during excavation. These flower and seed vouchers were sent to Johannesburg to be deposited in the Evolutionary Studies Institute herbarium at the University of the Witwatersrand. A complete set of voucher specimens will be lodged at the Selmar Schonland Herbarium, Grahamstown, with any duplicates going to the Ria Olivier Herbarium at Nelson Mandela Metropolitan University (NMMU), Port Elizabeth.

Identifications were made mainly by Yvette van Wijk, with assistance from Johan Baard, Jan Vlok, Richard Cowling (Ria Olivier Herbarium), Tony Dold (Selmar Schonland Herbarium), Sandra Burrows and Rodney Moffett, with some input from iSpot (2016). Classification and authors are according to the Angiosperm Phylogeny Group (2016), and the International Plant Names Index (IPNI 2016). Naming for all Angiosperms follows Manning & Goldblatt (2012), and Pteridophytes follow Crouch et al. (2011). To prevent confusion due to many recent name changes, synonyms are given in the tables for family, genus and species wherever relevant.

RESULTS

A total of 268 species, in 196 genera and 78 families were collected and are listed in table 1 (see also electronic appendix). The species were collected in 24 numbered areas shown in figs 3 & 4, and represent presence and absence data. Accessibility in some of the sites was hampered by sheer cliffs, impenetrable thorny vegetation or dense stands of the alien invasive tree *Acacia cyclops* and some areas have not been collected. The species tally from these areas is therefore unlikely to be comprehensive. The number of collecting areas in which each species was collected is indicated in table 1. The common names of each species including, where possible, Khoe-San names are given in the table and are according to Batten et al. (2001), iSpot (2016), Manning & Goldblatt (2012), Smith (1966), van Wyk et al. (1997) and van Wyk & Gericke (2000). The uses of these taxa as medicinal and/or edible plants, as well as those with other uses are also indicated (Fox & Norwood-Young 1982, Hutchings et al. 1996, Smith 1966, van Wyk et al. 1997, Arnold et al. 2002, van Wyk & Gericke 2000, Pote et al. 2006, Y. van Wijk & R. Rust, Rhodes University, South Africa, unpubl. res.)

Where the actual species present at Klasies is not referred to in the references cited, but the genus is however described

Table 1 – **Klasies River species list 2013 to 2015.**
Synonyms are italicised in brackets - aliens marked with *. M = medicinal, E = edible, O = other use. GM = Genus reported in the literature as medicinal, GE = edible, GO = other use. FM = Family reported in the literature as important medicinally. F = forest, T = thicket, C = coastal, fy = Fynbos.

Taxon	No of Areas present	Common name	Uses	Veg type
Acanthaceae			**FM**	
Hypoestes aristata (Vahl) Roem. & Schult. (*verticillaris*)	19	Ribbonbush, Seeroogblom	E	FTC
Justicia leptantha (Nees) T.Anderson	3	Kiesieblaar	GM	–
Isoglossa ciliata Lindau	6	Businessman's plant	GM	FT
Adiantaceae (*Pteridaceae*)				
Adiantum capillus-veneris L.	1	Maiden Hair fern	M	–
Agavaceae (*Anthericaceae*)				
Chlorophytum comosum (Thunb.) Jacques	4	Hen & Chickens	E	FTC
Aizoaceae				
Carpobrotus deliciosus (L.Bolus) L.Bolus	10	Sour Fig, Suurvy, Tandsprooi, Brakvy, Gaukum, Dikgoena	M E	TCfy
Conicosia pugioniformis (L.) N.E.Brown	1	Snotwortel, Varkslaai	E	T
Delosperma litorale (Kensit) L.Bolus	4	Kalkklipvygie	GM	TC
Delosperma saxicola Lavis	1	Rotsvygie	GM	–
Drosanthemum floribundum (Haw.) Schwantes	5	Douvygie	–	T
Lampranthus spectabilis (Haw.) N.E.Br.	2	Rankvygie	–	–
Mesembryanthemum aitonis Jacq.	7	Brakvygie, Brakslaai	M E	C
Ruschia lineolata Schwantes	10	Muisvygie	–	–
Tetragonia decumbens Mill.	3	Dune spinach	E	TC
Tetragonia fruticosa L.	13	Sea spinach	GM	TC
Amaranthaceae (*Chenopodiaceae*)				
Chenolea diffusa Thunb.	8	Seawrack, Soutbossie	M	TC
**Chenopodium ambrosioides* L.	2	Wormseed, Galsiekbos	M E	–
**Chenopodium murale* L.	5	Misbredie, Varklossie, Tjuana-seep	M E	–
**Chenopodium vulvaria* L.	1	Pisbossie	GM	–
Exomis microphylla (Thunb.) Aellen	5	Hondepisbossie, Rambos	M E	TC
Pupalia lappacea (L.) Juss.	3	Klitz, Sweethearts	M E	FT
Sarcocornia littorea (Moss) A.J.Scott	3	Samphire, Lidjiesbos, Ganna-asbos	E	TC
Amaryllidaceae	-		**FM**	
Haemanthus albiflos Jacq.	1	Paintbrush, Poeierkwas, Veldskoenblaar	M O	FTC
Anacardiaceae				
Searsia chirindensis (Baker f.) Moffett (*Rhus*)	1	Wild Currant, Boskaree	M E O	F
Searsia crenata (Thunb.) Moffett (*Rhus*)	10	Soettaaibos, Korentebos	E O	FTCfy
Searsia glauca (Thunb.) Moffett (*Rhus*)	6	Blinkblaartaibos, Krintingbessie,	E O	FTCfy
Searsia nebulosa (Schönland) Moffett (*Rhus*)	1	Sandtaaibos	E	T
Searsia pyroides (Burch.) Moffett (*Rhus*)	6	Deurmekaartaaibos, Rivierkaree	E O	T
Apiaceae			**FM**	
Apium decumbens Eckl. & Zeyh.	6	Sea Celery	M	C
**Centella asiatica* (L.) Urb.	2	Pennywort, Waternavel	M E	–
Dasispermum suffruticosum (P.J.Bergius) B.L.Burtt (*Heteroptilis*)	2	Sea Parsley	E	C
Lichtensteinia interrupta E.Mey.	1	Wild Anise, Kalmoes	M	–

Table 1 (continued) – **Klasies River species list 2013 to 2015.**
Synonyms are italicised in brackets; aliens marked with *. M = medicinal, E = edible, O = other use. GM = Genus reported in the literature as medicinal, GE = edible, GO = other use. FM = Family reported in the literature as important medicinally. F = forest, T = thicket, C = coastal, fy = Fynbos.

Taxon	No of Areas present	Common name	Uses	Veg type
Apiaceae			**FM**	
Notobubon ferulaceum (Thunb.) Magee (*Peucedanum*)	2	Lidjiesbos, Wildeseldery, Gatagaai	GM	T
Notobubon laevigatum (Aiton) Magee (*Peucedanum*)	3	Lidjiesbos, Bergseldery, Gatagaai	M E	FT
Apocynaceae			**FM**	
Acokanthera oppositifolia (Lam.) Codd	3	Bushman's poison, Boesmansgif	M	FTC
Carissa bispinosa (L.) Desf. ex Brenan (*haematocarpa*)	12	Num-num, Nam-noempies, Noem-Noem	M E O	FTC
Cynanchum ellipticum (Harv.) R.A.Dyer	4	Dawidjiewortel, Bobbejaantou, Bokhoring, Nenta	M E	FTC
Cynanchum natalitium Schltr.	5	Dawidjiewortel, Bobbejaantou, Bokhoring, Nenta	E GM	FTC
Secamone alpini Schult.	3	Melktou, Bobbejaantou	GM	FTC
Aquifoliaceae				
Ilex mitis (L.) Radlk.	2	Wild Holly	M E	F
Araceae			**FM**	
Zantedeschia aethiopica (L.) Spreng.	2	Arum Lily, Hottentotsblare	M E	F
Araliaceae			**FM**	
Cussonia thyrsiflora Thunb.	4	Spekbos, Nooiensboom	E	TC
Asparagaceae (*Liliaceae*)			**FM**	
Asparagus aethiopicus L.	1	Wild Asparagus, Katdoring, Katjang	M E	FTCfy
Asparagus densiflorus (Kunth) Jessop (*sprengeri*)	10	Wild Asparagus, Katdoring, Kattestert	M	T
Asphodelaceae (*Liliaceae*, *Xanthorrhoeaceae*)				
Gasteria acinacifolia (J.Jacq.) Haw.	2	Beestong, Ox Tongue, Hottentot Rice, Bontkouterie	E GM	FT
Trachyandra divaricata Kunth	2	Veldkool, Wild Cabbage	E	FC
Aspleniaceae				
Asplenium adiantum-nigrum (Kunze) J.P.Roux	2	Maidenhair Fern	M	–
Asteraceae			**FM**	
Arctotis linearis Thunb.	1	Gousblom	GM	C
Arctotheca prostrata (Salisb.) Britten	5	Cape weed, Gousblom, Skaapoor	M	–
Arctotheca populifolia (P.J.Bergius) Norl.	1	Seepampoen	GM	TC
Artemisia afra Jacq. ex Willd.	1	Wildeals	M	T
Berkheya decurrens (Thunb.) Willd.	3	Grootdisseldoring	M	T
Cineraria geifolia (L.) L.	13	Geelkransbossie	GM	–
Cotula sericea L.f.	10	Buttons, Ganskos	M	TCfy
**Cotula coronopifolia* L.	1	Ganskos	GM	C
Dimorpotheca fruticosa (L.) Less. (*Osteospermum barberae*)	2	Cape Daisy	GM	TC
Felicia echinata (Thunb.) Nees	3	Seebloubossie	GM	TCfy
Gazania rigens var. leucolaena (DC.) Roessler	5	Strandgousblom	M	C
Gazania rigens var. uniflora (L.f.) Roessler	9	Botterblom, Gousblom	M	TC
Gazania pectinata (Thunb.) Hartweg	2	Gousblom	E	–

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Asteraceae			**FM**	
Gerbera piloselloides (L.) Cass.	2	Swarteebossie, Pitpursies	M	F
Haplocarpha nervosa (Thunb.) Beauverd	1	Brandbossie	M	–
Helichrysum albanense Hilliard	1	Everlasting	GM	T
Helichrysum anomalum Less.	1	Everlasting, Hotnotstee	GM	Cfy
Helichrysum aureum (Houtt.) Merr.	1	Everlasting	M	–
Helichrysum cymosum (L.) D.Don	5	Kooigoed, Hotnotskooigoed, Hotnotstee	M	FTCfy
Helichrysum herbaceum (Andrews) Sweet	1	Everlasting	M	–
Helichrysum petiolare Hilliard & B.L.Burtt	5	Kooigoed, Vaalky, Geita Hotnotskooigoed, Langbeenghyta,	M	FCfy
Helichrysum rosum (P.J.Bergius) Less	2	Everlasting	GM	–
Helichrysum teretifolium (L.) D.Don	5	Verpis	GM	TCfy
Helichrysum umbraculigerum Less.	5	Kerriebos, Kerriekruie, Hotnotstee	–	–
Metalasia muricata (L.) D.Don	6	Blombos, Witsteekbossie	M	TCfy
Oncosiphon africanus (P.J.Bergius) Källersjö	1	Wild Chamomile, Kamella	GM	–
Osteospermum (*Chrysanthemoides*) *moniliferum* L.	1	Bitou, Boetabessie, Bietou, Bilhô	M E	FTCfy
Othonna carnosa Less.	4	–	GM	T
Plecostachys serpyllifolia (P.J.Bergius) Hilliard & B.L.Burtt	1	Vaaltee	M E	T
Senecio angulatus L.f.	1	Cape Ivy	M	FTC
Senecio elegans L.	5	Strandblommetjie	GM	C
Senecio oederiifolius DC.	12	Hongerbos, Ragwort	GM	FT
Senecio othonniflorus DC.	1	Sybos	M	T
Stoebe plumosa (L.) Thunb.	1	Slangbossie, Vaalbossie	M	Cfy
Syncarpha argentea (Thunb.) B.Nord.	1	Everlasting, Sewejaartjies	GM	C
Syncarpha striata (Thunb.) B.Nord.	2	Everlasting, Sewejaartjies	GM	–
Tarchonanthus littoralis P.P.J.Herman	6	Wild Camphor, Seesalie, Siriehout, Swartsalie, Hottentot Tobacco	M O	FTCfy
Boraginaceae			**FM**	
Cordia caffra Sond.	1	Ouhout, Septee	M E	FT
Brassicaceae			**FM**	
Heliophila linearis DC.	3	Bloubekkie	GM	T
Heliophila subulata Burch. & DC.	2	Blompeperbossie	M	–
Campanulaceae				
Prismatocarpus campanuloides (L.) Sond.	1	Bell Flower	M	–
Wahlenbergia undulata (L.f.) A.DC.	1	African Bluebell	M E	–
Capparaceae			**FM**	
Capparis sepiaria L.	2	Wild caper, Wag-'n-bietjie	M	FTC
Maerua racemulosa Pax	1	Without, Bush Cherry	E	FTC
Caryophyllaceae				
Silene (primuliflora) crassifolia L.	7	Dune Catchfly, S'nama	M	FTCfy
Silene undulata Aiton	4	Wildetabak, Ubulao	M E	FT
**Stellaria media* (L.) Vill.	7	Chickweed	M	–

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Celastraceae			**FM**	
Cassine peragua L.	2	Bastersafraan, Koeboebessie	M O	FTCfy
Elaeodendron croceum (Thunb.) DC.	2	Saffron, Safraan	M O	FT
Gymnosporia nemorosa (Eckl. & Zeyh.) Szyszył. (*Maytenus*)	6	Pendoring, Kamnassiehout	M	FT
Lauridia tetragona (L.f.) R.H.Archer (*Cassine*)	3	Droëlewer	E	FTCfy
Maytenus procumbens (L.f.) Loes.	6	Duinekokoboom	O	TCfy
Mystroxylon aethiopicum (Thunb.) Loes.	4	Cape Cherry, Safraanbas, Koeboehout	M E O	FTC
Putterlickia pyracantha (L.) Endl.	1	Wolwedoring,	–	FTC
Pterocelastrus tricuspidatus Walp.	14	Kershout, Cherry Wood	M O	FTCfy
Robsonodendron maritimum (Bolus) R.H.Archer	1	Duinesybas	–	FTC
Commelinaceae				
Commelina africana L.	2	Yellow Wandering Jew	M	FT
Crassulaceae			**FM**	
Cotyledon orbiculata L.	8	Plakkies, Varkoor, Kouterie	M E	FTC
Crassula atropurpurea (Haw.) D.Dietr.	1	Persplakkie	GM	T
Crassula cultrata L.	4	Plakkiebos	GM	T
Crassula expansa Aiton	1	Strepies	GM	TC
Crassula nudicaulis L.	1	Skraalplakkie	GM	TC
Crassula orbicularis L.	2	Klipblom	M	FT
Crassula ovata (Mill.) Druce	1	Plakkieblaar, Karky, t'karekey	M E	T
Crassula pellucida subsp. *marginalis* (Dryand) Tolkein	4	–	GM	FTfy
Crassula tetragona L.	1	Karkai	M	T
Cucurbitaceae			**FM**	
Kedrostis nana Cogn.	5	Stinkpatat, Bospatat, Karu	M E	FT
Zehneria scabra Sond.	2	Cape Zehneria	M E	FTC
Cyperaceae				
Carex aethiopica Schkuhr	6	African Tussock Sedge	E	FC
**Cyperus rotundus* L.	4	Nutgrass, Watergras, Uintjie	M E	–
Ficinia nodosa (Rottb.) Goetgh., Muasya & D.A.Simpson	2	Vleibiesie	–	TC
Ficinia ramosissima Kunth	2	Biesie	–	Tfy
Ficinia bergiana Kunth	1	Biesie, Rush	–	–
Isolepis sororia Kunth	1	Sedge	–	–
Schoenus nigricans L.	1	Black Bog Rush	–	–
Tetraria involucrata (Rottb.) C.B.Clarke	1	Rush, Biesie	–	fy
Dennstaedtiaceae (*Aspleniaceae*)				
Pteridium aquilinum subsp. *capense* (Thunb.) C.Chr.	1	Bracken Fern	M	Ffy
Dipsacaceae				
Scabiosa incisa Mill.	1	Wild Scabious, Pisgoedbossie	M	T

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Dryopteridaceae				
Rumohra adiantiformis (G.Forst.) Ching	1	Seven Week Fern	–	FCfy
Ebenaceae			**FM**	
Diospyros dichrophylla (Gand.) De Winter	7	Star Apple, Koolhout, Tolbos, Hotnotstolletjie	M E O	FTCfy
Euclea racemosa L.	5	Kersiebos, See-ghwarrie	M E	FTCfy
Ericaceae				
Erica glandulosa subsp. fourcadei (L.Bolus) E.G.H.Oliv. & I.M.Oliv.	2	Erica	O	fy
Erica pectinifolia Salisb.	1	Erica	O	fy
Erica peltata Andrews	1	Ker-ker, Raasheide	O	–
Euphorbiaceae			**FM**	
Acalypha ecklonii Baill.	3	Katpisbossie	GM	FT
Acalypha peduncularis E.Mey. ex Meisn. (incl. *A. zeyheri* Baill.)	1	Besembos	M	T
Adenocline acuta (Thunb.) Baill.	5	Spurge	M E	FT
Euphorbia erythrina Link	2	Pismelkbos	GM	T
Fabaceae			**FM**	
**Acacia cyclops* Cunn. ex Don	14	Port Jackson, Rooipitjie, Makboom	M O	–
Dipogon lignosus (L.) Verdc.	2	Wild pea	M E	FTCfy
Erythrina caffra Thunb.	1	Coral Tree	M	FT
Indigofera porrecta Eckl. & Zeyh.	3	Leeuhoutjie, Louhoud	M E	–
Indigofera tomentosa Eckl. & Zeyh.	1	Louhoud	GM	–
Psoralea repens P.J.Bergius	1	Creeping Psoralea	M	TC
Rhynchosia caribaea (Jacq.) DC.	2	Vaalertjie	M	F
Tephrosia capensis (Jacq.) Pers.	3	Rankbossie, Platertjie	M	Tfy
Tephrosia grandiflora (Aiton) Pers.	1	Rooiertjie	M	T
Trifolium burchellianum Ser.	5	Wild Clover	M	–
Vigna vexillata (L.) A.Rich.	1	Wild Sweetpea, Wilde-ertjie	E	–
Gentianaceae			**FM**	
Chironia peduncularis Lindl.	1	Christmas Berry, Aambeibossie	GM	C
Geraniaceae			**FM**	
Geranium incanum Burm.f.	1	Ou-meid-op-die-werf, Mickie-Jan-Willem	M E	Tfy
Pelargonium capitatum (L.) L'Hér.	8	Wild Geranium, Malva	M	TC
Pelargonium grossularioides (L.) L'Hér.	2	Rooirabasam	M	–
Pelargonium odoratissimum (L.) L'Hér.	1	Scented Geranium, Malva	M	–
Hyacinthaceae				
Albuca virens (Lindl.) J.C.Manning & Goldblatt (*Ornithogalum tenuifolium*)	6	Slymuintjie, Jikui, Gambry	E	T
Drimia uniflora J.C.Manning & Goldblatt	5	Fairy Snowdrop	GM	–
Ornithogalum graminifolium Thunb.	3	Grass Chink	GM	T
Veltheimia bracteata Harv. ex Baker	1	Sandlelie, Quarobe, Kwarobe	GM	FT

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Hypoxidaceae			**FM**	
Spiloxene trifurcillata (Nel) Fourc. (*Pauridia*)	2	Sterretjie	GM	–
Hypoxis cf. *stellipilis* Ker Gawl.	2	African Potato, Toevanna	M O	TC
Iridaceae				
Aristea ecklonii Eckl. ex Klatt	1	Blue Stars	M	–
Bobartia orientalis Gillett	1	Geelblombiesie	GE	Tfy
Chasmanthe aethiopica (L.) N.E.Br.	2	Suurkanol	GE	FTC
Watsonia knysnana L.Bolus	1	Watsonia	GE	–
Juncaginaceae				
Triglochin elongata Buchenau	1	Bulbous Arrowgrass	M E	C
Triglochin striata Ruiz & Pav.	1	Three-rib Arrowgrass	GM	TC
Lamiaceae			**FM**	
Clerodendrum glabrum E.Mey.	1	Tinderwood	M	FT
Leonotis leonurus (L.) R.Br.	1	Duiwelstwak, Lion's Ears, Wildedagga	M E	FT
Salvia africana-lutea L.	3	Strandsalie, Bruinsalie	M	TCfy
Stachys aethiopica L.	3	Katpisbossie, Kruie	M	FTCfy
Linaceae				
Linum africanum L.	5	African Flax	M	Cfy
Lobeliaceae (*Campanulaceae*)			**FM**	
Lobelia anceps L.f.	2	Leafy Lobelia	M	FC
Lobelia cuneifolia Link & Otto	5	Wedge Leaved Lobelia	M	F
Lobelia flaccida (C.Presl) A.DC.	6	Wild Lobelia	M	–
Monopsis decipiens (Sond.) Thulin	2	Wild Violet	M	–
Malvaceae				
Grewia occidentalis L.	7	Raisin bush, Kruisbessie, Vierpuntjies, Booghout, Pylhout	M E O	FTC
**Hibiscus trionum* L.	1	Wild Hibiscus	M	–
Meliaceae				
Ekebergia capensis Sparrm.	1	Cape Ash, Essenhout	M	T
Menispermaceae			**FM**	
Cissampelos torulosa E.Mey. ex Harv. & Sond.	1	Dawidtjieswortel	M	FT
Moraceae				
Ficus burtt-davyi Hutch.	7	Wild Fig, Rankvy, Hottentotstou	E O	FTC
Myricaceae			**FM**	
Morella cordifolia (L.) Killick	1	Waxberry, Gammabos	M E O	FTCfy
Morella serrata (Lam.) Killick	1	Waterolier, Bergwasbessie	M	Ffy
Myrsinaceae				
Rapanea gilliana (Sond.) Mez	1	Dwarf Cape Beech, Kleinblaarboekenhout,	GM	TCfy
Rapanea melanophloeos (L.) Mez	5	Cape Beech, Boekenhout	M	FC
Nymphaeaceae			**FM**	
Nymphaea nouchali var. *caerulea* Burm.f.	1	Blue Water Lily	M E	–

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Oleaceae				
Chionanthus foveolatus (E.Mey.) Stearn (*Linociera*)	4	Pock Ironwood	M	FTC
Jasminum angulare Vahl	1	Wild Jasmine	M	FT
Olea capensis L.	3	Wild Olive, Ironwood	M E O	FC
Orchidaceae				
Bonatea speciosa (L.f.) Willd.	4	Wood Orchid	GM	FT
Satyrium parviflorum Sw.	3	Orchid	M	–
Satyrium princeps Bolus	1	Orchid	GM	TCFy
Oxalidaceae				
Oxalis smithiana Eckl. & Zeyh.	6	Suuring	E	–
Penaeaceae				
Penaea cneorum Meerb.	1	Brickleaf	GM	Ffy
Pittosporaceae				
Pittosporum viridiflorum Sims	2	Cheesewood, Kaarsuur	M	FC
Plantaginaceae			**FM**	
Plantago crassifolia Forssk.	5	Weeblaar	GM	TC
Plumbaginaceae				
Limonium scabrum Kuntze	6	Sea Lavender, Brakbossie	–	TCfy
Poaceae				
Cynodon dactylon (L.) Pers.	1	Bermuda Grass	M	TCfy
Digitaria eriantha Steud.	2	Fingergrass	M O	T
Ehrharta calycina Sm.	5	Polgras, Bushman Grass	–	FTCfy
Ehrharta erecta Lam.	1	Panic Veldtgrass	–	FT
Eragrostis capensis (Thunb.) Trin.	1	Love Grass, Hartjiegras	GM	FT
Eragrostis curvula (Schrad.) Nees	1	Weeping Lovegrass	E	T
Helictotrichon hirtulum (Steud.) Schweick.	1	Oat grass	–	–
Heteropogon contortus (L.) P.Beauv. ex Roem. & Schult.	1	Tanglehead	M	Tfy
Pentameris pallida (Thunb.) Galley & H.P.Linder (*Pentaschistis*)	1	Duinegras	–	T
Polypogon strictus Nees	1	Baardgras	–	C
Setaria sp.	1	Foxtail Grass	GM	T
Sporobolus africanus (Poir.) Robyns & Tournay	1	Paramatta Grass	M	TCfy
Sporobolus virginicus (L.) Kunth	11	Brakkweek	GM	TC
Stenotaphrum secundatum (Walter) Kuntze	16	Buffalo, Strandkweek	M E	FTCfy
Themeda triandra Forssk.	2	Rooigras	M	TFy
Tristachya leucothrix Nees (*Apochaete hispida*)	1	Trident grass	–	fy
**Vulpia myuros* (L.) C.C.Gmel.	1	Wildegars, Wild Barley	–	T
Polygalaceae			**FM**	
Muraltia squarrosa (L.f.) DC.	1	Skilpadbos	M	Tfy
Polygala ericaefolia DC.	1	Milkwort	GM	Tfy

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Polygonaceae			**FM**	
Rumex sagittatus Thunb.	1	Climbing Sorrel, Ranksuring	M E	TC
Proteaceae				
Leucadendron salignum R.Br.	2	Tolbos, Geelbos	M O	Cfy
Leucadendron spissifolium I.J.Williams	1	Tolbos	–	–
Leucospermum cuneiforme (Burm.f.) Rourke	1	Pincushion	–	fy
Protea coronata Lam.	1	Green Protea	GM	–
Protea cynaroides (L.) L.	1	King Protea	GM	fy
Protea neriifolia R.Br.	1	Protea	GM	fy
Protea tenax R.Br.	1	Ground Protea	GM	fy
Rhamnaceae				
Phylica litoralis (Eckl. & Zeyh.) D.Dietr.	3	Luisbos	–	TCfy
Phylica purpurea Sond.	4	Luisbos	–	Ffy
Rhamnus prinoides L'Hér.	2	Blinkblaar, Hondepishout	M E	FT
Scutia myrtina (Burm.f.) Kurz	6	Katdooring, Rank	M E O	FTC
Restionaceae				
Restio leptoclados Mast. (*Ischyrolepis*)	4	Besemgoed	O	fy
Restio triticeus Rottb.	1	Besemgoed	O	TCfy
Thamnochortus fruticosus P.J.Bergius	2	Thatching reed	O	–
Rosaceae				
Cliffortia ilicifolia L.	1	Doringtee, Rysbos	M	fy
Cliffortia linearifolia Eckl. & Zeyh.	1	Glastee	GM	Tfy
Rubus pinnatus Willd.	1	Wild Blackberry, Braambossie, Vaalbraam	M E	F
Rubiaceae			**FM**	
Burchellia bubalina (L.f.) Sims	1	Wild Pomegranate	M	FTC
Canthium inerme (L.f.) Kuntze	2	Bokdrol, Hardepeer	M E	FTC
Canthium spinosum (Klotzsch ex Eckl. & Zeyh.) Kuntze	2	Doringtou	M E	FTC
Psydrax obovata (Klotzsch ex Eckl. & Zeyh.) Bridson	3	Psydrax, Kwar, Quar	M	FT
Rutaceae			**FM**	
Agathosma apiculata E.Mey. ex Bartl. & H.L.Wendl.	4	Anys Buchu, Knoffelbuchu, Hottentotsboegoe	M	Cfy
Agathosma ovata (Thunb.) Pillans	2	False Buchu, Valsboegoe, Rondeblaar boegoe	M E	FTfy
Agathosma serpyllacea Licht. ex Roem. & Schult.	1	Steenbok Buchu, Steenbokboegoe	M O	–
Clausena anisata (Willd.) Hook.f. ex Benth.	1	Perdepis	M	FT
Coleonema pulchellum I.Williams	1	Confetti Bush, Aasbossie, Muishondboegoe	M	T
Zanthoxylum capense (Thunb.) Harv.	5	Perdepram, Wildekardamom	M O	FTC
Salicaceae (*Flacourtiaceae*)			**FM**	
Scolopia zeyheri (Nees) Szyszył.	4	Doringpeer, Wolwedoring	M	FT

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Santalaceae				
Colpoon compressum P.J.Bergius (*Osyris*)	7	Bloupruim, Basbessie, Looibos, 'Nantegara, Namtarri, Notchou	M E O	FTC
Thesidium fragile (Thunb.) Sond.	5	Teringbossie	GM	TCfy
Sapindaceae			**FM**	
Allophylus decipiens (E.Mey.) Radlk.	5	Rooibessie	M	FTC
Sapotaceae				
Sideroxylon inerme L.	10	Milkwood	M E	FTCfy
Scrophulariaceae				
Chaenostoma polyanthum Benth. (*Sutera*)	3	Sutera, Ruikbossie	GM	T
Chaenostoma cordatum (Thunb.) Benth. (*Sutera*)	4	Sutera, Ruikbossie	GM	FT
Jamesbrittenia microphylla (L.f.) Hilliard (*Sutera*)	1	–	GM	Tfy
Selago corymbosa L.	1	Slakkiebos, Aambeibos	M	T
Selago myrtifolia Rchb.	1	Bitterbos	GM	T
Teedia lucida (Aiton) Rudolphi	1		M	FT
Sinopteridaceae (*Pteridaceae, Adiantaceae*)				
Cheilanthes hirta Sw.	1	Kleinvaring, Oorstokkies	M	F
Solanaceae			**FM**	
Lycium ferocissimum Miers	10	Wolvebessie, Slangbessie, Kariedoring	M E O	T
Solanum africanum Mill. (*americanum*)	7	Dronkbessie	M	TC
Solanum linnaeanum Hepper & P.-M.L.Jaeger	5	Gifappel, Bitterappel	M	T
Solanum retroflexum Dunal (*Solanum nigrum*)	1	Sobo-sobo, Nasgal, Wolwebos	M E	T
Withania somnifera (L.) Dunal	3	Geneesvelletjie, Geneesblaar	M	T
Stilbaceae (*Loganiaceae, Buddlejaceae*)				
Nuxia floribunda Benth.	11	Wildevlier, Wild Elder	M	F
Theophrastaceae (*Samolaceae*)				
Samolus porosus Thunb.	2	Water Pimpernel	GM	C
Samolus valerandi L.	1	Brookweed	M	–
Thurniaceae (*Prioniaceae*)				
Prionium serratum (L.f.) Drège	1	Palmiet,	E	–
Thymelaeaceae			**FM**	
Passerina corymbosa Eckl. ex C.H.Wright	1	Bakbossie	GM	Cfy
Passerina ericoides L.	2	Bakbos, Christmas berry, Dronkbessie, Gonna	M O	–
Passerina rigida Wikstr.	7	Bakbos, Gonnabas	M O	FTC
Struthiola hirsuta Wikstr.	1	Roemenaggie, Aand gonna	–	fy
Urticaceae				
Didymodoxa caffra (Thunb.) Friis & Wilmot-Dear	2	Nettle	–	FT
Vitaceae				
Rhoicissus digitata (L.f.) Gilg & M.Brandt	17	Wild grape, Wildepatat, Boesmansdruif	M E O	FTC
Rhoicissus tomentosa (Lam.) Wild & R.B.Drumm.	2	Forest grape, Bobbejaantou	M E	FTC

Table 2 – Collected species grouped into vegetation types according to cited references. Some species are listed in more than one vegetation type.

	Vegetation Type – references	Total No spp. in table 1 per reference	No spp. collected per veg type	% of 268 spp. collected
FOREST	**Southern Cape Forests** Geldenhuys (1993)	93	FOREST 100	20%
	Southern Afrotemperate Forest (FOz 1) Mucina & Rutherford (2006)	18		
	Southern Coastal Forest (FOz 6) Mucina & Rutherford (2006)	13		
	Tsitsikamma National Park Hanekom et al. (1989)	23		
THICKET	**Subtropical thicket, Subtropical Thicket Ecosystem Project (STEP)** Vlok & Euston-Brown (2002)	148	THICKET 163	33%
	Humansdorp region, Kaffrarian thicket Cowling (1982)	27		
	Subtropical Dune Thicket (AZs 3) Mucina & Rutherford (2006)	38		
	Gamtoos Thicket (AT 4) Mucina & Rutherford (2006)	39		
COASTAL	**Eastern & Southern Cape Coasts** Lubke & van Wijk (1998a, 1998b)	73	COASTAL 109	22%
	Tsitsikamma National Park Hanekom et al. (1989)	52		
	Cape Seashore Vegetation (AZd 3) Mucina & Rutherford (2006)	20		
	Algoa Dune Strandveld (AZs 1) Mucina & Rutherford (2006)	26		
FYNBOS	**Humansdorp region, S Coast dune fynbos** Cowling (1982)	19	FYNBOS 73	15%
	Southern Cape Dune Fynbos (FFd 11) Mucina & Rutherford (2006)	20		
	Humansdorp region, **Grassy fynbos** Cowling (1982)	31		
	Tsitsikamma National Park Hanekom et al. (1989)	31		
	Absent in referenced literature	55	55	10%

as a medicinal genus, it is listed in table 1 and in the electronic appendix as a 'medicinal genus' (GM). Similarly, an edible genus or a genus with other uses is indicated as GE or GO respectively. There is often substitution of species within a genus by users depending on what is locally available (Y. van Wijk, Rhodes University, South Africa, unpubl. thesis) which validates our use of these categories included here in order to show more clearly the overall high level of useful plants present in the Klasies area.

In addition, the vegetation types in which each taxon occurs locally is noted (tables 1 & 2). The vegetation types – forest, thicket, coastal vegetation or fynbos – have been identified according to species check lists from the relevant literature (Cowling 1982, Hanekom et al. 1989, Geldenhuys 1993, Lubke & van Wijk 1998a, 1998b, Vlok & Euston-Brown 2002, Mucina & Rutherford 2006). Mucina & Rutherford list taxa for each vegetation type but make it clear that these are only the "important taxa" (Mucina & Rutherford 2006: 6) and not every species to be found in that specific vegetation type. Many of the species collected at Klasies River occur in more than one vegetation type and are therefore included in each type.

Tables 1 and 2 show that the vegetation we sampled within the wider 5 km radius at Klasies River is comprised of thicket (163 spp., 33%), forest (100 spp., 20%) and coastal species (109 spp., 22%). Of the collected species, 49 co-occur in forest, thicket and coastal vegetation, 78 in forest and thicket, but only nineteen occur in all four vegetation types. The 73 species associated with fynbos vegetation account for only 15%. The 55 species not included in any reference lists contribute 10%. Thicket and forest types form a mosaic structure in much of the study area with many thorny taxa which form dense, impenetrable stands (fig. 5A). Thicket and forest species are particularly dominant in the areas sampled close to the cave sites – collecting areas 3, 8, 8a, 9, 12, 13, 14 and 17 in the vicinity of Main Site, as well as Areas 6, 7 and 15 near Caves 3 and 4 (fig. 4). Coastal vegetation occurs mainly in areas 2a, 4a, 5, 10, 10a, 11, 16, 18 and 19 and is very species rich. The coastal species are associated with the sea-spray affected littoral and hummock dune vegetation. Most of the fynbos species listed in table 1 were growing in a small patch of fynbos in area 20 (fig. 3), while some fynbos taxa were also present on the plateau in areas 14 and 23 (figs 3 & 4, electronic appendix).

For purposes of comparison, species lists were obtained from the Integrated Biodiversity Information System (SIBIS) of the South African National Biodiversity Institute (SANBI, http://biodiversityadvisor.sanbi.org/online-biodiversity-data/sabif-3/sibis/). SIBIS check lists for four coastal 1:50 000 grids including and surrounding the Klasies River area – 3424AA, AB, BA & BB – were compared with our species list. The results of this study show that the Klasies grid Clarkson 3424AB is significantly under-represented on SI-

Table 3 – **Quantification of useful species for the 268 species listed in table 1.**

# individual species reported as being useful (ie: medicinal, edible, other, see below)	# species in genera referenced as useful	# nul uses	Total species listed in table 1
179	62	27	268
67%	23%	10%	100%

Table 4 – **Uses allocated to the 179 individual useful species in table 3.**
Many species have more than one use category.

Medicinal	Edible	Other	Total reported uses for 179 spp.
148	77	36	261
57%	30%	13%	100%

BIS, with only 69 of the 268 species we collected (table 1) appearing on the SIBIS database. The lack of data captured by SIBIS (now Brahms) for the Klasies grid, and the lack of other surveys undertaken or published specifically for this grid, precludes the use of this data for analysis. The Cape St Francis 3424BB grid, representing the area to the east of Klasies, is however better collected, doubtless due to years of collecting by Richard Cowling and the local Fourcade Botanical Club (http://stfranciskrommetrust.co.za/outreach-fourcade/). Of the 922 species in the SIBIS list for 3424BB, 137 species occur in our Klasies species list; at only 15% of the SIBIS total, this is still minimal, and again does not allow for useful data analysis.

A large proportion of the shrubs and trees listed in table 1, particularly in forest and thicket vegetation types, have medicinal properties and/or bear edible fruits. Table 3 shows that 67% of the 268 species collected by us and listed in table 1, were reported as useful during our ongoing ethnobotanical survey and in the literature cited previously (in the first paragraph of this section). In addition, 23% of the species are listed in table 1 as GM (medicinal genera in the literature cited) which brings the overall useful tally to 90%, while only 10% had no reported uses. Table 4 presents a breakdown of the use categories – medicinal (M), edible (E) or other uses (O). Many taxa are reported in more than one use category. Of the total reported uses for the 179 individual species, 57% were medicinal, 30% edible and 13% had other uses.

DISCUSSION

In this review and analysis of the vegetation we provide a new detailed description and characterisation of the Klasies River landscape. Our work extends the current knowledge of vegetation in this area significantly although there is still much research and systematic plant collecting to be done before the composition of its vegetation is understood more fully. We have shown that the Klasies River landscape, which forms a part of the SIBIS 3424 AB map vegetation record, is under-represented and our collection of a restricted area has added 168 species to this record. The fact that the Klasies area has not been well collected previously, and that the coastal strip is privately owned with restricted entrance by permission only, as well as the difficulty in collecting in impenetrable sections and on the steep cliffs, could explain why 55 species or 10% of the species we collected are not present in any of the lists referenced in table 2. Some exotic species recorded such as *Chenopodium* spp., *Withania somnifera*, *Solanum nigrum* / *retroflexum*, *Stellaria media*, *Cyperus rotundus* and *Centella asiatica* are not listed in the literature researched, possibly because they are considered, perhaps erroneously, as relatively recent and weedy introductions to the area. It is thought-provoking that most of these weedy species occur frequently at archaeological sites throughout the southern Cape (Y. van Wijk, Rhodes University, South Africa, pers. obs.) and all are widely used today.

The collection of a range of modern botanical specimens has also enabled us to address the perception that the Klasies sites are located in fynbos vegetation. Mucina & Rutherford (2006), for example, characterise the Klasies River area as Southern Cape Dune Fynbos on the Algoa sediments and Tsitsikamma Sandstone Fynbos on the plateau. This might have led to the perception that fynbos comprises "96.83% of the major habitat types represented in a 10 km radius around Klasies River" (Marean et al. 2014: 170). However, as shown in tables 1 & 2, the vegetation in the immediate vicinity of the sites is a complex mosaic consisting of mainly thicket, forest and coastal vegetation types, with some fynbos elements.

The great diversity of vegetation types – a feature typical of the south-eastern Cape (Cowling 1984, Cowling & Potts 2015) – is due to a variety of factors which have resulted in the extremely varied terrain providing a wide range of microhabitats and micro-climates often associated with distinctive vegetation types or even biomes. These factors include the underlying geology and associated soils, fire, aspect and salt-laden wind exposure. Where the sea winds and salt spray blows unhindered, the vegetation is no more than 10 to 20 cm tall yet remains species rich and could be called 'Lilliputian' (Acocks 1988) coastal thicket-forest. Where the valleys or slopes are protected from the prevailing winds by cliffs and ridges, the thicket-forest comes into its own and trees as high as 3 to 4 metres are present, often within just a few metres of dwarfed examples of the same species. For example, isolated dwarfed *Sideroxylon inerme* (milkwood) trees only 20 cm in height occur in area 2 whereas dwarf milkwood forest 20 cm high, intertwined with thorny *Lycium ferocissi-*

mum, is found higher up the same south facing slope in area 3. This abruptly becomes 1–3 m impenetrable milkwood forest as the ground suddenly falls away to the north (fig. 5A).

Afrotemperate coastal forest 3–6 m tall survives in sheltered areas below Caves 3 and 4 (fig. 5B), below Cave 5, and above area 18. On low lying sections along the coast, such as areas 10, 10a, and sections of 18, the vegetation consists of salt-tolerant grass, low herbs, geophytes and shrubs, many of which are succulent. Large tracts of closely packed *Trachyandra divaricata* (Veldkool) in this grassy seashore vegetation (fig. 5C) promise good pickings of flowerbuds for a nutritious green bredie (stew) in Spring (van Wyk & Gericke 2000, and Y. Van Wijk, Rhodes University, South Africa, pers. comm.). A variety of cliff dwelling succulent plant species populate the cracks and ledges of the weathered and eroded quarzitic sandstone of the cliffs above areas 8, 9 and 11 (fig. 5D). This cliff vegetation includes tree and thicket species as well as geophytes such as the rare *Satyrium princeps* and succulents such as *Gasteria acinacifolia*.

The richness and complexity of the vegetation is not adequately shown by the presence and absence data in table 1. While fynbos is regarded as more species rich than thicket and forest vegetation types, it is confined to small patches on the inland plateau in the broader study area. The coastal vegetation is however very species rich. An example of this is, to some extent, illustrated by listing the surprisingly numerous species collected in one measured square metre of what appeared at first glance to be simply low grassy ground cover. This square metre in area 8 contained 21 different species, including trees, herbs, creepers and geophytes (see fig. 6).

The soil underlying this small plot is nutrient-rich, spongy with humus, and dark black-brown in colour. This topsoil, a fertile loam, covers the fossil dune(s) and is also evident in areas 4, 8, 9, 12, 13 and 14 (fig. 4). This dark brown earth is the result of millennia of thicket growth, die back, perennial leaf shedding, and capture of wind-blown sands and soil from the coast and inland (Tinley 1985, Y. van Wijk, Rhodes University, South Africa, pers. comm.). The 80–90 cm depth

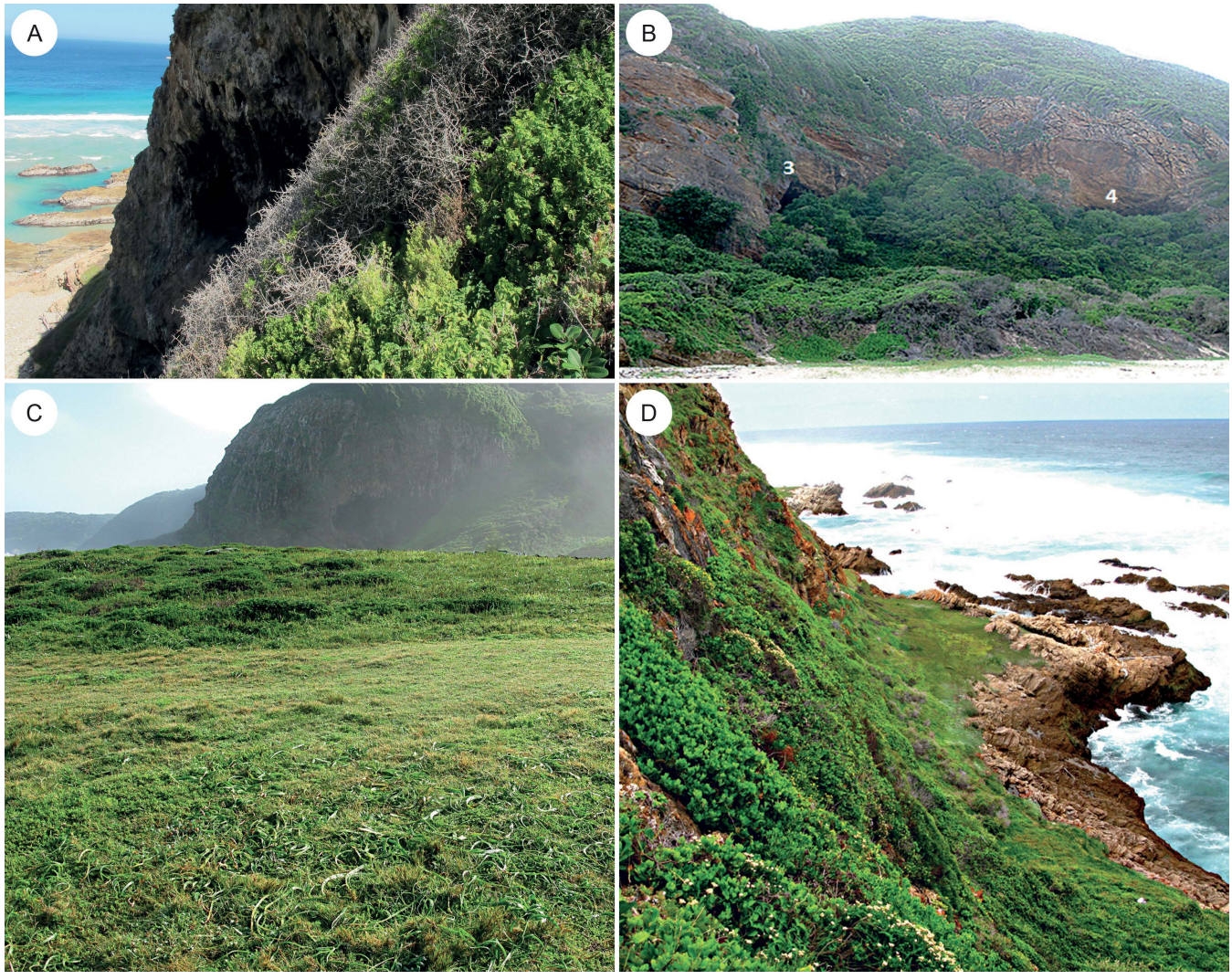

Figure 5 – A, impenetrable vegetation in upper area 3: *Lycium ferocissimum*, *Sideroxylon inerme* and *Hypoestes aristata*; B, forest patch in area 15 and protective fore-dune in area 16, located between and below caves 3 and 4; C, area 10 & 10a, large patches of *Trachyandra divaricata* (veldkool, wild cabbage) in the foreground; D, upper section of area 11. Cliff vegetation. Photographs by Y. van Wijk.

of the dark humus-rich loamy soil covering the fossil dune directly above the Klasies River main site, (fig. 7) is an indication of the ancient origin of the dense thicket community in this area. Although climate oscillations during the Pleistocene would have affected the distribution of thicket, thicket extent in the Klasies region has probably changed little since the end of the Late Pleistocene (Cowling et al. 2005, Potts et al. 2013). In contrast to the loams, the plateau soils are mainly infertile, poorly drained, duplex forms (sand overlying clay at 0.5–1 m depth) (Strydom & Schafer 1997).

In the context of the total South African flora of nearly 24,000 species, only 3,000 or 12.5%, have been reported as medicinal (van Wyk & Gericke 2000, Arnold et al. 2002). The 57% of medicinal plants out of a total of 268 species collected near the sites at Klasies (tables 1 & 4) indicates a much higher proportion of medicinal species than would be expected, and the 43% of species which are edible or have other uses is also impressive. Edible species and those with other uses have not been quantified for South Africa and the difficulty of doing so is formidable. Of the 78 families collected (table 1), all except three are reported as useful, while 33 of these families have been shown through chemical and pharmaceutical research to be particularly active medicinally (Hutchings et al. 1996, van Wyk & Gericke 2000, Zhu et al. 2011).

Of the 163 thicket species present, 56 species (34%) are reported as edible, lending support to De Vynck et al. (2016a) who demonstrate that thicket taxa comprise the bulk of edible species in Cape south coast landscapes. Geophytes or underground storage organs (USOs), are plentiful and varied

▲ **Figure 6** – One square metre with 21 species present. *Adenocline acuta*, *Senecio elegans*, *Senecio angulatus*, *Cotula coronipifolia*, *Carpobrotus deliciosus*, *Crassula pellucida* subsp. *marginalis*, *Rumex saggitatus*, *Hypoestes aristata*, *Trachyandra divaricata*, *Ornithogalum graminifolium*, *Indigofera porrecta*, *Cynanchum natalicum*, *Putterlickia pyracantha*, *Ficus burtt-dayvi*, *Acokanthera oppositifolia*, *Cineraria geifolia*, *Centella asiatica*, *Stenotaphrum secundatum*, *Ehrharta calycina*, *Polypogon strictus*, *Sporobolus virginicus*. (Compound Voucher *YvWijk* 6382).

► **Figure 7** – A vertical cutting through the fossil dune in area 13. Showing depth of loam supporting dense thicket vegetation.

(table 1), but are well hidden in dense thicket and ground-covers when not in flower. Year-round collection of specimens and intimate knowledge of the area is necessary to ensure they are adequately quantified. It is interesting that two fresh-water plant species, *Prionium serratum* and *Nymphaea nouchali* var. *caerulea*, were collected within the wider 5 km radius. Although neither are listed in the vegetation literature cited, both are important because they could provide carbohydrates in larger quantities year-round than the seasonal geophytes (Fox & Norwood-Young 1982, Wrangham et al 2009, De Vynck 2014).

The presence of so many useful taxa puts the richness of the Klasies River area in perspective. The large number of medicinal taxa and those with edible fruit, leaves, bark and USOs available, plus the presence of highly nutritious seaweeds (Anderson et al. 1989, Buchholz et al. 2012) and the very important availability of much needed salt (Brigand & Weller 2015), would have meant that coastal areas were sought-after, resource rich areas because of their abundant and useful plant wealth, as well as readily available seafood and faunal prey.

The botanical data collected by us during the present study, makes it possible to compare the vegetation at Klasies with that at 74 other archaeological sites in the southern and south-eastern Cape which form part of a larger study about the connection through time between humans and the surrounding vegetation at habitation sites, being undertaken by Y. van Wijk (Rhodes University, South Africa, unpubl. res.). This connection begs further investigation of the nature of the areas associated with archaeological sites, for example, about how 'pristine' they actually are. Concepts such as the synergistic co-evolution of plants and humans, and the anthropogenic effects on vegetation pattern can be seen as distinct possibilities. The results of vegetation sampling at Klasies River show considerable overlap with the vegetation at other important southern Cape coastal sites, for example, Nelson's Bay, Pinnacle Point and Blombos. Klasies River has however a much higher species diversity than other sites.

Our work clearly indicates the need for thorough and systematic collecting at archaeologically significant sites in the Cape region. This is particularly important considering the many archaeological sites that occur in the area, and the need for and increasing interest in comparative material for further archaeobotanical research. The collections provide data for the identification of and comprehensive research on the archaeobotanical remains in terms of past vegetation and plant use, and will provide further environmental proxies for the interpretation and contextualisation of human behaviour in the past. It will also contribute to the broader debate about the context in which the development of anatomically modern humans took place.

SUPPLEMENTARY DATA

Supplementary data are available in Excel file at *Plant Ecology and Evolution*, Supplementary Data Site (http://www.ingentaconnect.com/content/botbel/plecevo/supp-data) and consists of all plant species collected in 1984/1985 and from 2013 to 2015 within 5 km of the Klasies River archaeological sites in 24 areas. Vegetation types, use categories, and voucher numbers are included.

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